NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE SPECIFICATION

EARLY SUCCESSIONAL HABITAT DEVELOPMENT/MANAGEMENT

(Ac.)

CODE 647

DEFINITION

"Manage plant succession to develop and maintain early successional habitat to benefit desired wildlife and/or natural communities."

Plant Succession. In a healthy ecosystem plant communities are in a state of dynamic (or ever changing) balance due to natural disturbances. These disturbances are complex and they range in extremes from micro-soil disturbance by earthworms, to fire, to climate change. Over evolutionary time, each plant and animal community has developed a unique set of traits that allow them to survive, exploit, and even depend on these natural disturbances.

As part of this adaptation, ecosystems have developed a natural resistance and resilience to many of these disturbances, which allows it to retain its original community during and after a disturbance. An example: seasonal storms may damage the community, but it still persists in its original state (with little to no change).

However, when natural disturbances push the ecosystem past its resistance and resilience threshold, it results in a change in the plant and/or animal community. An example is a forest fire. The resulting series of changes within the community are part of the evolutionary adaptation to the disturbance, and in many cases the process is necessary to maintaining the balance to the ecosystem.

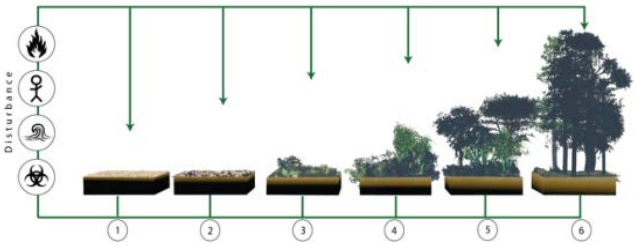
This process of community change over time in response to a disturbance is referred to as 'ecological succession' (specific to a plant community is 'plant succession').

An Example of Plant Succession

The diagram provided below represents an example of forest succession over time following a disturbance such as fire.

After the fire, bare ground is exposed① which allows pioneering mosses and annual/biennial grasses to grow②. This protects and builds the soil to allow perennial grasses and forbs to establish, which then outcompete the pioneering mosses and grasses③. Within this perennial plant community, pioneering woody plants start to establish④, then fast growing trees (such as softwoods) start to develop a forest canopy; which shades-out many of the perennial grass/shrubs and develops conditions to allow hardwood seedlings to establish⑤. Eventually the hardwood trees dominate resulting in a 'climax' forest⑥. In this ecosystem, it may take 120 years or more to complete succession.

Diagram 1 - example of forest succession



Stages of Succession

As demonstrated above, succession contains a number of stages which are most often described by the dominate species present at each stage. For example the first stage is generally dominated and described as the "pioneering annual grass stage②".

To simplify for general purposes, these stages are lumped into those considered "early succession", "mid-succession", and "late succession".

This practice only focuses on the early successional stage.

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As described in the above section, each stage of succession provides a different type of community, comprised of different species (or composition) of plants and animals. Often the species found in each stage have developed a unique set of traits that allow them to survive, exploit, and even depend on one or more of the stages. In a natural ecosystem, there is a balance between the disturbances and the resulting successional stages, which provides habitat to maintain species life-cycle needs. But when something disrupts that natural balance, it can result in a loss or reduction of the habitat necessary to sustain species life-cycle needs.

The NRCS 647 practice is designed to develop and manage the early successional plant stage where the natural cycle of disturbance has been disrupted; for the purpose of providing habitat to species which require early successional habitat for all or part of their life cycle.

An example is where a grassland system has evolved with fire. If human actions cause fire suppression, the condition of the grassland degrades. This practice could be used to re-introduce fire using prescribed burning to mimic the natural disturbance.

This practice may also be appropriate on human-altered systems to improve the habitat quality for species which require early successional habitat for all or part of their life cycle.

Refer to the NRCS Fish and Wildlife Habitat Management Leaflet No. 41 for more information: Early Successional Habitat Tech. Note 190-67.

When Targeting Wildlife Habitat

When using early successional habitat to benefit targeted wildlife (species, group or guild) a habitat appraisal or evaluation should be used to 1] identify if early successional plant stages will benefit the targeted wildlife and 2] to identify what type, extent and timing of succession is needed.

Wildlife Habitat Evaluation/Appraisal Guides are found online in the NRCS New Mexico FOTG Section II. If one is not provided for the desired target species or habitat, contact the NRCS NM State Biologist for assistance.

Refer to Table 1 for a partial listing of wildlife species, occurring in New Mexico, which require an early successional stage of habitat for some portion of their life cycle.

Planning Requirements

In addition to conservation plan requirements, the plan shall identify and describe:

1. ***Site Ecology***

To implement this practice it is necessary to understand the ecology of the project site and its surrounding landscape or larger context.

Identify the Ecosystem Type

Ensure that the project area's ecological system is adequately defined at the appropriate scale with enough detail to implement this practice.

There may be several distinct systems within a project area to identify. For example on a floodplain, the ecological system for floodplain wetlands will have a different successional requirement than the forested riparian.

Additionally, all systems have the potential to change from one type to another depending upon human-alterations. For example, an herbaceous riparian ecosystem may have been altered with dikes and water application to become a semi-permanent wetland ecosystem (altered system).

Identify the Natural Disturbances

Identify the type of natural disturbance, including frequency, duration, or severity of the event that results in succession. There may be several disturbance types. Additionally, identify which disturbance(s) have been restricted or altered.

Note: If the goal is to develop/maintain a human-altered system, then identify the disturbances which are necessary to develop and/or maintain the site to its desired condition. These often mimic natural systems.

Identify the Successional Stages

Identify the successional stages that are to be expected following a natural disturbance based on historical records or studies on similar systems.

Available references include:

- Southwest Regional Gap Analysis Project provides a map and assessment of biodiversity for a five-state region (AZ, CO, NV, NM, UT). Provided at: http://earth.gis.usu.edu/swgap/
- Ecological Site Description (ESD's).

Identify Baseline Conditions.

Plant succession is strongly influenced by the pre-disturbance conditions, including: soil properties (i.e. soil moisture, organic matter, nutrient cycling); interactions of the species present and the

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availability of colonists or seeds (seed bank).

Succession is influenced and oftentimes restricted by altered landscapes and land uses. Identify any alteration on-site and within the surrounding lands which may affect either the natural succession or the desired successional state.

In addition, succession is influenced by the character of the disturbance: the type of disturbance; timing; intensity and duration.

All influencing factors must be identified and understood in order to provide an appropriate disturbance that will achieve the desired outcome.

CASE STUDIES AND EXAMPLES

Appendix 1 provides examples and techniques:

- Fallow/Abandoned Fields for Wildlife
- Piñon-Juniper Ecosystems

MONITORING and MANAGEMENT

Monitoring evaluates the effect the practice is having on the targeted wildlife and/or the targeted natural community. This differs from an O&M review which evaluates the function of the practice. For example, the O&M review may find that a practice is functioning as intended, but it may not be having the effect that was intended.

The NRCS planner must determine when monitoring and management is necessary and appropriate. Generally, it is necessary when the effects of the practice are uncertain, or where it is anticipated that the practice will need to be managed to achieve or maintain effectiveness.

- **O&M** evaluates **Function** and results in **Maintenance**.
- **Monitoring** evaluates **Effects** and results in **Management**.

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Table 1 - New Mexico wildlife that ***requires*** early successional habitat for all or part of their life cycle (not a complete list).

Common Name	Scientific Name	Early Successional Habitat Association	Basic Life Cycle Needs for Early Successional Habitat *(this is for general reference only)*
American woodcock	*Scolopax minor*	Requires early successional forest and shrubland interspersed with grassy openings 1/2 acre or larger (clear-cuts, meadows, pasture, and fallow fields)	**Breeding/Nesting/Roosting/Foraging** • Requires sparsely vegetated grassy areas for courtship display, located near forest cover. • Needs young, second-growth hardwood stands
Blue grouse	*Dendragapus obscurus*	Requires early successional forest meadows.	**Foraging** (invertebrates, leaves, fruit, seed, buds, twigs, flowers) • Broods require herbaceous areas with a high density of forbs and bunchgrasses (insects). • Forage areas must be near nesting sites.
Common nighthawk	*Chordeiles minor*	Uses early successional playas, mud flats, savanna, grasslands, meadows, herbaceous riparian, forest openings, pastures, hayland and fallow fields.	**Breeding/Nesting** • open and semi-open habitats, especially the savanna, grassland and fallow fields. **Foraging** (flying insects) • Forages where there is high insect abundance.
Horned lark	*Eremophila alpestris*	Requires early successional grassland, juniper savanna, open shrub land and sparsely vegetated fallow fields.	**Breeding/Nesting** (ground nesting) • Requires sparse vegetation cover. **Foraging** (mostly ground insects, fruit, seeds)
Lesser prairie-chicken	*Tympanuchus pallidicinctus*	Requires early successional patches within shinnery oak or sand sagebrush-grassland.	**Breeding** • Requires sparsely vegetated areas for courtship display (lek). **Foraging** (insects, tender green plant material, seeds, buds, catkins and mast) • Broods require herbaceous areas with a high density of forbs (grasshoppers); located near nesting areas.
Loggerhead shrike	*Lanius ludovicianus*	Requires early successional forest (clearing, burns), or shrub-grasslands, meadows, pasture, hayland and fallow fields.	**Foraging** (large insects, reptiles, amphibians, small mammals) • Areas with high forb density. • Patches with bare or low ground cover. • Foraging areas interspersed within shrubland and woodland is preferred. • Perch sites enhance the foraging habitat.
Northern harrier	*Circus cyaneus hudsonius*	Requires early successional open grassland, meadows, fallow fields, wetlands and playas.	**Breeding/Nesting** in denser ground cover. **Foraging** (small mammals, birds, reptiles and amphibians) • Prefers foraging in open grassy area, near to areas with dense stands of trees and/or shrubs.
Scaled quail	*Callipepla squamata pallida*	Requires early successional desert grassland and patches within arid shrub-grassland.	**Foraging** (seeds primarily but also insects, green leafy material, fruits, buds) • Broods require herbaceous areas with a high density of forbs (insects); located near nesting areas.
Smooth green snake	*Opheodrys vernalis*	Requires early successional herbaceous riparian, meadows/grasslands or fallow fields near water.	**Breeding/Nesting** (under grass clumps, rocks, decomposing logs, soil cavities) • Downed logs and ground debris is desired. **Foraging** (invertebrates: mostly insects)
Vesper sparrow	*Pooecetes gramineus*	Requires early successional grassland, sagebrush steppe and other arid shrub lands, woodland clearings, fallow fields, meadows, and pastures	**Breeding/Nesting** (ground nesting), and **Foraging** (50% insects -50% grass/forb seeds). • Areas with high forb density. • The vesper sparrow responds quickly to changes in habitat; it is often the first species to occupy reclaimed mine sites and abandoned farm fields.
Wild turkey	*Meleagris gallopavo*	Uses early successional forest meadows, herbaceous riparian, meadows.	**Foraging** (invertebrates, leaves, seeds, fruit, buds, tuber/bulb/corm, mast) • Juveniles require herbaceous areas with a high density of forbs (insects). • Forage areas must be near cover.

***not a comprehensive listing. Data provided by BISON-M** (http://www.bison-m.org)

Fallow/Abandoned Fields for Wildlife

A fallow or abandoned agricultural field can be managed in an early successional state to provide vegetative structure and diversity for nesting and brood-rearing habitat, feeding, and escape/thermal cover for wildlife.

Fields may be maintained long-term in an early successional state (in the case of abandoned fields) or only managed for early succession when the field is fallow (in-between crops). Also consider developing early successional habitat on a portion of a field where agricultural production is marginal or where the field is planned to be taken out of production and restored to a more natural plant community.

Size. Large fields (>25 acres) or fields within a landscape of similar habitat[1] can provide valuable habitat to species which are area/size sensitive. These area-sensitive species tend to also be the at-risk wildlife species such as the vesper sparrow. However, smaller management areas (5-25 ac.) can also be beneficial to many wildlife species.

[1] Similar habitat may include pasture, hayfields, rangeland, shrub land, forest, wetland and riparian.

Location. Focus on providing a block of habitat. Avoid narrow (<150 ft.) linear habitat areas; they will be less utilized by wildlife and can become a population 'sink' where mortality by predation is high (the project may do more harm than good).

Select areas that adjoin or are in close proximity to other wildlife habitats. Where possible, select areas where the field edge will blend into the adjoining habitats (not separated by roads, cropland etc.).

Desired Condition is where there is a diversity of forbs, legumes, flowering plants, native bunchgrasses and low-growing native shrubs; providing an abundance of tender green-plant tissue and seed/fruit production. Where habitat is undisturbed during the nesting season and where seasonal growth is left intact overwinter.

It is expected that plants traditionally considered field weeds will be present. Limited effort should be made to control them; many are valuable for wildlife. This does not apply to noxious or invasive weeds (control efforts should be made).

Note: If targeting specific wildlife, there will be additional requirements to meet the needs of those species. For example, hatchlings may require more overhead concealing cover and sparser understory to allow movement. Refer to the appropriate Wildlife Habitat Evaluation Guide.

Duration. Generally, the first growing season only provides feeding habitat due to the implementation of the disturbance practices. Nesting/winter cover should be managed starting thereafter and continue until the next cycle of disturbance is necessary.

Techniques/Guidelines

Disturbance techniques must be completed outside of the primary nesting season; many species that utilize fields are ground nesting birds.

- Periodically mow or burn to maintain an early successional state: to reduce plant density or cover; improve plant nutritional value (stimulate new plant growth); reduce residual cover; limit tree growth, and/or to reduce plant height.
  - Use NRCS practice 314-Brush Management, 315-Herbacous Weed Control, or 338-Prescribed Burning for guidance.
  - Create a mosaic (required) by using patch burning or random mowing/brush hogging.
  - Mower deck should be set no lower than 5 inches above ground (6 in. is recommended). A flushing bar is recommended when mowing in late summer (i.e. birds may still be nesting).
  - Succession will need to be set-back every 3-5 years, generally. It should not be on an annual basis, but it may be necessary every 2 years.
  - Selective tree removal may only be necessary.
- Seed or inter-seed to increase plant diversity (especially forbs, legumes, flowering plants). Seeding may be needed periodically (every 3-5 years) as these groups of plants are often not self-sustaining. Inter-seeding should be done in the same season as mowing or burning.
  - Use NRCS practice 327-Conservation Cover or 512-Forage and Biomass Planting.
  - For recommended plants refer to the lists in the NRCS practice 645-Upland Wildlife Habitat Management Job Sheets for wildlife food plot and/or for pollinator habitat.
- Avoid insecticides, including drift from nearby application.
- Spot spray weeds, avoid broadcast application.
- Avoid early mowing on nearby hayfields (postpone first cut until July 15th if possible).

Refer to the 647 practice standard and specification for criteria requirements not mentioned on this example.

Managing Early Succession Piñon-Juniper Ecosystems

Multiple, small-scale treatments applied to the piñon-juniper ecosystem can help towards maintaining a healthier, more resilient ecosystem, and can provide the successional stages needed to support a full assemblage of wildlife species.

Natural disturbances such as drought, fire, herbivory and insects were inherent in the natural development and maintenance of piñon-juniper ecosystems. Where anthropogenic or natural causes have disrupted these processes (such as fire suppression, overgrazing, climatic changes) it can result in a denser stand of trees and loss of mosaic (infill), decrease of understory, increase of invasive plant species, change in fire behavior, increase susceptibility to insect-pathogen outbreaks and expansion into adjoining plant communities.

Types of Piñon-Juniper Ecosystem in NM

The natural piñon-juniper ecosystem is highly variable across the western landscape; varying in species composition, density, canopy structure, understory characteristics and disturbance regimes. Management efforts *must be* based on the ecology of the natural system to ensure the land is managed within its capabilities.

There are three fundamentally different kinds of piñon-juniper ecosystems; often described as piñon-juniper woodland, juniper savanna or piñon-juniper shrubland. New Mexico's ecosystems are briefly described below:

Piñon-Juniper Woodland is characterized as a late successional plant community with a multi-age stand of piñon and or juniper trees that includes seedlings, young trees, mature trees (>150 years old) and often some very old trees (>300 years old). Where the mature tree community occupies >25% canopy cover, or physical evidence suggests that the site once supported mature trees at >25% canopy; or, where the mature tree community has, or once had, >15% canopy cover with a tree height greater than 12 feet (USDA, 1997). Sparse shrubs may be present, and perennial herbaceous cover is generally low to moderate and often discontinuous. The potential for production of continuous fine fuels (including litter) is >600 lbs/acre (USDA, 1997). Topography and soils limit the frequency and intensity of natural fires (USDA, 1997); where topography is rugged and soils are very shallow to shallow, rocky, and often associated with exposed bedrock. Most precipitation is received in a bi-modal pattern or as winter precipitation (generally not an aridic or ustic aridic moisture regime). Upper elevation canopy cover may be greater than 60% (due to cooler, moister conditions and shallower soils); this is often referred to as 'closed woodland'. Lower elevation canopy cover may be 15-25% (due to warmer, drier conditions and deeper soils) and often referred to as an 'open woodland'.

Piñon-Juniper Shrubland often occurs on the lower elevations of piñon-juniper woodlands; where it is drier and warmer, and where soils are deeper and less rocky. Often on foothill and lower montane settings. Piñon-juniper shrublands may also occur as patches intermixed in woodland or savanna landscapes. Mature piñon and/or juniper have an average tree height of 10 feet or less (USDA, 1997) with a sparse herbaceous cover. It is common in areas where most of the annual precipitation comes in the winter but is not restricted to this precipitation regime.

Juniper Savanna is considered a transitional zone between piñon-juniper woodland/shrubland and grassland. However, the boundary between woodland/shrubland and grassland may be abrupt and without a savanna. This aridic (warm, dry) savanna is characterized as a grassland with sparse, scattered juniper trees (<130 trees/ac.). It may also have scattered shrubs or succulents, and individual old juniper trees (>150 years old) may be present. The trees are generally low-growing (<16ft tall). The understory is generally >25% canopy cover and capable of producing continuous fine fuels under normal precipitation. Savannas occur on deep, fine-textured soils on lower elevation mountain slopes, gentle broad valley bottoms and on gently rolling hills; it may also occur on rockier sites and plateaus where soils are deep and plant productivity is high. Juniper savanna is found at xeric sites (than woodlands) and precipitation generally is received in the summer.

Note: It can be especially challenging to differentiate between a Juniper Savanna and a juniper invaded grassaland (both communities are similar in appearance). However, a juniper invaded grassland generally has deeper, more productive soils to support a more robust plant community, and it should show indications of the suppressed or remnant plant communities. Conversely, the site would lack large-diameter piñon or juniper trees, snags, stumps or downed wood; which would indicate a naturally a piñon-juniper community.

To classify and better understand these communities, NM NRCS has established Ecological Site Descriptions (ESD's) that describe: the plant community at the time of ESD inventory; the historic, climax plant community and any other stable states; and a discussion of the pathways followed to each state.

Techniques/Guidelines

Disturbance activities to implement this practice must be completed outside of the primary nesting season; more than 70 species of birds breed in piñon-juniper woodlands and 20-30 may occur at any one site.

- Use NRCS practice 666-Forest Stand Improvement for developing early succession in all piñon-juniper ecosystems. The 666 practice standard for "*Additional Criteria to Provide Wildlife Habitat*" must be followed to implement this practice.
  - Implement multiple, small-scale treatments (do not use large, block treatments).
  - Intense fires should be avoided.
  - Treatment areas are susceptible to invasion of noxious or undesirable weeds. Ensure measures are provided to prevent/reduce infestation and to provide control.
  - Leave some felled trees to nurture new seedlings and to provide habitat diversity.
  - Projects will be designed with the least amount of soil disturbance as possible.
  - Leave large, dead trees standing for cavity nesting birds, bats, rock squirrels and other cavity species. Insectivorous birds search the bark for insects, and several raptors and falcons require these perches while hunting. *Note:* Mature piñon and juniper are generally not considered a fell hazard; but ensure that it would not pose a hazard if it fell.
  - Leave enough winter food supplies (i.e. piñon nuts, juniper fruit) for wildlife.
  - Without natural disturbances, succession treatments will generally be needed every 10 years.
- Grazing deferment followed by a prescribed grazing plan will be used to recover the understory grasses, forbs and shrubs. Use NRCS practice 472-Access Control and/or 528-Prescribed Grazing. Prescribed grazing may also be required prior to development of early successional habitat.
- Treatments will be conducted in a manner that will not have long-term negative effects on the soil crust community.

Mature juniper with nest cavity

Examples by Ecosystem Type

It is important to recognize that development of early succession in piñon-juniper ecosystems can enhancing habitat for some species, while degrade habitat for other species. For example, there are at least 16 species of birds that only breed in mature, dense stands of piñon pine. These and other piñon-juniper 'specialists' are especially vulnerable to treatment techniques. The examples provided below take this into consideration:

For Piñon-juniper Woodlands

- Create openings in dense stands where there are deep, fine-textured soils that can support a healthy understory. Openings should mimic a natural mosaic (a series of small, irregular opening). These are especially important at higher elevations where naturally the plant community would support pockets of montane shrubs, and at lower elevations where naturally the plant community would support pockets of chaparral species. Shrub plantings may be appropriate; select native species (local ecotypes if possible) that would naturally occur.
- Open-up dense stands by thinning/harvesting the decadent, thin-crowned or crowded trees; to develop a more natural, stand density. Keeping in mind that site conditions influence the natural stand density and treatments should be adjusted accordingly (i.e. density should be higher at higher elevations). Large crowned trees and old trees (especially piñon) should be preserved. Also, ensure that a large proportion of high-density mature piñon pines are left untreated as large patches. Numerous wildlife species are obligate or semi-obligate to this late-successional state, and overall species richness clearly increases as the quantity of piñon trees increases.

For Juniper Savanna

- Reduce stand density by thinning/harvesting to develop a more natural, early successional stand density. Old trees (>150 years old) should be preserved. Ensure that the natural pockets of piñon-juniper trees are left untreated; these areas are often found in draws, rocky areas or where soils are courser (where less herbaceous cover can grow). When treating areas that transition into other communities (especially piñon-juniper woodland or shrubland), ensure that the transition is blended and natural (avoid abrupt lines).