

# **TECHNICAL NOTE**

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**USDA - Natural Resources Conservation Service  
Salt Lake City, Utah**

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## **Pinyon and Utah Juniper Site Evaluation Procedure for Utah**

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This technical note transmits information on determining what the ecological history of a Pinyon and Juniper site was, for application of this knowledge in conservation planning and soil mapping.

- 1) Learn about human occupation in the area where you are working.
  - a) How did Native Americans use this area? How was the historic fire regime influenced by Native American activities? (see Forgotten Fires by Omer Stewart)
  - b) When did European settlers start moving into the area? Also when did they bring livestock into the area? Often it was 5 to 20 years after the first Europeans moved into the area before a town was established. When European settlement took place fire suppression and livestock grazing started which set the stage for Juniper/Pinyon increase to start.
  - c) Calculate the expected tree ages for the stand. For example; if a town was founded in 1866 and the area in question was first settled by Europeans in 1859 and the area is in the Upland zone (Aridic Xeric or Aridic Ustic moisture regime), it would have a fire cycle of 15 to 70 years (1859 minus 70 equals 1789). If there were trees on the site historically, in the year 2014 the oldest trees could be 225 years old (2014 minus 1789 equals 225). If you are working in the Semidesert zone (Xeric Aridic or Ustic Aridic moisture regime) where the fire cycle is 30 to 80 years then (1859 minus 80 equals 1779) so in the year 2014 the oldest trees could be 235 years old. If the area was not settled until 1892, the oldest trees in the upland zone should be around 192 years old.
- 2) Take a good look at the stand from the outside before entering it so that you get a good feel for the stand.
  - a) What type of topography (slopes, landscape) is the site located on? This information is needed to determine if the woodland is located on a site that could be a juniper site. Utah Juniper prefer steep barren slopes that do not produce enough understory vegetation to carry a fire into the site or to carry a ground fire with enough flame height to get into the tree canopy. Rolling hills, side slopes, valley and/or canyon bottoms are not normally sites for these types of woodlands.
  - b) Are the trees all the same apparent age or are there young and old appearing trees in the stand? If all of the

## When Your Increment Borer is Too Short

The way to figure the age of a tree that is too large in radius for the increment borer to reach the heart of the tree is:

- 1 - Figure the radius of the tree
- 2 - Measure the core taken from the tree.
- 3 - Count the rings
- 4 - Figure the average number of rings per inch found on the core sample
- 5 - Figure the radius of the tree minus 1 inch
- 6 - Multiply the average number of rings by the answer in step "5"
- 7 - Multiply the average number of years in 1 inch of the core by 0.7
- 8 – Add the answer from step 6 to answer from step 7
- 9 – This will give you a more accurate approximation to the age of the tree taking in the faster growth factor of the tree in the seedling stage.

Example: A tree has a Diameter of 30 inches. So the radius is 15 inches. The retrievable core is 10 inches long. There are 100 years represented on the core. So 100 divided by 10 equals 10 years per inch. With the radius being 15 inches subtract one inch giving you 14 inches. Multiply the 14 inches by 10 to get 140 years. Take the remaining inch and multiply the 10 years by 0.7 to get 7. This added to the 140 years you have a tree that is 147 years old.

trees are the same age in appearance then the trees are going to be an invasion on the site. If you have both old and young growth appearing trees then a more in-depth investigation is needed to make this determination. Young trees will have pointed crowns. Old trees have flat topped crowns.

- c) How dense is the stand? This gives you an idea of how completely the site is being occupied by the trees and the amount of competition that the understory is receiving. The denser the trees the more pressure the understory receives. A canopy cover of 60% plus is heavy, from 25 to 60% medium and less than 25% light. (These percentages are derived from articles that I have read in the past verified by personal observation and experience.)
  - d) What condition are the tree crowns in: Dense, Medium, Sparse, or all of the classes. (See NRPH Exhibit 4-4 Foliage Denseness classes, 4ex-7) This information gives you an idea of the health of the trees on the site. Stands where the canopy cover becomes too dense for the existing growing conditions will have more trees in the Medium to Sparse tree crown categories.
- 3) Go into the stand far enough to get away from the edge effect area. This will often be 100 feet or greater. Move around in the stand enough to get a real good feel for the stand of trees.
- i) What is the height of the majority of the trees? A tree that the crown is starting to go from a pointed crown to a rounded crown, but not starting to flatten out on top is one that is starting to mature.

**Table 1**

Woodland Tree Growth Form		
Characteristic	Relatively Young Trees	Relatively Old Trees
Juniper Crown Shape	Conical with Pointed tip	Flattened, rounded, or uneven top
Pinyon Crown Shape	Conical with Pointed to slightly rounded tip	Flattened, rounded, or uneven top
Juniper Branch Structure	Branches become progressively smaller from bottom to top of tree	In open stands, large branches near the base. In closed stands branches remain relatively large well into the crown.
Pinyon Branch Structure	Branches become progressively smaller from bottom to top of tree, general orientation is vertical	In open stands branches large near the base and remain relatively large well into the crown, more randomly oriented. This also holds true in closed stands but the all of the branches will be smaller in girth than in the open stand.
Dead Wood	Little dead wood in bole, few dead branches, little or no foliose lichen on juniper	Dead branches, bark missing, juniper covered by a light green lichen. In Utah the lichen tends to be a yellow-green and if found will be on the north to east sides of the tree.
Juniper Bark	Flaky, relatively thin with limited or shallow vertical furrows	Thick, fibrous with well-developed vertical furrows
Pinyon Bark	Relatively thin, flaky, with weak vertical furrows	Thicker, more plate-like structure than furrowed
Juniper Leader Growth	Terminal leader growth in upper 1/4 of the tree, usually > 2 inches. In open stands, leader growth > 2 inches from bottom to top	Leader growth in upper 1/4 of the tree usually < 1 inch
Pinyon Leader Growth	Leader growth in pinyon similar to juniper but not directly visible. Must look for bud scale scars to determine length	Leader growth in upper 1/4 of the tree usually < 2 inches
Caveats	The above described scenario works well in areas above 13 inches of precipitation. It will be useful in precipitation zones from 11 to 13 inches and will be misleading below that point. In the 13 + Zone the trees will be somewhere between 25 to 150 years of age. This depends a lot on the depth of the soil and the amount of rock on the surface and in the soil profile. All of this will take place at younger ages in sites less than 11 inches of precipitation.	The above described scenario works well in areas above 13 inches of precipitation. It will be useful in precipitation zones from 11 to 13 inches and will be misleading below that point. In the 13 + Zone the trees can be from 100 years + in age. This depends a lot on the depth of the soil and the amount of rock on the surface and in the soil profile. All of this will take place at younger ages in sites less than 11 inches of precipitation.

This table is taken from "Pinyon and Juniper Field Guide: Asking the Right Questions to Select Appropriate Management actions" The Caveats and all other material added in are from my own observations in Utah, Southern Idaho, Eastern Nevada, and Western Wyoming areas.

- ii) Trees starting to mature that are around six feet high are most often associated with “Semidesert” (Xeric Aridic or Ustic Aridic soil moisture regime).
  - iii) Trees starting to mature that are around nine feet or higher are most often associated with “Upland” (Aridic Xeric or Aridic Ustic soil moisture regime).
  - iv) On Semidesert sites it takes fewer trees/acre to dominate a site than on Upland sites.
- b) Are the trees all the same apparent age or are there young and old appearing trees in the stand? If you are not sure of the ages of the trees, increment bore at least one or more of the oldest looking trees of each species i.e. Juniper and Pinyon. Also bore at least one or two trees of each species that are of the majority age group. Juniper will, in most cases, be the oldest trees and the species to check the closest. Do not guess at the ages unless you have a great deal of experience (see Table 1). This is the biggest mistake made in this procedure though not the only one. If you do not have an increment borer available, find a cut tree stump and clean part of the surface (from the edge to the center) with a knife and count the rings to get an idea of the diameter-to-age ratio. Also cutting a tree down will work. Young trees will have pointed crowns. Old trees have flat topped crowns.
- c) How dense is the stand? (heavy, medium, light) Heavy means having enough trees to be controlling 80 to 100% of the resources of the site. Light is where 70 to 90% of the resources are controlled by the understory plants.
- d) What condition are the tree crowns in: Dense, Medium, Sparse, or all of the classes. (See NRPH Exhibit 4-4 Foliage Denseness classes, 4ex-7). This information gives you an idea of the health of the trees on the site. A stand that becomes too dense for the existing growing conditions will have more trees in the Medium to Sparse categories.
- 4) What plants are found in the understory? (see figure 20)
- a) Are there any big sagebrush? If this species is found then it is extremely unlikely that the site is a tree site. These could be either living or dead plant skeletons.

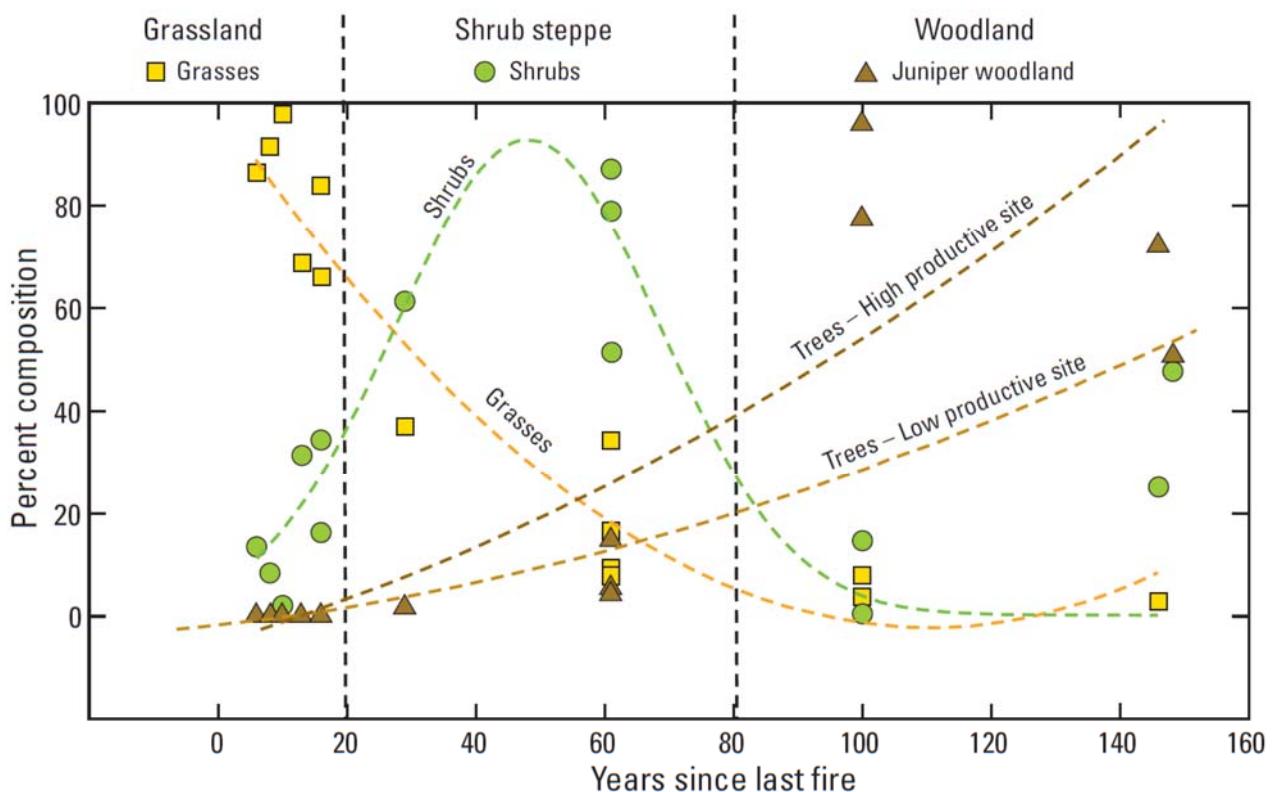


These are photos of Sagebrush dead wood (left) showing the distinctive characteristic of dark brown bands perpendicular to the annual growth rings that helps distinguish it from other kinds of wood. The photo on the right shows Sagebrush live wood. The best way to see this characteristic is to split off a branch where two branches join.

- b) How dense is the understory? If it is dense and has a notable amount of production in shade intolerant and competition intolerant plants then it is not likely to be a tree site.

Some juniper sites will have a good understory at a point that is close to the reference state.

- i) Examples of shade intolerant plants are western wheatgrass, bottlebrush squirreltail, Indian ricegrass, muttongrass, most milkvetches, blue (Lewis) flax and snowberry.
- ii) Examples of competition intolerant plants are bluebunch wheatgrass, western wheatgrass and arrowleaf balsamroot.
- c) Where black sagebrush is found, note the overstory and understory plant density and what other plants are found. If the Pinyon and/or Juniper overstory is dense and the shrub, grass and forb understory is still fairly dense then the site is not likely a tree site.



**Figure 20.** Relation of time since fire and the percent composition (dominance) of grasses, shrubs, and trees (from Miller and others, 2007).

Figure from 'Pinyon and Juniper Field Guide: Asking the Right Questions to Select Appropriate Management Actions'.

- 5) Check the soils.
  - a) What is the soil depth? Shallow soils are more likely to be Juniper and/or Pinyon sites than soils that are moderate deep to deep. In some situations deep cobble or stony soils may be Pinyon/Juniper sites.

- b) Does the soil surface horizon have mollic color? If so, then the site is not a Pinyon/Juniper site.
  - i) Dry and moist values for mollic colors are typically “5” dry and “3” moist. These colors do not necessarily mean that you have a Mollic horizon, it just means that you have a notable accumulation of organic matter in the soil surface. In the Semidesert zone it is very unlikely that you will have a Mollic horizon like you often do in the Upland zone areas, but the color (depending on parent material color) will be there.)
  - ii) Check color of parent material. If the parent material is too light to produce mollic color even with a lot of organic matter then it could still be a sagebrush site.

References:

Woodland in the Soil Conservation Service, USDA NRCS publication

Inventorying, Classifying, and Correlating Juniper and Pinyon Communities to Soils in Western United States, USDA NRCS publication

Pinon and Juniper Field Guide: asking the right Questions to Select Appropriate Management Actions, USDI USGS publication

Age Structure and Expansion of Pinyon-Juniper woodlands: A Regional Perspective in the Intermountain West, USDA USFS publication

Forgotten Fires: Native Americans and the Transient Wilderness by Omer C. Stewart, University of Oklahoma Press, Feb 1, 2009

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<b>Pinyon And Utah Juniper Invasion Evaluation Worksheet</b>				
GPS Coordinates		NAD 27	NAD 83	Date:
Lat.		Long.		
UTM	E.	N.		Zone
Observations from outside the stand				
Stand Appearance from outside	Even age	Uneven age	Note:	
Note: Select every apparent age class of trees that you can observe from this position.				
Stand Canopy Cover	Heavy	Medium	Light	
Apparent average age classes of trees	Young	Mid	Old	
Apparent tree crown condition	Dense	Medium	Sparse	All classes
Observations from inside the stand				
Average height of the majority of trees	6 ft. or less	9 ft. or more	Note:	
Stand Appearance from inside	Even age	Uneven age		
Stand Canopy Cover	Heavy	Medium	Light	
Apparent ages of trees	Estimated			
Oldest appearing age class		to	years old	
Majority age class		to	years old	
Ages of trees	Bored			
Oldest appearing age class		to	years old	
Majority age class		to	years old	
What condition are the tree crowns	Dense	Medium	Sparse	
Are there sagebrush plants in the understory? If so are they:	Big Sages		Black Sage	
Are there plants that do best in full sunlight	Yes	No		
Are there plants that have problems with competition	Yes	No		
Density of Understory	Sparse	Medium	Dense	
Are Soils	Shallow	Mod. Deep	Deep	
Is the soil surface color Mollic	Yes	No		
Juniper/Pinyon Invasion Site	Yes	No		
Note:				
ESD Site Name:	ESD Site Number:			

**This sheet is to be used with the Evaluation Procedure Tech Note**

The Evaluation Sheet has to be followed closely in order for this sheet to have any value. Also the majority of evidence needs to point toward invasion or non-invasion to make the final decision.