

BIODIVERSITY CONSERVATION

An Organic Certifier's Guide



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Introduction

Biodiversity Conservation and Organics

The USDA National Organic Program (NOP) Rule¹ requires the conservation of biodiversity and the maintenance or improvement of natural resources, including wetlands, woodlands, and wildlife. Until recently, the organic community has had no common understanding of what these requirements mean. With the help of the Wild Farm Alliance and others, the National Organic Standards Board (NOSB) approved biodiversity conservation additions into their model Organic System Plan (OSP) in August 2005.

Indicators of Compliance

The goal of this guide is to increase and unify organic certifiers' and farm inspectors' understanding of organic standards that conserve biodiversity and the natural resources of organic farming systems. The guide draws on the knowledge and experience of organic farmers, certifiers, and conservationists, as well as current research and literature, to lay out a range of farming possibilities for a variety of situations that affect farms and ranches and the larger ecosystem. By providing indicators of biodiversity compliance and non-compliance, the guide makes it easier for inspectors to verify, evaluate, and inform the applicant of compliance requirements and to communicate to a certifying agency the farming practices that are contributing to, or degrading, biodiversity conservation.

The Biodiversity Crisis

Wendell Berry has written, "The question we must deal with is not whether the domestic and the wild are separate or can be separated; it is how, in the human economy, their indissoluble and necessary connection can be properly maintained."² Of the 200,000 plants and animals now known to exist in the U.S., fully one-third are at risk, with 400 species already lost to extinction and another 100 missing.³ To put these statistics in perspective, one must understand that agricultural lands comprise roughly two-thirds of the continental U.S., and the destruction and degradation of native habitat during the conversion of these lands to present farm and ranch uses is the major cause for the listing of 42% and 26% of endangered species, respectively.⁴⁻⁹

Biological Diversity (Biodiversity)

Biological diversity (biodiversity) includes variety in all forms of life, from bacteria and fungi to grasses, ferns, trees, insects, and mammals. It encompasses the diversity found at all levels of organization, from genetic differences between individuals and populations (groups of related individuals) to the types of natural communities (groups of interacting species) found in a particular area. Biodiversity also includes the full range of natural processes upon which life depends, such as nutrient cycling, carbon and nitrogen fixation, predation, symbiosis, and natural succession.

NOP Rule—Preamble

We have amended the definition of organic production to require that a producer must conserve biodiversity on his or her operation. The use of 'conserve' establishes that the producer must initiate practices to support biodiversity and avoid, to the extent practicable, any activities that would diminish it. Compliance with the requirement to conserve biodiversity requires that a producer incorporate practices in his or her organic system plan that are beneficial to biodiversity on his or her operation.

NOP Rule—Subpart A—Definition 205.2 Organic Production

A production system that is managed in accordance with the Act and regulations to respond to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity.

NOP Rule—Subpart C—Organic Production and Handling 205.200 General

Production practices implemented in accordance with this subpart must maintain or improve the natural resources of the operation, including soil and water quality.

NOP Rule—Subpart A—Definition 205.2 Natural Resources of the Operation

The physical, hydrological, and biological features of a production operation, including soil, water, wetlands, woodlands, and wildlife.

Water development, much of which, again, has occurred in the name of agriculture, affects 30% of endangered species. Of course other impacts have contributed to the decline, such as commercial development, which is responsible for 35% of endangered species listings.¹⁰



Management decisions farmers make, such as providing habitats and wildlife linkages, can dramatically affect biodiversity levels. At the same time, these habitats can serve to support beneficial organisms and processes.

Farmers' Decisions Make a Difference

The International Federation of Organic Movements (IFOAM) reports that 37% of the earth's land is in agricultural production. Habitat loss is the main threat to biodiversity worldwide, with agricultural activities affecting 70% of all threatened bird species and 49% of all plant species.¹¹ Where large proportions of plants and animals of a given region depend on habitats within areas in agriculture, the management decisions farmers make can dramatically affect the overall level of biodiversity as well as the success of particular species.

At most, 5% of U.S. wildlands are protected. These "islands" in a sea of highly altered land do not provide satisfactory habitat or connectivity (movement and gene flow between populations) for many species. Networks of functional habitats must be created to link fragmented populations of key species and ecosystems. While the amount of wildness and existing habitat varies greatly from farm to farm, farmers and ranchers can work with adjoining landowners to help establish and maintain

ecosystem connections through enhanced and restored waterways, woodlands, grasslands, wetlands, and other habitats across the landscape. Farms and ranches can help provide these habitats and wildlife linkages, thereby reaping nature's ecosystem services, including pollination, insect pest control, advantageous fire, predation, and natural erosion control.

Coming Full Circle

From beneficial microorganisms to predators, agriculture innately functions within and interacts with the larger ecosystem. Bacteria and fungi break down organic matter and help to maintain soil quality and recycle nutrients. Native pollinators, which contribute to an estimated \$40 billion in orchard, row, and pasture business, can require native vegetation during non-crop flowering periods.¹² Predatory and parasitic insects colonize a farm's native plants from wilder areas. Their presence at the early stages of pest outbreaks can mean significant savings over more costly and toxic pest control measures.

Insectivorous birds and bats, which in the course of a single day during breeding season can capture more than their body weight in invertebrates, benefit from nesting and roosting habitat on or near farms, as do rodent-eating owls and raptors. Four-footed meso (midsize) predators, such as foxes, skunks, and raccoons, need territories that stretch through many family farms as they help keep gophers, mice, and ground squirrels in check. Coming full circle, the widest-ranging predators—cougars, bears, and wolves—regulate these meso predators from overly impacting the birds, snakes, fish, and other wild vertebrates. Supplying the necessary connected landscapes for these top food chain predators also provides the habitat linkages that pollinators require.

Working with Care

Not all conservation practices come without risks. The potential to bring unwanted pest birds, mammals, insects, and diseases onto the farm does exist. Unanticipated consequences to sensitive ecosystems may also occur, such as in manipulating a wetland that may then become less viable for priority species, or in attracting native species into an area that makes priority species vulnerable to predation.

Benefits On and Beyond the Farm

Many organic practices can benefit wildlife and native ecosystems. However, there is great opportunity for agricultural lands to more effectively support and restore biodiversity and ecosystem health. More and more, public and private incentive programs are available to support conservation on the farm and beyond (see resource section). In a similar WFA guide to this one for organic farmers, benefits and incentives are addressed in detail.



Native pollinators like this sweat bee contribute to an estimated \$40 billion in orchard, row, and pasture business. Identifying and protecting nesting and foraging sites, letting crops go to flower, providing artificial habitat, and restoring native habitats can increase the number of native pollinators on the farm.

How to Use This Guide

Part A helps the inspector prepare for a farm inspection by outlining core biodiversity principles and the need for background research. Part B describes various practices that producers can use or adapt to local conditions to maintain and increase biodiversity on the whole farm, in uncultivated areas, in cropland, and for livestock management and wild harvest operations. Part B allows inspectors to evaluate progress in biodiversity conservation over time. Part C, the biodiversity amendments to the National Organic Standards Board's Organic System Plan template, parallels part B. And last, part D guides the inspector with the assessment of the producer's knowledge and the evaluation of the biodiversity component of the organic system plan.

A. Preparation for the Farm Inspection

To assess biodiversity conservation, organic farmers and inspectors must have knowledge of native species and ecosystems on the farm and in the larger landscape.

Quality habitat is key for native plants and animals. The amount of food, cover, and water determines what kinds of wildlife live on the land, while soil and water conditions and disturbance regimes determine native plant populations. A farmer's actions can change native species' numbers by changing these parameters. If doing so compromises wildlife habitat, animals become vulnerable to prey or harsh weather conditions and will either move on or die. Native plants are resilient, but only under the right conditions. However, maintaining habitat can be enduring and cost effective; an organic farmer's standard of living is measured not only by yields, but also by the quality and biodiversity of life.



When balancing the changes that agriculture brings to the land, the gain of a pigeon or hayfield does not offset the loss of an eagle or wetland.

Understanding Core Biodiversity Principles

Ecosystem and biodiversity conservation generally takes place over landscapes much larger than an individual farm or ranch. The measure of success is not simply the number

of plant or animal species or natural communities in a given area, but whether the landscape as a whole achieves habitat and ecosystem conservation able to support viable populations of native species, particularly those most adversely affected by human disturbance.

When assessing the degree to which biodiversity is conserved, all things are not equal, and they should not be given equal weight when balancing the changes that agriculture brings to the land. For example, the gain of a pigeon or a hayfield does not offset the loss of an eagle or a wetland. Some species and communities, such as those that thrive in fragmented, simplified, human-dominated environments, are quite common across the landscape, and their numbers may even increase through agricultural activities. Others may be uncommon, rare, or key components of healthy ecosystems, and their well-being should receive more consideration in a farmer's organic system plan.



Take care not to foster unnaturally abundant species, such as the white-tailed deer, which damage ecosystems through much of the country. Instead uncommon, rare, or species that function as key components of healthy ecosystems should receive more consideration in the organic system plan.

In general, the conservation of native predators, such as raptors and large carnivores, should carry more weight than the conservation of their prey. Similarly, some species, such as reptiles and amphibians, are more likely to be adversely affected by farming activities than, say, rodents or sparrows, and the organic system plan should include strategies to avoid or mitigate such losses.



In order to comply with the NOP Rule, sensitive habitat like the wetland in the foreground is preserved rather than converted to agriculture or development.

Certifiers and inspectors need to have knowledge of native species and ecosystems to help ensure that farmers manage their lands for the protection of highest priority species and habitats. For example, such knowledge will help to identify and protect sensitive habitats from gradual degradation or outright conversion to other uses, to safeguard lands and waters from incursion and spread of invasive species, and to enhance riparian areas as beneficial habitat links to lessen the impacts of fragmentation.

By working with their neighbors, non-governmental organizations, and public agencies, farmers can learn to identify highest-priority species and effectively protect and link patches of essential habitat as part of a functional conservation network. As farmers and inspectors focus more on biodiversity conservation and the benefits derived from natural ecosystem services, fresh approaches will replace uncompromising practices that attempt to control nature. Farmers who help conserve biodiversity will gain the benefits of a more profitable and sustainable farm, and inspectors will assist in assessing farmscapes for the benefit of biodiversity.

Manage farmland within a watershed or ecosystem context.

Organic operations generally manage for diversity to increase the health, vigor, and resilience of their soil and crops. When managed within the framework of biodiversity at the watershed or ecosystem level, the farm

becomes more hospitable and permeable for pollinators and other wildlife, and the surrounding ecosystem becomes more naturally complex, offering an array of services. By collaborating with others in the watershed or region, farmers can achieve the broadest ecosystem goals.

Take advantage of nature's ecosystem services: pollination, pest control, beneficial predation, advantageous fire, flood and erosion control, nutrient cycling, and improved water quality and quantity.

Ecosystem services come from every biological level on earth. Farmers' thoughtful care of habitats contributes to the strength, stability, and function of these services, which have been roughly valued at \$33 trillion for the world.¹³

Avoid conversion of sensitive habitats to agricultural production or development.

Protecting sensitive habitats from degradation or conversion to other uses is critical in conserving biodiversity. Farmers should identify all the high-priority existing habitats on their farms—including grasslands, desert scrub, forests, and wetlands—and ensure their protection for native species conservation. In some cases, a permanent conservation easement may be appropriate to establish long-term protection of key areas.



Riparian areas support an inordinate number of native species compared to the rest of the landscape. Restoring degraded riverside habitats greatly benefits biodiversity and helps with water purification, flood protection and groundwater recharge.



Endangered species, like this Chiricabua leopard frog, rely in a large part on farms for their water and habitat needs. Protecting them directly addresses the biodiversity crisis.

Protect threatened and endangered species, species of special concern, and keystone species.

These categories of species (described in detail in the glossary on pages 23 and 24) are among the highest priorities for conservation of biological diversity. Farmers should maintain all that occur naturally on their farms.

Conserve native plants and animals of the production operation, including in and around water bodies.

Biodiversity conservation depends on the protection of habitats for native plants and animals. In the U.S., the greatest loss of species and habitat by far occur in freshwater ecosystems. Roughly 30% of the protected and proposed protected species made the list because of water resource development.¹⁴ By managing riparian areas and wetlands for biodiversity, farms and ranches can also benefit from nature's services, including nutrient cycling, erosion control, water purification, and flood protection.

Conduct restoration based on native species and ecosystems present on the land before it was turned over to agriculture.

Successful restoration efforts are based on species and ecosystems that are adapted to, and that had historically occupied the farm. Nearby intact ecosystems that resemble the land prior to conversion can serve as libraries of ecological knowledge.

Maintain and restore linkages and connectivity, including large blocks of habitat and wildlife corridors, to strengthen regional networks of conservation areas.

In any region, farmlands should help conserve enough native habitat, in the appropriate configuration, to maintain self-sustaining populations of native species in functioning ecosystems. Large core reserves (wilderness) interconnected by habitat linkages (wildways) to smaller zero-extraction reserves, even within individual farms, are important. “Working landscapes” are not enough; true wildlands are critical. In regions used primarily for agriculture, enough quality habitat (e.g., grasslands or woodlands) should be retained or restored to support the native plants and animals that inhabited the area prior to widespread conversion to crops.

Prevent introduction and spread of non-native, invasive species.

The spread of non-native, invasive plants, animals, and pathogens poses a major threat to the U.S. economy and environment. Leaders in agriculture and conservation call the devastation caused by such organisms one of the most serious and least-recognized tragedies of our time. With increasing global trade and travel, non-native species spread farther and faster than ever. It is critical to control populations of established invasives and to aggressively prevent the introduction and spread of new pest species, especially those that threaten natural areas.



Invasive, non-native species like this salt cedar present the second greatest threat to biodiversity after habitat destruction. The cost of invasive species in the U.S. is estimated to be more than \$138 billion per year.¹⁵



When you realize that habitat loss is the greatest threat to native plants and wildlife, the importance of maintaining, enhancing, and even increasing native habitat becomes clear.

Researching Priority Species, Habitats, and Conservation Goals of the Region

Farmers will take the lead in developing biodiversity conservation plans as part of the organic system plan (OSP). It is essential, however, for certifiers and inspectors to fully understand biodiversity conservation so they can evaluate farmers' implementation and monitoring of the OSP. Therefore, certifiers and inspectors must become familiar with priority species, habitats, conservation partnerships, biodiversity goals, and invasive species of the regions where their farm inspections occur. Much of this information is easily accessible from a few key websites:

- Every state has or is working to complete a “comprehensive wildlife conservation plan” which addresses the “species of greatest conservation need” and the “full array of wildlife and wildlife issues.” Links to each state’s plan or its agency conducting the plan appear on the Biodiversity Partners website’s Biodiversity Planning page (www.biodiversitypartners.org).
- The NatureServe website (www.natureserve.org/explorer) provides information on rare and endangered species by particular watersheds and on threatened ecosystems by states.
- The Invasive Species site (www.invasivespeciesinfo.gov) gives state-by-state information on problem species.

Inspectors should bring to their inspections information on conservation goals and collaborations of the region as well as lists of priority species in the watershed, and threatened ecosystems and invasive species in the state.

B. Practices & Actions That Support Biodiversity

Part B offers a variety of biodiversity conservation practices for the whole farm, for uncultivated and cropland areas, and for livestock management and wild harvest operations. The conditions and priorities for biodiversity conservation vary widely from region to region. Some of the practices and actions are broadly applicable across many regions, and other examples are more specific. Inspectors should examine how the producer adapts, modifies, or adds to the practices given here to create a biodiversity conservation plan that is appropriate to the farm, to the local watershed, and to regional conservation goals. The issues covered in this section correlate with the NOSB's OSP biodiversity questions shown in part C.

Whole Farm Biodiversity

Taking Steps to Plan or Provide for Biodiversity

High Conservation Value

- Watershed map shows farm's connection to riparian areas/drainages at higher and lower elevations and to nearby public natural resource lands and protected areas.
- Farm map includes hedgerows, woodlands, wetlands, waterways and riparian zones, wildlife corridors, special habitats, invasive species, and erodable areas.
- Biodiversity list includes wildlife and dominant native plants present on the farm, especially highlighting priority species.
- Farmer considers the following when making a biodiversity conservation farm plan:
 - Wildlife and dominant native plants that existed on the land prior to farming.
 - Regional conservation priorities established by conservation groups/agencies.
 - Nearby natural areas that have intact ecosystems.
- Farmer collaborates with neighbors and others to enhance biodiversity for larger effect.

Moderate Conservation Value

- Watershed map shows farm's connection to riparian areas/drainages at higher and lower elevations and to nearby public natural resource lands and protected areas.
- Farm map includes hedgerows, woodlands, wetlands, waterways and riparian zones, wildlife corridors, special habitats, invasive species, and erodable areas.

Inconsistent with NOP Standards

- Farm map does not identify biodiversity features or problem areas.

NOP Rule

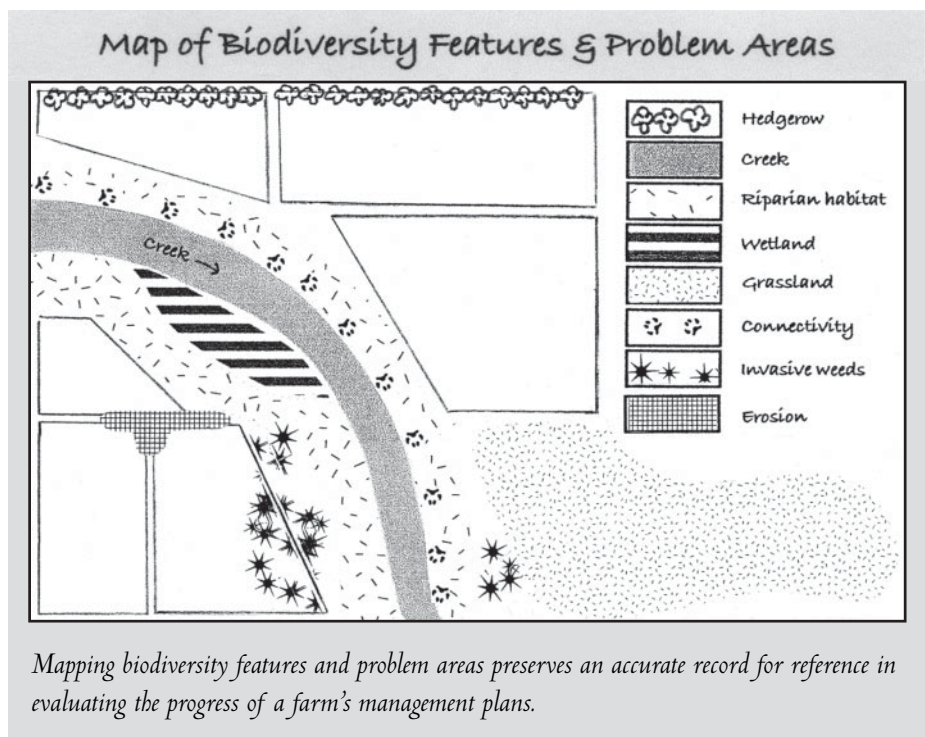
Subpart A – Definitions

Organic Production

Natural Resources

Subpart C – Organic Production

205.200 General



Whole Farm Biodiversity

Managing Water for Crops, Livestock, Native Species, and Riparian Ecosystems

High Conservation Value

- Water is used judiciously, and regionally appropriate crops are planted with the knowledge that large portions of conserved water will benefit native species and ecosystem functions.
- Water is managed to benefit priority species. For example, farm neighbors work together to time irrigations to ensure a creek never falls below safe levels for rare fish.
- Structurally diverse vegetation buffers of trees, shrubs, grasses, and forbs specific to the site are conserved or restored in shallow draws, along creeks and streams, and around pools, ponds, and wetlands, to support a multitude of wildlife, stabilize banks, and serve as a natural filter for pollutants.
- Wide riparian areas benefit priority species and may serve as a wildway or link to neighboring habitats and contribute to a broader conservation network.
- Efforts are made to protect or improve the natural function of a river and natural disturbance regimes important for aquatic species. For example, where appropriate, periodic flooding is allowed and drain tiles are removed from converted wetlands. Or a tree that has fallen into a stream or appears ready to do so is left to provide habitat.
- Riparian areas and adjacent floodplains are managed in coordination with a regional or watershed planning efforts to benefit native species and to allow the natural hydrology to function.

Moderate Conservation Value

- Water is used somewhat judiciously and some crops are planted that conserve water, thus leaving a portion for native species and ecosystem processes.
- Riparian zones and floodplains are managed to provide some benefits to native pollinators, natural enemy insects, and other native species.
- Narrow native vegetation buffer along water's edge reduces erosion.

Inconsistent with NOP Standards

- Farm operation uses water inefficiently.
- Farm operation reduces surface water availability, thereby negatively impacting priority and other fish and wildlife species.
- Farming practices abut riparian areas without a vegetative buffer, causing erosion, sedimentation, and degradation of aquatic habitat.
- Natural hydrological functions, such as flooding, are not allowed to occur, and terrestrial and aquatic species suffer.

NOP Rule

Subpart A – Definitions

Organic Production

Natural Resources

Subpart C – Organic Production

205.200 General

205.203 Soil Fertility and

Crop Nutrient Management

Managing Water for Agriculture and Wild Nature



Stream Corridor Restoration: Principles, Processes, and Practices, (FISRWG)

Riparian areas are the green zones beside rivers, streams, creeks, lakes, ponds, pools, and wetlands. Since they provide habitat for many species, wider is better for biodiversity.



S. Earmshaw

Canal banks planted with native plants offer wildlife essential food, cover, and water, and serve as wildlife movement corridors as well.

Uncultivated Area Biodiversity

Providing Habitat for Pollinators, Insect Predators, Birds and Bats

High Conservation Value

Moderate Conservation Value

Inconsistent with NOP Standards

- Native trees are planted or conserved (even as snags) for roosting and nesting habitat of birds, bats, native bees, and other wildlife.
- Sequentially flowering hedgerows and windbreaks including a layered complexity of native plants are well designed, installed, and maintained to benefit priority species and other wildlife, such as beetles, pollinators, insect predators and parasites, and birds.
- Hedgerows and windbreaks are installed in wide swaths and linked to natural areas on and off the farm where feasible.
- Unused areas like field corners and fencerows are planted to extend native habitat.
- Refuges of undisturbed soils are left for ground bees to create nesting burrows.

- Bird and bat boxes support predatory birds and insectivorous birds and bats.
- Bird roosting sites that encourage predatory birds are conserved.
- Structures such as barns and sheds provide habitat for priority birds and bats.
- Invasive weeds are replaced with native grasses and forbs to help control erosion and to attract pollinator, predatory, and parasitic insects.
- Wooden blocks or bundles of stems or straws support native tunnel-nesting bees.

- Natural roosting sites for pollinators, insect predators and parasites, birds, and bats—such as hedges, live trees, and dead snags—are removed without first exhausting alternatives to eliminating habitat.
- Field margins, such as roadsides, fencerows, and areas around buildings, are eroding or are covered with invasive weeds.

NOP Rule

Subpart A – Definitions

Organic Production

Natural Resources

Subpart C – Organic Production

205.200 General

205.206 Crop Pest, Weed, and

Disease Management Practice

Providing Habitat for Pollinators, Insect Predators, Birds and Bats



S. Eernshew

Provide the right kind of habitat and they will come. Nectar and pollen producing native plant hedgerows attract beneficial insect pollinators, predators, and parasites.



Whitney Cranshaw, Colorado St. Univ.

Native bees can save farmers money because they reduce the need for importing hives of honeybees. This native squash bee helps ensure good cucumber fruit set.



John Triana, Regional Water Authority, www.insectimages.org

Conserving native habitat on the farm and working with neighbors to do the same allows species like this barred owl to forage throughout the region.

Uncultivated Area Biodiversity

Restoring and Protecting Natural Areas

High Conservation Value

Moderate Conservation Value

Inconsistent with NOP Standards

- | | | |
|--|--|--|
| <ul style="list-style-type: none"> • Natural areas are retained, restored, and managed to accommodate the full range of native species specific to the farm and are connected or linked to other habitats in a regional conservation network. • Linkages and corridors, which provide safe passage for wildlife, are preserved and restored. • An agricultural conservation easement held by a qualifying agency or organization preserves the farm from development while protecting the natural resources of the land. • Significant efforts are made to manage or protect habitats for the benefit of priority and other native species. For example: <ul style="list-style-type: none"> • Select areas are allowed to flood to create habitat for migratory birds. • Trees are maintained, standing deadwood and fallen and rotting trees are retained, and live denning foliage remains for priority species and other wildlife. • A pond managed for natives might have a log tethered in the middle to serve as a safe place for basking turtles, and might be allowed to dry up seasonally to favor desirable natives over their predators (e.g., frogs and fish). • The beaver, a keystone species, is allowed to build a dam. | <ul style="list-style-type: none"> • Natural areas are left undisturbed, invasive species are controlled, and traffic is restricted during sensitive stages of native species' life cycles (reproductive and rearing) and migratory activity. • Moderate efforts are made to manage or protect habitats in uncultivated areas for the benefit of priority and other native species. • When cutting firewood, non-old growth trees are selectively harvested, leaving a thick cover of denning trees and other vegetation to protect the land. | <ul style="list-style-type: none"> • Sensitive habitats have been converted to agricultural production since the site was first certified. • Natural and fallow areas are dominated by non-native species. |
|--|--|--|

NOP Rule

Subpart A – Definitions

Organic Production

Natural Resources

Subpart C – Organic Production

205.200 General

205.206 Crop Pest, Weed, and Disease Management Practice

Restoring and Protecting Natural Areas



Restoring marginal farmlands to wetlands helps with floodplain protection, improves groundwater recharge, and supports a variety of terrestrial and aquatic species.

Beavers are keystone species, meaning they play a critical role in biodiversity. Many priority species rely on them to create the habitat associated with their ponds. Their handiwork also helps decrease the severity of floods and aids in recharging aquifers.

Uncultivated Area Biodiversity

Controlling Invasive Species

High Conservation Value

- Farmer is knowledgeable about invasive species in the region, especially those that threaten natural areas, and has an effective plan and monitoring system.
- New invasive species are aggressively controlled before they become established.
- Invasives are excluded from the farm by using fully composted material, clean soil amendments and mulches, and uncontaminated tractor tools.
- Organic methods, including biological control, are used and have no negative effects on desirable native species.
- In previously degraded areas where invasives have been removed, restoration is occurring with native plants to benefit priority species and other wildlife.

Moderate Conservation Value

- Invasive species are being controlled to a moderate but inconsistent degree.

Inconsistent with NOP Standards

- Invasive species widely occur and new ones are allowed to establish and spread.
- Pests are controlled in ways that harm desirable native species, when alternative control methods exist.

NOP Rule

Subpart A – Definitions

Organic Production

Natural Resources

Subpart C – Organic Production

205.200 General

205.206 Crop Pest, Weed, and

Disease Management Practice

Controlling Invasive Species



Cindy Roche, www.invasive.org

Yellow star thistle, the bane of many western ranch lands, is often referred to as invasive, non-native, an invasive weed, or an exotic plant pest. Aggressively controlling new invasive species before they become established saves time and money.



Joseph O'Brien, USDA Forest Service

Sudden Oak Death (SOD) affects not only oak trees, but other woody species as well. The dull black fungus shown here is in an advanced stage. Newly formed fruiting bodies are green or shiny black. Take care that mulch brought onto the farm does not contain SOD.



U.S. Geological Survey, Pacific Island Ecosystems Research Center

Wild boars, also known as feral hogs, are native to Europe. They root up, wallow in, and destroy the integrity of the plant and soil community that local wildlife depends on. They also compete for food with native wildlife.

Cropland Area Biodiversity Conserving and Providing Habitat

High Conservation Value

- Safe passage of wildlife through part of the farm is planned by:
 - Fencing only individual fields, if necessary.
 - Using smooth wire instead of barbed or woven wire.
 - Designing fences to allow smaller wildlife to go under the barrier.
 - Adapting fences in places of known migration routes, making them shorter or less dangerous to cross.
- Fallow fields are flooded, if appropriate, to provide habitat for waterfowl and shore birds.
- Growing winter cover crops provides green browse, erosion control, and wildlife cover.

Moderate Conservation Value

- In-field pollinator and natural enemy insectary plants, cover crops, and companion plants are grown to increase organic matter and to provide cover and habitat for beneficial insects and other wildlife.
- Intercropping is practiced to introduce diversity in perennial cropping systems.
- Growing a variety of crops in annual systems brings diversity to the farm.
- Fallow fields are planted with cover crops that displace invasive weeds and provide temporary wildlife habitat.

Inconsistent with NOP Standards

- The whole farm is fenced in a way that presents migration barriers for wildlife.
- Crop diversity is not present.
- Alley cropping, intercropping, or companion planting are not practiced in perennial systems.

NOP Rule

Subpart A – Definitions

Organic Production

Natural Resources

Crop Rotation

Subpart C – Organic Production

205.200 General

205.205 Crop Rotation Practice

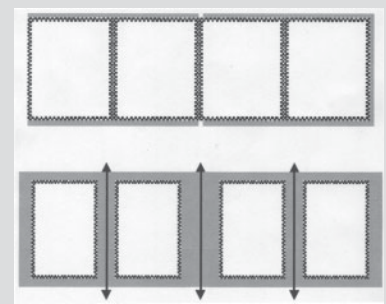
Conserving and Providing Habitat



Flowering strips of alyssum interspersed with vegetable crops help to draw pollinator, predator, and parasitic insects through the field as they forage for nectar.



Allowing rice fields to flood in the off-season attracts waterfowl and shorebirds, who feed on leftover grain and newly hatched aquatic invertebrates. The birds in turn trample the rice straw, and their excrement helps to break down the crop stubble, alleviating the need for burning and reducing future fertilizer inputs.



Fencing fragments the landscape and impedes wildlife movement. If fencing is required, fence individual fields, leaving wildlife paths in between them, rather than fencing the whole farm.

Cropland Area Biodiversity Scheduling Farming Practices to Benefit Wildlife

High Conservation Value

- Farm management accommodates sensitive life stages, such as nesting and spawning, and migration needs of priority and other wildlife species. Practices may include:
 - Delayed hay and grain harvests allow ground-nesting birds to fledge and newborn four-legged animals to move on.
 - Clearing non-crop vegetation before bird breeding season, so birds do not become established.
 - Preventing disturbance in areas where mammals, including birds and bats, hibernate or rear young.
- Alternate mowing of field grasses, leaving 25–30 foot strips around hayfields when harvesting, provides wildlife refuges in undisturbed sites. Cleaning alternate sides of ditch banks allows for filtering processes important for water quality and satisfies the needs of aquatic species.
- Crop rotations are planned so that some fields always provide food (intentionally planted wildlife food crops or crop leftovers), water, and cover for priority and other wildlife.
- At harvest time, a minimum of one-quarter acre for each 20 acres of crop is left standing, ideally in patches or strips near native cover, to provide additional cover or food for native wildlife.

Moderate Conservation Value

- Farm management accommodates the spawning, nesting, and migration needs of native fish and other wildlife.
- At harvest time, a small portion of the crop, or its stubble, is left standing to provide cover or food for native wildlife.

Inconsistent with NOP Standards

- The spawning, nesting, and migration needs of native fish and other wildlife are disrupted, which results in harm, because no attempt was made to adjust the timing of farm practices to accommodate sensitive life stages.

NOP Rule

Subpart A – Definitions

Organic Production

Natural Resources

Subpart C – Organic Production

205.200 General

Scheduling Farming Practices to Benefit Wildlife



Insectivorous barn swallows need safe, undisturbed places to rear their young. It is most critical for farms to accommodate wildlife during the sensitive life stages, such as the nesting of birds, the spawning of fish, and the migration of wildlife.



Wildlife plantings of corn and small grains provided safe foraging and roosting cover for birds and created sheltered resting areas for mammals during a cold winter on this Wisconsin farm. Plantings like these help wildlife avoid hypothermia, exposure, and starvation at the coldest times of the year.

Mary Kay Salwey

Cropland Area Biodiversity

Preventing Water Contamination

High Conservation Value

- Contoured crop rows reduce erosion.
- Roads, the ditches beside them, and the ends of crop furrows are planted in grasses to filter out sediments and contaminants.
- Sediment basins are placed at the low end of fields to stop eroded sediment from leaving the farm.
- Stream banks are protected from erosion with bioengineering by using appropriate native vegetation.
- Nutrient needs of crops are calculated and only the amounts crops can take up are applied as fertilizer.
- Fertilizers and composts are stored away from waterways or wells to avoid contamination.

Moderate Conservation Value

- Fertilizers and composts are generally applied in correct amounts.
- Reduced or minimum tillage lessens soil erosion.

Inconsistent with NOP Standards

- Soil is eroding.
- Runoff from fertilizers and composts contaminate waterways.
- Fertilizers are applied to fields in excess.

NOP Rule

Subpart A – Definitions

Soil and Water Quality

Subpart C – Organic Production

205.203 Soil Fertility and

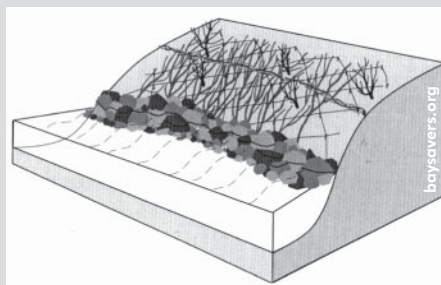
Crop Nutrient Management

Practice

Preventing Water Contamination



Contouring crop rows reduces soil erosion and excess sedimentation of waterways while helping to retain moisture in the field where it does the most good.



Bioengineering techniques, such as this brush mattress, use vegetation, soil, and rocks instead of steel and concrete to stabilize eroding streambanks. Installing live stakes or live bundled stems and branches, which eventually sprout into numerous individual plants, is cost effective, self-repairing, aesthetically pleasing, and good for wildlife and water quality.



Planting dense grasses on farm roads slows the erosive energy of water and cost-effectively reduces road maintenance and rebuilding.

Biodiversity When Livestock Are Involved
Protecting Riparian Areas and Sensitive Habitats

High Conservation Value

Moderate Conservation Value

Inconsistent with NOP Standards

- Fencing is used to keep livestock out of sensitive habitats including riparian zones and easily trampled or polluted rare plant and animal communities. If access to water is needed, use a fence chute across a stream to restrict livestock impact.
 - Animals are fed away from natural water sources and sensitive areas to minimize their impact.
 - Off-stream water sources and mineral blocks are supplied to disperse livestock and reduce impact on sensitive habitats.
 - Strong efforts are made to prevent bank erosion and to conserve native vegetation along waterways, so stored groundwater in this functioning ecosystem releases back into the stream and riparian areas during drier months of the year.
- If fencing is not used, extra attention to the frequency, intensity, and timing of livestock grazing is given to control access to sensitive habitats.
- Livestock degrade sensitive habitats, denude riparian vegetation that supports native species, and/or disturb aquatic habitats, including spawning gravels of fish.
 - Livestock contribute to waterway contamination.

NOP Rule

Subpart A – Definitions

Pasture

Organic Production

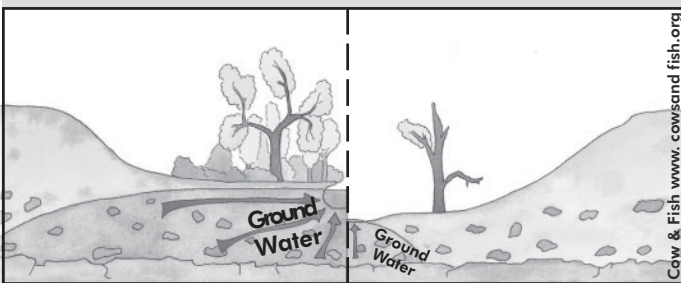
Natural Resources

Subpart C – Organic Production

205.200 General

205.239 Livestock Living Conditions

Protecting Riparian Areas and Sensitive Habitats



In healthy, well-managed watersheds, stored groundwater releases back into the stream and riparian area.

Watersheds with poor groundwater storage capability may suffer low stream flows as limited storage is exhausted. Streams may become intermittent in flow during crucial times, and water may become unavailable for livestock, wildlife, and fish.

Fencing riparian zones to keep out livestock while providing an alternate water source can foster restoration of denuded habitat and ensure the high water quality important for healthy animals.

Biodiversity When Livestock Are Involved

Improving Pastures and Rangelands

High Conservation Value

- Rangeland and pastures are well managed and overgrazing is prevented.
- Restoration of trampled and eroded areas is done with native perennial grasses and forbs for the benefit of wildlife as well as livestock.
- New invasive weeds are prevented from becoming established.
- Invasive species are controlled with minimal negative impact. If appropriate, sheep and goats are allowed to graze, biological control methods are used, or prescribed burning is done with the assistance of experts to help control difficult invasive weeds.
- Grazing takes into account habitat needs, including reproduction and migration, of priority species and other wildlife.
- The frequency, intensity, and timing of livestock grazing are managed to minimize negative impacts to soil, vegetation, and ecosystem health.
- Multiple grasses and forbs comprise the pastures and rangelands.

Moderate Conservation Value

- Pastures are grazed to encourage a variety of healthy, vigorous, native and domestic forage plants.
- Livestock do not impact priority and other wildlife species or special habitats.

Inconsistent with NOP Standards

- Overgrazing has led to an infestation of weedy invasives, a decrease in food value for livestock and wildlife species, soil erosion, and water contamination.
- Livestock degrade vegetation or special habitat areas and diminish or exclude sensitive native species.
- Wildlife and ecosystem health is compromised by unsanitary pasture conditions.

NOP Rule

Subpart A – Definition

Pasture

Organic Production

Natural Resources

Subpart C – Organic Production

205.200 General

205.238 Livestock Health

Care Practice

Improving Pastures and Rangelands



Overgrazing harms the land and livestock. During the early part of the last century, overgrazing caused this deep gully in the Wasatch Plateau of Utah.



Prescribed burning, when done safely with the help of experts, can help to alleviate invasive weeds and improve wildlife habitat. Once this California pasture was burned, it was successfully replanted in native grasses.

**Biodiversity When Livestock Are Involved
Employing Wildlife Friendly Management Practices**

High Conservation Value

Moderate Conservation Value

Inconsistent with NOP Standards

- Operator does not shoot, trap, or poison native predators to protect livestock. Instead various benign practices are used, for example:
 - Guard animals, such as llamas, donkeys, or dogs, help protect livestock.
 - Frequent and unpredictable appearances are made by rancher to discourage predators.
 - Cattle are herded with sheep, goats, and calves to furnish protection for the smaller animals.
 - Fencing is located, designed, and managed to keep out predators, but corridors are left for wildlife when possible (some federal or state regulations may prohibit fence construction in certain areas).
 - Pasture use is scheduled for when predation pressure is low.
 - Circumstances of livestock death are documented and evaluated to determine predator role.
 - Priority species including keystone species that provide habitat for wildlife, such as prairie dogs and beavers, are not harmed.
 - Other non-predatory wildlife, such as native grazers, are allowed to co-exist with livestock.
- Operator only kills a native predator after determining it has made multiple killings of livestock (see resources section), and all other strategies (see left) were tried, with results recorded.
 - Operator allows native wildlife to co-exist with livestock.
- Operator kills native predator, whether or not it was determined to have caused previous livestock deaths, without trying other ways to discourage it.
 - Operator kills non-predatory keystone and other priority species.

NOP Rule

Subpart A – Definitions
Organic Production
Natural Resources
Subpart C – Organic Production
205.200 General

Employing Wildlife Friendly Management Practices



Guard animals, such as these Great Pyrenees dogs, offer protection to vulnerable livestock. Llamas and donkeys can also supply excellent predator defense. Trapping and shooting should only be used as a last resort, after attempting all predator-friendly practices and after documenting the causes of livestock deaths.



Prairie dogs are keystone species. As many as 33 other wild birds, mammals, and reptiles rely on them as a food source and for the creation of habitat. Prairie dogs also help to conserve soil moisture and decrease soil compaction.

Biodiversity When Harvesting From the Wild

Maintaining and Improving the Sustainability of the Harvested Species

High Conservation Value

- Harvesting and gathering is only done from stable and sustainable populations and environments.
- Collections do not threaten the existence of priority and other native species or special habitat areas.
- Erosion and introduction of non-native invasives are prevented.
- It is known whether other people harvest from the same area; if so, harvest is coordinated to prevent negative ecosystem impacts.
- Re-establishment of harvested species is fostered.
- Agency or non-government organizations responsible for ecological management of the area have been notified of collections, and licenses have been obtained, if necessary.
- Wild crop sustainability is monitored using photographs, species counts, or other assessment techniques that can be referenced over time.

Moderate Conservation Value

- Sustainability of populations is strived for by the individual harvester but is not part of a coordinated effort.

Inconsistent with NOP Standards

- Harvesting or gathering threatens the existence of the collected native plant or animal species in the region.
- Harvesting or gathering exceeds the sustainable yield of the ecosystem and thereby negatively impacts the surrounding non-collected species.

NOP Rule

Subpart A – Definitions

Wild Crop

Organic Production

Natural Resources

Subpart C – Organic Production

205.200 General

205.207 Wild-crop

Harvesting Practice

Maintaining the Sustainability of the Harvested Species



Wild rice and other wild crops are harvested from stable and sustainable populations. At the same time, it is determined how these harvests maintain the area's biodiversity.



Wild crops, such as ginseng, are harvested only with the property owner's permission and care is taken to avoid causing erosion or introducing non-native, invasive species.

C. Biodiversity Conservation Amendment to the National Organic Standards Board's OSP

The National Organic Program (NOP) Rule requires each producer to develop an Organic System Plan (OSP). The National Organic Standards Board (NOSB) has approved the following biodiversity conservation amendment to their OSP template. Many certifiers have adopted the NOSB's model OSP forms and will continue to use their updates. These additions provide transparent and predictable guidance to farmers, inspectors, certifiers, and accreditation auditors.

Natural Resources: Biodiversity Management

NOP Rule 205.2 defines organic production as a production system managed in accordance with the Act and its regulations to respond to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity. NOP Rule 205.200 and 205.203(a) require that production practices maintain or improve natural resources (soil, water quality, wetlands, woodlands, and wildlife) of the operation.

• *Whole Farm Biodiversity*

Does your field map include features such as hedgerows, woodlands, wetlands, riparian zones, and special habitats? yes no

List wildlife and dominant native plants present on the farm (note priority species):

What steps do you take to plan/provide for biodiversity conservation?

understand farm's location within watershed ascertain what wildlife and dominant native plants existed on the land prior to farming learn about regional natural areas and conservation priorities work with neighbors/others to enhance biodiversity (connectivity, restoration, etc.) other*

How do you manage water for the needs of crops/livestock, native species, and riparian ecosystems?

plant regionally appropriate crops conserve water manage water for priority species retain/restore vegetated riparian buffers/wetlands protect/improve natural hydrology/ecological function of riparian areas other*

• *Uncultivated Area Biodiversity*

What actions do you take to provide habitat for pollinators, insect predators, birds, and bats?

bird/bat/bee boxes hedgerows/windbreaks maintain/provide natural roosting/nesting/foraging sites other*

How are you restoring and/or protecting natural areas?

manage for native plants/wildlife specific to the site preserve/restore wildlife corridors/large blocks of habitat establish legal conservation areas have not converted native habitats to farmland since certification other*

List problem invasives: _____

What actions do you take to control invasive plant/animal species, especially those that threaten natural areas?

learn about invasives use weed- and pest-free seed/planting stock/soil amendments/mulches monitor for new introductions and control immediately suppress invasives using organic methods other*

● Cropland Area Biodiversity

How do you conserve and provide habitat for wildlife?

use companion planting/intercropping ensure crop diversity erect wildlife-friendly fences manage fallow fields for wildlife other*

Do you schedule farm practices to benefit wildlife?

avoid nests during breeding season stagger mowing/tilling practices plan fields to leave food/cover for wildlife other*

● Biodiversity When Livestock Are Involved

How do you protect riparian areas and sensitive habitats?

fence to minimize impacting wildlife control sensitive area access prevent bank erosion feed animals away from water other*

How do you improve your pasture or rangeland?

prevent overgrazing reseed/protect trampled or eroded areas plant native pasture employ ecologically sound grazing system use prescribed burning other*

What wildlife-friendly management practices do you use?

use guard animals schedule grazing when predation pressure is low house livestock overnight in protected area document circumstances of livestock death other*

List problems with predators or other wildlife:

Have you assessed the farm for biodiversity problems and greatest opportunities, then developed goals and a timeline for biodiversity conservation?

yes no

Please describe or explain: _____

How do you monitor farm biodiversity?

visually species counts other*

● Biodiversity When Harvesting From the Wild

How do you maintain or improve the sustainability of the harvested species?

harvest from stable populations minimize disruption of priority species/sensitive habitats avoid erosion allow re-establishment monitor wild crop sustainability other*

***If you check other, please explain.**

Natural Resources: Water Use

What practices do you use to protect water quality?

sediment basin compost/fertilizer stored away from water

D. Conducting the Farm Inspection

Assessing the Farmer's Knowledge and Ascertaining the Farm's Biodiversity

A farmer's willingness to seek further knowledge, cooperate with others, and take part in a biodiversity strategy for the landscape is a key indicator of contribution to biodiversity conservation. The inspector should look for signs of commitment to understanding and conserving the full complement of biodiversity, and check that the biodiversity resources on the farm have been sufficiently assessed.

Review the biodiversity organic system plan (part C) in relation to the graduated slate of compliance and non-compliance biodiversity measures outlined in part B. Be prepared to discuss with the farmer key issues and practices and how to prioritize actions. Ensure that expectations, measures, and timelines for implementation and monitoring are mutually understood.

Begin the biodiversity conversation by assessing the producer's knowledge of:

- The farm's location in the watershed relative to the nearest wildlands, open spaces, waterways, and protected areas. How does the farm fit into the larger ecosystem?
- Regional priorities for conservation of native species, natural communities, and ecological processes.
- Biodiversity conservation actions undertaken by other farmers and organizations in the area. Is the producer contributing to a regional biodiversity strategy?
- Other biodiversity conservation resources. Has the producer engaged in any workshops or continuing education opportunities that address biodiversity or natural resource conservation? Is the producer familiar with nearby lands that have intact ecosystems?
- Incentives to assist with planning and implementation of natural resource and biodiversity conservation through non-governmental organizations or state and federal habitat conservation programs (see resource section).

Continue the biodiversity discussion by reviewing the farm's natural resources, including:

- The list of wildlife and dominant native plants present on the farm. Has the farmer determined what priority species exist in the watershed and possibly on the farm?

- The map of natural resource features on the farm such as hedgerows, woodlands, wetlands, waterways and riparian zones, hydrological and drainage conditions, wildlife corridors, invasive species, perennial cover, topography, soils, eroded areas, and special habitats like those used by priority species. Is the producer attempting to determine or is considering conducting farm restoration modeled after nearby intact ecosystems that resemble the land before agriculture?

Reviewing the Farmer's Biodiversity Conservation Component of the OSP

Practices and Actions That Address Goals

Identify and prioritize practices and actions to conserve biodiversity based on the biodiversity problems and greatest opportunities for meeting conservation goals and adding value to the farming operation. They should:

- Contribute to regional biodiversity goals: support priority species (threatened and endangered species, species of concern, and keystone species) and habitats, migration and movement of native species, and ecosystem processes.
- Maintain or increase biodiversity: enhance the diversity, presence, numbers, health, and vigor of native species and habitats. Refrain from harming existing biodiversity resources.
- Control non-native invasive species and erosion: prevent establishment and spread of new invasives and proactively address possible erodible sites.

Monitoring

- Is there a plan to monitor or evaluate the success of the implemented biodiversity practices? What are the expectations, timeline, and frequency for monitoring success? Are photo monitoring; water quality analyses; or plant, mammal, bird, reptile, amphibian, or insect surveys being conducted? Have natural resources of the farm or surrounding area benefited from conservation measures?

Plan Revision

- Does the farmer review and revise the plan, priorities, and timeline as needed based on evaluation of emerging conditions and management results?

Glossary

- Biodiversity includes variety in all forms of life, from bacteria and fungi to grasses, ferns, trees, insects, and mammals. It encompasses the diversity found at all levels of organization, from genetic differences between individuals and populations (groups of related individuals) to the types of natural communities (groups of interacting species) found in a particular area. Biodiversity also includes the full range of natural processes upon which life depends, such as nutrient cycling, carbon and nitrogen fixation, predation, symbiosis, and natural succession.
- Connectivity is the degree to which patches of habitat link to one another, allowing organisms and natural processes (e.g., fire and water flow) to travel between the patches.
- Conservation easement is a legal agreement a property owner makes with a non-profit organization or public agency to restrict the type and amount of development that may take place on his or her property. The easement spells out the rights the landowner retains and the restrictions on use of the property. Each right and restriction is negotiated between the landowner and the conservation organization holding the easement.
- Conservation network is a system of land and water managed for the primary purpose of conserving the representative ecological attributes of a region. It often includes lands used for such purposes as recreation and agriculture as long as ecological values receive special consideration. The network is configured to support native species and sustain the natural processes that clean our water and air and maintain thriving, diverse, natural ecosystems. Networks should include large core reserves—wilderness—linked by wildlife corridors and buffered by farmlands.
- Desert scrub is a plant community typified by desert shrubs.
- Ecosystem is a biotic community and its abiotic environment.
- Ecosystem functions are a set of biophysical conditions and processes whereby an ecosystem maintains its integrity (e.g., primary productivity, food chain, biogeochemical cycles, etc.). Ecosystem functions include such processes as decomposition, production, nutrient cycling, gene flow, and disturbance.
- Ecosystem services are the beneficial outcomes that result from ecosystem functions (e.g., cleaner water, pollination, reduced human health and ecosystem risks). These require some interaction with, or at least some appreciation by, humans, but can be measured in physical terms (e.g., water quality, crop set, and human health).
- Endangered species are those in danger of becoming extinct within the foreseeable future throughout all or a significant portion of their range.
- Forbs are vascular plants without significant woody tissue above or at the ground.
- Habitat is the natural environment for the life cycle and growth of an organism.
- Hydrology is the science of water, its properties, phenomena, and distribution uses and conservation over the earth's surface.
- Invasive species are those that spread from human settings (gardens, agricultural areas, etc.) to wild or natural areas. Once in the wild, they continue to reproduce and displace native species, causing biodiversity to suffer. Invasive species are usually non-native (i.e., humans introduce them into an area).
- Keystone species is one whose impacts on its community or ecosystem are large and often greater than would be expected from its relative abundance or total biomass. Because it makes a significant contribution to the maintenance and modification of its ecosystem, its decline would lead to the decline of many other species. For example, the beaver is not an endangered species, but it is essential to its ecosystem because it actively expands and maintains the riparian habitats and functions upon which many other species depend.
- Migratory species reside in more than one location during the year, moving with the seasons (e.g., many birds and some mammals and butterflies).
- Native plant or animal is indigenous (produced, growing, or living naturally in a locale, country, or climate; not exotic; not imported) to a given location.
- Natural areas are dominated by native vegetation and exist as a natural process of ecological succession.

Priority habitats are those in need of special conservation attention, usually determined by a statewide or regional biodiversity assessment. Priority habitats have declined significantly from their historic range. For example, white oak savannas were historically common in Oregon and now only cover 1–2% of their previous range. Priority habitats may also be vegetation types not well represented in existing conservation networks.

Priority species are “threatened” and “endangered” species, “species of special concern,” and “keystone species.”

Riparian area is defined as “a zone of transition from an aquatic ecosystem to a terrestrial ecosystem, dependent upon surface or subsurface water, that reveals through the zone’s existing or potential soil-vegetation complex the influence of such surface or subsurface water. A riparian area may be located adjacent to a lake, reservoir, estuary, pothole, spring, bog, wet meadow, muskeg or ephemeral, intermittent or perennial stream.”¹⁶

Sensitive habitats are areas in which plant or animal life or their habitats are either rare or especially valuable.

These include habitats containing or supporting “priority” species; all perennial and intermittent streams and their tributaries; coastal tide lands and marshes; and lakes, ponds, and shore habitat.

Sensitive species are prone to becoming threatened or endangered.

Species of special concern is an informal term used by many public agencies to identify species that are potentially at risk, declining in numbers, or in need of concentrated conservation actions to prevent decline, commonly referring to a species or subspecies that has entered a long-term decline in abundance or has become vulnerable to a significant decline due to low numbers, restricted distribution, dependence on limited habitat resources, or sensitivity to environmental disturbance. Categorization as a species of concern generally carries no procedural or substantive protections.

Threatened species are those likely to become endangered in the foreseeable future.

Notes

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6. U.S. Dept. of Interior, Bureau of Indian Affairs, *Agriculture on Indian Lands, The Catalog of Domestic Assistance*, 15.034, 2002, www.cfda.gov/public/viewprog.asp?progid=396.
7. U.S. Dept. of Interior, BLM, *Working Together for the Health of America’s Public Lands, Annual Report*, 1997, <http://www.blm.gov/nstc/blmanual/annual97/AnnualReport1997.pdf>.
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14. Stein et al., *op. cit.*
15. David Pimentel, L. Lach, R. Zuniga, D. Morrison, *Environmental and Economic Costs Associated with Non-Indigenous Species in the United States* (Ithica, NY: Cornell University, College of Agriculture and Life Sciences, 1999).
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Whole Farm Biodiversity

Taking Steps to Plan or Provide for Biodiversity

- Biodiversity Partnership/Defenders of Wildlife. *Biodiversity Planning* webpage links to each state's comprehensive wildlife conservation plan: <http://www.biodiversitypartners.org/bioplanning/index.shtml>. Find approaches and concepts for "conservation network design" at the regional level at <http://www.biodiversitypartners.org>.
- InvasiveSpeciesInfo. State-by-state information on invasive species is available at www.invasivespeciesinfo.gov/.
- Native Plant Society. Check on a listing for your state organization (e.g., California Native Plant Society: <http://www.cnps.org>).
- NatureServe. *NatureServe Explorer: An Online Encyclopedia of Life*. This website provides information on rare and endangered species by particular watersheds, and threatened ecosystems by states: <http://www.natureserve.org/explorer/>.
- TerraServer USA. Watershed topographical maps are available across the U.S. at: <http://www.terra-server-usa.com/>.
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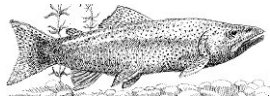
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Line art in resource section: *Bob Savannah/USDA Forest Service*.

Inside back page photos: *Jo Ann Baumgartner/WEA; Robert Gerard*.

Organic Farms and Farmers Supporting Biodiversity



Photos left to right from top: Kevin Lunny, Jardin del Alma, Riverdance Farm, Laura Smith with Stephen Pedersen, Quetzal Farm, High Ground Organics, Latir Mountain Ranch, Tom Willey, Sean Feder with Ed Sills, Charlie Rominger, Embudo Valley Organics, Phil Foster, One Straw Farm, Preston Vineyards, Lou Preston, Santa Cruz Farm, Michael Alexander.



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