

Bluewater Forest Restoration Project – Desired Condition Demonstration, Cibola National Forest

Purpose of Visit:

- Discuss the concepts and various aspects of the desired conditions including: the degree of structural openness; the grass/forb/shrub matrix; the size (area, number of trees), shape, and spacing of tree groups; the interlocking crowns of trees within groups; the diversity and interspersions of tree structural (age, size) stages, and the sustainability of the desired conditions.
- Discuss and discuss the value of the desired conditions for wildlife habitat and food webs.
- Discuss how key elements of the desired conditions relate to natural disturbances.
- Discuss specific differing existing conditions that are moving towards the desired conditions.
- Discuss the ecological, social, and economic outcomes of achieving the desired conditions.

Background:

- Demonstration site (stand 5A) represents a ponderosa pine forest growing on moderately-productive (average) site. This site has had fire exclusion since the early 1900s; with the exception of slash burning following cutting 25+ years ago.
- Past management: this site was cut 25+ years ago to remove diseased, dying and poorly-formed trees (sanitation/salvage cutting). Pre-treatment (2010) stand condition: uneven-aged structure/high-density, modeled fire behavior - high-intensity crown fire.
- Prescribed cutting treatment (focused on the desired conditions and restoration) were implemented during summer 2010. Prescribed burning treatments are scheduled for fall/winter 2011/12.

Demonstration Stand (post-treatment):

- Uneven-aged stand structure (3+ ages): within the stand, there are roughly balanced areas of young, mid, and old age trees with provision of suitable openings between tree groups for development of grass/forb/shrub component and localized recruitment of trees.
- Desired spatial patterns are similar to natural conditions
 - Tree groups with interlocking crowns
 - Fine-scale dispersion of tree groups
 - Grass/forb/shrub openings
- Small diameter woody debris abundance is higher than desired (pre-burning).
- Downed logs and snags are less than desired.
- Tree densities (within group and per unit area) are within desired ranges (overall avg. 40-80 sq. feet basal area).
- Seedlings have not yet established in desired locations.
- Desired grass/forb/shrub cover has not yet established.
- Modeled fire behavior is low-intensity surface fire.

Bluewater Forest Restoration Project – Desired Condition Demonstration Data

Aerial photos

Pre-treatment



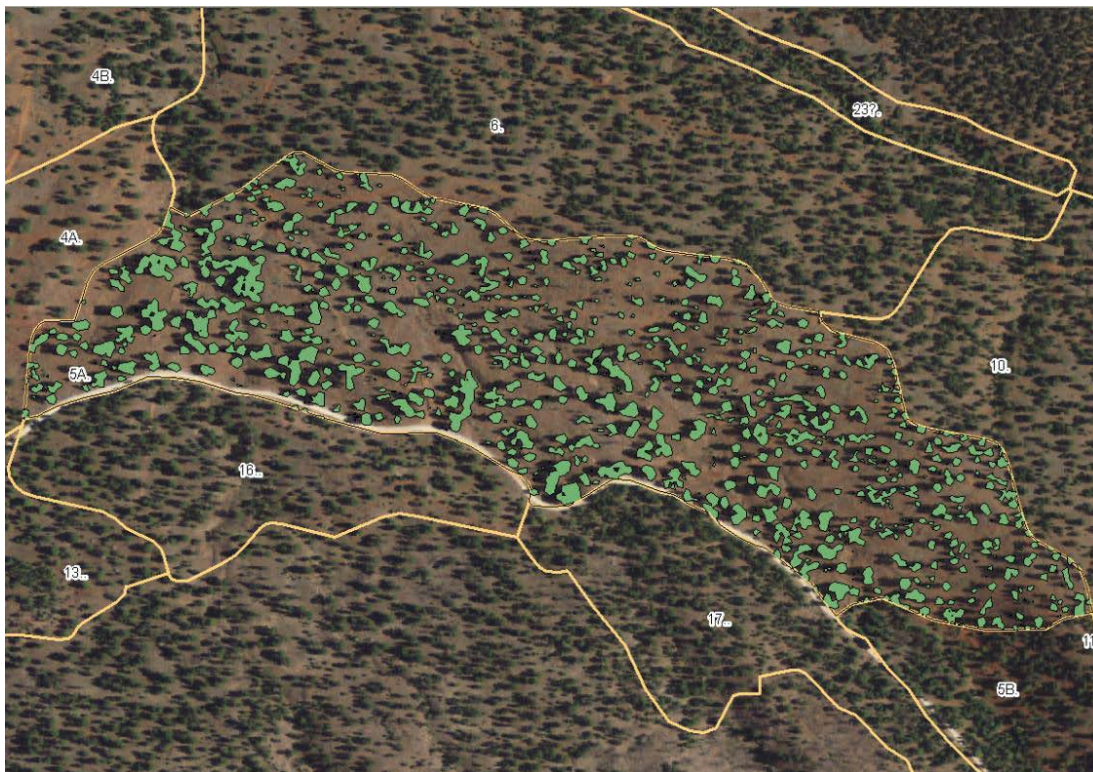
Post-treatment



Stand 5A exam data (post-treatment)

All Species Diameter Class	Trees/Acre	Basal Area/Acre
1 - 4.9 in	3.3	0.4
5 - 8.9 in	16.7	4.6
9 - 12.9 in	23.3	16.2
13 - 16.9 in	5.0	6.1
17 - 20.9 in	5.0	10.2
21 - 24.9 in	1.7	4.3
25 + in	1.6	6.1
Total	56.6	47.9

Current conditions (post-treatment) - spatial patterns



Spatial analysis results (Stand 5A)

- 48% of the area to be managed for tree cover
 - 28% of the area is currently represented under mid-old tree crowns (tree drip-line measurement)
 - 20% of the area to be managed for recruitment and/or development of tree seedlings/saplings
- 52% of the area to be managed as open grass/forb/shrub

Modeled future conditions

a. Forest structure (FVS simulation)

FVS SIMULATION: natural growth, no treatments											
SIMULATION DONE: 10-11-2011											
AVERAGE* SUMMARY STATISTICS BY COMMON CYCLE											
year	trees/ acre	basal area	stand density Index	dominant ht.	quadratic mean diameter	total cubic ft.	merch. cubic ft.	merc. board ft.	years	cubic ft. growth	cubic ft. mortality
2011	57	47	72	48	11.6	786	676	3075	10	37	1
2021	198	57	118	53	7.2	1149	1017	4993	10	41	2
2031	195	71	141	58	8.2	1547	1387	7081	10	43	2
2041	264	87	176	63	7.8	1963	1786	9306	10	44	2
2051	259	102	200	67	8.5	2379	2185	11570	10	44	2
2061	269	118	226	70	9	2801	2574	13847	10	41	4
2071	261	131	244	73	9.6	3171	2930	15998	10	38	10
2081	240	139	252	76	10.3	3449	3246	17887	10	36	9
2091	223	147	259	78	11	3717	3547	19354	10	34	8
2101	210	154	266	79	11.6	3968	3815	20799	10	31	8
2111	199	161	273	81	12.2	4196	4057	22137	0	0	0

- This simulation **assumes no treatments or fire occurrence for 100 years**. Natural regeneration is imputed at intervals, based upon stand density and characteristic ponderosa pine development. Numbers of trees reflect in-growth without the thinning effects of fire or other management. The limited assumptions of this simulation (no fire occurrence or tree-cutting) does not imply management intent, but is presented to show projected growth without disturbances for discussion purposes.

b. Fire Behavior (Flam Map simulation –based on 2011 conditions)

- Predicted surface fire on 99% of the area
- Predicted passive crown fire (torching) on 1% of the area

Dry Mixed Conifer Forest Ecology, Santa Fe National Forest

Purpose of Visit:

- Discuss classification and ecological differences between ponderosa pine, dry mixed conifer & wet mixed conifer forest types.
- View a dry mixed conifer forest site where the tree species composition and function has changed over time as a result of fire suppression and past vegetation management.
- Discuss desired forest species composition for dry mixed conifer forests, and relationships to ecological function.

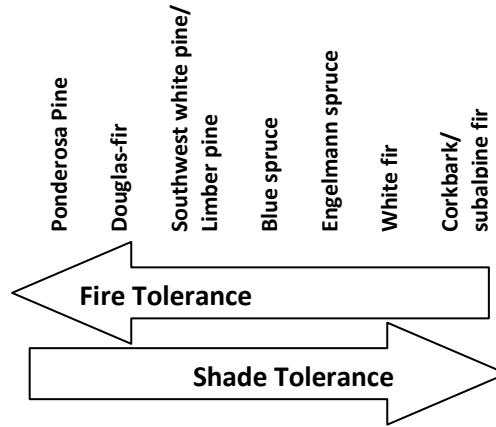
Natural fire regimes of Southwestern forest types. Fire frequency refers to the mean number of years between fires, and fire severity relates to the effect of the fire on dominant overstory vegetation. Infrequent-fire forests (wet mixed-conifer and spruce-fir) are included for comparison to frequent-fire forests.

Forest Type (sub-type)	Fire Regime ¹		Fire Type ²	Forest Structure	Seral Species	Climax Species
	Fire Frequency	Fire Severity				
Ponderosa pine (all sub-types)	<u>Regime I</u> 0-35 years Low		Surface	Uneven-aged, grouped, open	Dominant: ponderosa pine	Dominant: ponderosa pine
Dry mixed-conifer (warmer/drier)	<u>Regime I (common)</u> 0-35 years Low		Surface	Uneven-aged, grouped, open	Dominant: ponderosa pine Subdominant: aspen	Shade-intolerant species under fire dis-climax historic conditions.
	<u>Regime III (rare)</u> 35-100+ years Mixed		Mixed	Uneven-aged, patched, open	and/or oak (in sub-stand scale patches)	Dominant: ponderosa pine Subdominant: Douglas-fir and Southwestern white pine or limber pine
Wet mixed-conifer (cooler/wetter)	<u>Regime III (common)</u> 35-100+ years Mixed		Mixed	Uneven-aged, patched, closed	Dominant (depending on habitat type): aspen or Douglas-fir	Shade tolerant species.
	<u>Regime IV (rare)</u> 35-100+ years High		Stand-replacing	Even-aged, closed		Dominant (depending on habitat type): white fir and/or blue spruce
Spruce-fir (mixed, lower sub-alpine)	<u>Regime III and/or IV</u> 35-100+ years Mixed / High		Mixed/ stand-replacing	Even-aged, closed	Dominant (depending on habitat type): aspen or Douglas-fir	Shade tolerant species. Dominant (depending on habitat type): Engelmann spruce and/or white fir Shade tolerant species.
Spruce-fir (upper sub-alpine)	<u>Regime V</u> 200+ years High		Stand-replacing	Even-aged, closed	Dominant (depending on habitat type): aspen, Douglas-fir, or Engelmann spruce	Dominant: Engelmann spruce and corkbark fir or sub-alpine fir

¹Schmidt et al. (2002)

²The Nature Conservancy (2006)

Relative shade and fire tolerance of common conifer tree species in mixed conifer and spruce-fir forests



Species Composition (on-site)

Tree Species (conifer)	Current age range of the most mature individuals on site	Estimated historic (1880) % of composition
Ponderosa pine		
Douglas-fir		
SW white pine		
Blue spruce		
White fir		

East Fork Forest Restoration Demo Area, Santa Fe National Forest

Purpose of Visit:

- View an area where different forest restoration approaches were implemented for demonstration, and discuss basis for treatment strategies.
- Discuss the concepts and various aspects of the desired conditions including: the degree of structural openness; the grass/forb/shrub matrix; the size (area, number of trees), shape, and spacing of tree groups; the interlocking crowns of trees within groups; the diversity and interspersions of tree structural (age, size) stages; and the sustainability of the desired conditions.
- Discuss forest entomology/pathology (reference and current conditions).

Background:

- To be discussed on site

Treatment Areas (post-treatment):

- Uneven-aged structure (3+ ages). Old age trees were below desired proportional representation before treatment, therefore none were cut.
- Desired spatial patterns are similar to natural conditions
 - Tree groups with interlocking crowns
 - Fine-scale dispersion of tree groups
 - Grass/forb/shrub openings
- Slash was masticated, not burned (effects on site: fire behavior and understory development????). Large woody debris abundance is lower than desired.
- Tree densities (within group and per unit area) are within desired ranges (overall averages 30-90 sq. feet basal area).
- Seedlings have not yet established in desired locations.
- Desired grass/forb/shrub cover has not yet fully established (effects of remaining masticated slash????).
- Modeled fire behavior is low-intensity surface fire (ground fire intensity due to slash mastication????).
- How demonstrations differ:
 - Demo #1 represents a managed framework for restoration: roughly balanced area of young, mid, and old aged trees with provision of suitable openings for development of grass/forb/shrub component and localized recruitment of trees. Old age trees were below desired proportional representation before treatment, therefore none were cut. This represents an approach to initiate a multiple-use maintained restored forest landscape.
 - Demo #2 represents a natural processes framework for restoration: uneven-aged but age structure not balanced (more mid and old trees than young). This represents an approach to initiate a fire maintained restored forest landscape.

East Fork Forest Restoration Demo Area – Data

Aerial photos

Pre-treatment:



Modeled future conditions (FVS simulation)

Demo site #1

- This simulation assumes no treatments or fire occurrence for 100 years. Natural regeneration is imputed at intervals, based upon stand density and characteristic ponderosa pine development. Numbers of trees reflect in-growth without the thinning effects of fire or other management. The limited assumptions of this simulation (no fire occurrence or tree-cutting) does not imply management intent, but is presented to show projected growth without disturbances for discussion purposes.

Demo site #2

- This simulation assumes no treatments or fire occurrence for 100 years. Natural regeneration is imputed at intervals, based upon stand density and characteristic ponderosa pine development. Numbers of trees reflect in-growth without the thinning effects of fire or other management. The limited assumptions of this simulation (no fire occurrence or tree-cutting) does not imply management intent, but is presented to show projected growth without disturbances for discussion purposes.

Forest entomology/pathology (reference and current conditions)

- Understand how biological forest disturbance agents function in reference condition and contemporary forest landscapes.
- Discuss implications for forest resilience and sustainability

Current averages per acre

All Species Diameter Class	Trees/ Acre	Basal Area/ Acre
1 - 4.9 in		
5 - 8.9 in		
9 - 12.9 in		
13 - 16.9 in		
17 - 20.9 in		
21 - 24.9 in		
25 - 28.9 in		
29 - 32.9 in		
33 + in		
Total		

b. spatial patterns

- % of the area is under tree canopy (9.6 acres)
- % of the area is open grass/forb/shrub (14.8 acres)

Discussion: where does this stand fit in the context of DCs, resilience and sustainability?

Monument Canyon Forest Restoration Demo Area, Santa Fe National Forest

Purpose of Visit:

- View a Research Natural Area.
- Discuss reference conditions.
- Discuss restoration treatment and current conditions.
- Discuss maintenance of forest restoration treatments.

Background:

- Reference conditions
- Management history

Demonstration Restoration Treatment:

- Treatment prescription and implementation

Aerial photos

Pre-treatment:

Post-treatment

Current conditions (post-treatment)

a. Spatial analysis from aerial photos

- % of the area represented under mid-old tree crowns (tree drip-line measurement)
- % of the area represented as open grass/forb/shrub (not including meadow areas shown in green)

b. Stand exam data

Pre-treatment ()

Post-treatment ()

All Species Diameter Class	Trees/ Acre	Basal Area/ Acre (ft ²)
1 - 4.9 in		
5 - 8.9 in		
9 - 12.9 in		
13 - 16.9 in		
17 - 20.9 in		
21 - 24.9 in		
25 + in		
Total		

All Species Diameter Class	Trees/ Acre	Basal Area/ Acre (ft ²)
1 - 4.9 in		
5 - 8.9 in		
9 - 12.9 in		
13 - 16.9 in		
17 - 20.9 in		
21 - 24.9 in		
25 + in		
Total		

Modeled future conditions (FVS simulation)

This simulation assumes no treatments or fire occurrence for 100 years. Natural regeneration is imputed at intervals, based upon stand density and characteristic ponderosa pine development. Numbers of trees reflect in-growth without the thinning effects of fire or other management. The limited assumptions of this simulation (no fire occurrence or tree-cutting) does not imply management intent, but is presented to show projected growth without disturbances for discussion purposes.

American Springs Forest Fuels Management Demo Area, Santa Fe National Forest

Purpose of Visit:

- View a managed forest stand that survived two high-severity wildfires.
- Discuss the concepts and various aspects of the desired conditions.
- Discuss how key elements of the desired conditions relate to natural disturbances.
- Discuss specific differing existing conditions that are moving towards the desired conditions.

Background: Demonstration site represents;

- Past management

Stand Conditions:

- Two-aged stand structure: a third age is developing where disturbances have resulted in creation of suitable openings for development of grass/forb/shrub component and localized recruitment of trees.
- Desired spatial patterns are moving towards natural conditions
 - Tree groups with interlocking crowns
 - Some disturbance-created openings is reducing canopy continuity and defining tree groups
- Small diameter woody debris abundance is less than desired.
- Downed logs and snags are less than desired.
- Tree densities (within group) are within desired ranges but overall stand density is higher than desired (overall avg.?? sq. feet basal area) due to canopy continuity and limited forest openings/interspaces.

Aerial photos

Pre-treatment (1993):

Current condition (post Las Conchas fire):

Current conditions (post- Las Conchas fire)

a. Spatial analysis from aerial photos

- % of the area represented under mid-old tree crowns (tree drip-line measurement)
- % of the area represented as open grass/forb/shrub (not including meadow areas shown in green)

b. Stand exam data (04/2012)

Current averages per acre

All Species Diameter Class	Trees/ Acre	Basal Area/ Acre
1 - 4.9 in		
5 - 8.9 in		
9 - 12.9 in		
13 - 16.9 in		
17 - 20.9 in		
21 - 24.9 in		
25 - 28.9 in		
29 - 32.9 in		
33 + in		
Total		

Modeled future conditions (FVS simulation)

This simulation assumes no treatments or fire occurrence for 100 years. Natural regeneration is imputed at intervals, based upon stand density and characteristic ponderosa pine development. Numbers of trees reflect in-growth without the thinning effects of fire or other management. The limited assumptions of this simulation (no fire occurrence or tree-cutting) does not imply management intent, but is presented to show projected growth without disturbances for discussion purposes.