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Old Growth Protection
&
Large Tree Retention
Strategy

Contents

I. Old Growth Protection & Large Tree Retention Strategy (OGP&LTRS) Overview

The goals of the Four Forests Restoration Initiative (4FRI) are to restore healthy, diverse stands, supporting abundant populations of native plants and animals; to protect communities in forested landscapes from destructive wildland fire; and to support sustainable forest industries that strengthen local economies while conserving natural resources and aesthetic values. In short, we seek to re-establish largely self-regulating forested landscapes including their associated fire regimes through a process of ecological restoration that benefits communities, economies, ecosystems and biodiversity.

Ecological restoration will require thinning post-settlement ponderosa pine trees[1] in unnaturally dense stands. While there is broad agreement for reducing small diameter tree densities, where and how this should be done has often been the subject of social and scientific debate. The purpose of this document is to affirm recommendations of the 4FRI Stakeholder Group relating to the retention of large post-settlement and old growth trees—recommendations that are critical to moving beyond those debates—and to provide specific, science-based recommendations for incorporation into 4FRI restoration plans and projects.

Retention of Old Growth and Large Post-settlement Trees

"The Path Forward"—a foundational document of the 4FRI—calls for blanket old growth protection, regardless of tree size. It states that, "No old-growth trees (pre-dating Euro-American settlement) shall be cut." The document also includes broad recommendations for retaining large post-settlement trees with some carefully specified exceptions.

In southwestern ponderosa pine forests, old-growth trees are important to ecosystem structure and function. They increase genetic diversity on the landscape; old trees have greater genetic diversity than even-aged groups of young trees (Kolanoski 2002) and, thus, may have a better chance of adapting to changing climatic and environmental conditions, an ability they can pass on to their progeny. In addition, when not surrounded by large amounts of fuel, the thick bark of old-growth trees makes them largely resistant to low-intensity surface fire (Agee 1998). Old-growth trees also increase forest structural diversity, which, in turn, provides more wildlife habitat. For example, large trees provide additional structure for bats, which roost under slabs of bark; nest trees for northern goshawks and Mexican spotted owls; continuous canopy for tassel-eared squirrels; and foraging habitat for bark-gleaning birds (Bull and Hohmann 1994, Humes et al. 1999, Dodd et al. 2003). In addition, old trees often become long-lasting snags when they die, which benefits many species of cavity-nesting birds and mammals (Chambers and Mast 2005). Old, large trees also serve as long-term carbon stores (Harmon et al. 1990) and preserve a record of the past that can inform future research about insect outbreak, fire history, and climate change (Fulé et al. 1997, Soulé and Knapp 2006). Finally, old-growth trees enhance the

[1] Large and old growth tree recommendations offered in this document refer specifically to ponderosa pine trees.

aesthetics of forests (Brown and Daniel 1984) and, thus, increase public support for restoration projects. Old-growth trees are present on the landscape at similar or lower densities compared to presettlement times (Mast et al. 1999, Moore et al. 2004), depending on how many trees have been removed postsettlement by forest management practices (e.g., clearcut, thinning, seed tree, etc.). The three main threats to old-growth trees are high-severity wildfire, competition from mid- or under-story trees, and drought and subsequent bark beetle attacks (Kolb et al. 2007). Restoration treatments (thinning and prescribed burning) around old-growth trees can cause some mortality. However, this threat can be reduced through careful management (Hood 2010). In addition, restoration treatment should result in a reduced threat of wildfire, a release from competition, and increased tree growth (Fajardo et al. 2007, Fulé et al. 2007).

The Path Forward also calls for retaining large post-settlement trees (defined by the socio-political process as those greater than 16 inches diameter-at-breast height [dbh]) throughout the 4FRI landscape, except: (1) as necessary to meet community protection and public safety goals within the Community Protection Management Areas identified in the Analysis of Small Diameter Wood Supply in Northern Arizona and where stakeholder agreement identifies priority areas within approved CWPPs; and (2) when best available science and stakeholder agreement (as defined in the 4FRI Charter) identify sites where ecological restoration and biodiversity objectives cannot otherwise be met – specifically wet meadows, seeps, springs, riparian areas, encroached grasslands, aspen groves or oak stands, within-stand openings, and heavily stocked stands with high basal area generated by a preponderance of large, young trees.

We recognize that there are multiple causes of ecological degradation that may not be affected by mechanical thinning and different types of burning. The exceptions articulated in the following section are intended to be part of a more comprehensive and concurrent approach to treating causes (rather than just symptoms) of ecological decline. To that end, we are asking the Forests to work collaboratively on a comprehensive restoration assessment that identifies possible management actions to stem/reverse ecological decline. We believe this restoration assessment should focus on a wider range of forest resources than just timber and fire; such as hydrology, range, recreation, and wildlife. We ask the four National Forests to initiate this assessment with the 4FRI Stakeholders, upon release of the Draft EIS for the first project area.

The intention of the exception process is to increase landscape heterogeneity and conserve biodiversity. Thus we do not support implementing any exceptions where removing the trees would conflict with existing recovery/conservation plan objectives for managing sensitive, threatened or endangered species or their habitat. We also recognize there may be additional areas and/or circumstances where large trees need to be removed to achieve restoration. These circumstances should be identified through a site-specific, agreement-based, collaborative process as described in the 4FRI Charter.

II. OGP&LTRS Rationale: The Historical Debate Regarding Diameter Caps in the Southwest and the 4FRI's Large Tree Retention Policy

Introduction

Diameter caps for tree cutting have been used in forest management efforts across the West. They have been and continue to be the subject of much debate. In this section of the Large Tree Retention Strategy document, two different perspectives on diameter caps are presented. Recognizing that the 4FRI Large Tree Retention and Old Growth Protection Strategy is not meant to serve as a strict diameter cap, these perspectives are offered here to illuminate elements of the historical debate that have led to the 4FRI's formulation of the existing Large Tree Retention and Old Growth Protection Strategy.

Arguments in Favor of Diameter Caps

There is a generally recognized need to retain larger trees and protect old growth in southwestern ponderosa pine forest restoration. Some proponents of large tree retention have suggested that a 16" diameter cap is both ecologically and socio-politically warranted given the scarcity of mature and old growth forest cover in the region; the need to quickly re-establish lost mature and old forest structure; the necessity of retaining trees larger than 16" dbh to recruit new trees into regionally-underrepresented VSS 5, 6 and "old growth" structural stages; and the regional rarity of trees larger than 16" (approximately 96% of ponderosa pine trees in northern Arizona and New Mexico are smaller than 16-inch dbh).

Such proponents have proposed diameter caps as a means to (1) prevent large-tree logging for production-oriented, uneven-aged silvicultural goals, (2) discourage large-tree logging to pay for small-tree thinning or other activities, (3) favor small-diameter-specific industries over large-tree-dependent ones, (4) avoid population-level effects to imperiled species and wildlife that are associated with larger live and dead trees and denser canopy, (5) mitigate unforeseen large tree mortality during and following restoration treatments, (6) mitigate unknown rates of future large tree mortality resulting from re-establishing natural fire regimes and future climates, (7) mitigate under-estimates of historical tree densities owing to evidence undercounting and loss to fire, logging and decay, (8) accommodate differing reference scales, choices of reference attributes, restoration objectives and desired degrees of precision or rates of change, (9) mitigate uncertainty about future national forest policy, timber and wildlife habitat management, and (10) facilitate a restoration approach that reduces immediate crown fire threat while incrementally moving the forest toward its natural range of variability through a combination of thinning and natural fire.

Diameter limits and exception-thresholds for tree cutting are a common strategy for achieving ecological objectives in western forest landscapes. In their recommendations to Congress and the President, the Eastside Forests Scientific Society Panel proposed a 20" diameter limit for trees younger than 150 years old to protect late-successional and old-growth dry forests of eastern Oregon and Washington. They cited the ecological importance and scarcity of large and old trees and the need to retain them to replenish regionally-depleted supplies of large and old trees, snags, logs and associated wildlife habitat. Those recommendations formed the basis for interim management direction amending nine national forest plans and establishing a 21" diameter limit in dry forests which in turn carried forward into an exception-threshold of 21" diameter in legislation proposed to restore dry forests of eastern Oregon. The Sierra Nevada Framework set forth a 20" diameter limit for tree cutting to conserve late-seral forests across national forest land in the Sierra Nevada. Larger diameter limit and exception-thresholds in these examples reflect more productive forests and larger mean diameters than in southwestern forests. Diameter limits in Region 3 forest plans restrict large tree cutting in habitat for Mexican spotted owl and northern goshawk for their viability and in "old growth"; diameter-based "vegetative structural stages" guide management of those species' habitats.

Arguments Against Diameter Caps

Arbitrary diameter thresholds (or "caps") may assure that trees of a certain size are retained, but they do not guarantee that short- or long-term ecological restoration goals will be achieved. In fact, diameter caps can actually prevent attainment of ecological restoration objectives because they can have unintended consequences such as interfering with the restoration of herbaceous openings and, where unnaturally dense stands of larger, post-settlement trees predominate, caps can limit fuel reduction and, therefore, undermine the agency's ability to re-establish surface fire (Abella et al. 2006, Sanchez-Meador 2009). A diameter threshold also creates a "one-size-fits-all" guideline which can lead to treatments that are inconsistent with site-based conditions.

In general caps are arbitrarily chosen to achieve socio-political objectives that do not necessarily support comprehensive ecological restoration. Contemporary diameter caps, even as an informal agreement, have become the condition that allows fuel reduction and restoration to move forward without lengthy delays due to appeals and litigation. Examples of their arbitrary application include:

- In order to test restoration treatments in the Grand Canyon, a 5-inch cap was required by environmental advocates (Fulé 2006).
- For restoration to proceed in the White Mountains, a 16-inch cap was required (Abrams and Burns 2007).
- A 12-inch cap was employed to define forest biomass appropriate for generating renewable energy (Arizona Corporation Commission, 2006).
- On the Coconino National Forest, a 16-inch cap was imposed to allow restoration projects proposed by the Grand Canyon Forest Partnership to proceed (Friederici 2003).

Further evidence that caps undermine ecological restoration goals is reflected in a recent decision on the Marshall Fuel Reduction and Forest Restoration Project (USFS 2010). The Forest Service rejected an alternative that proposed a 16-inch diameter cap because, "A 16-inch cap would prevent the restoration of natural openings and more natural spatial distribution of clumps of trees important for wildlife habitat and forest health." When administrative and legal challenges to forest thinning and restoration projects prevail it is generally because of issues related to agency compliance with law and policy (Brown 2009)—not because there is a scientific basis for a diameter threshold.

Finally, a static diameter cap fails to account for the fact that trees grow, that restoration will occur over decades while those trees are growing, and that over time, retention of excess trees may undermine efforts to restore ecosystem resilience in the face of drier conditions associated with climate change (Glicksman 2009, Westerling et al. 2006).

Conclusions

Recognizing a need to move beyond the historical debate and move forward with landscape-scale restoration that is ecologically, socially, and economically viable, the 4FRI Collaborative has agreed that the 4FRI effort should implement large tree retention and old growth protection strategies that are not based on strict diameter limits, but are based upon a 16" diameter threshold that limits the cutting of trees larger than 16" to circumstances and criteria set forth in pre-defined exception categories that follow. In addition, we are committed to monitoring the outcomes of treatments that follow this guidance to determine if they achieve our ecological restoration goals. If they do not we are committed to adapting this policy to achieve better ecological outcomes.

It is our hope and expectation that this approach will balance the approaches and opinions expressed above, and will serve as a policy mechanism for supporting comprehensive ecosystem restoration while addressing stakeholders' needs for protecting old growth and large ponderosa pine trees.

III. Exception Process for Large Post-Settlement Tree Retention

The following section outlines a problem statement, specific identifying circumstances, ecological objectives and selection criteria for instances in which large post-settlement trees may be cut to meet restoration objectives. At specific locations, large trees may need to be removed, felled, or girdled for purposes of ecological restoration and biodiversity conservation. The purpose of this section is to provide sufficient specificity to translate those exception categories—where stakeholder agreement exists to do so—into management actions and tree-marking guidelines. For eight of the nine exception categories programmatic recommendations describe the circumstances and criteria in which large post-settlement trees may need to be removed. For the "Heavily Stocked Stands with High Basal Area Generated by a Preponderance of Large Young Trees" (or "Large Young Tree") exception category, getting to a higher level of social and scientific agreement entails more complexity and challenges, so we propose the initiation of additional collaborative discussion and planning that we hope will bolster restoration efforts by increasing confidence and knowledge-sharing, maximizing agreement and minimizing disagreement.

IV. Exceptions

Seeps & Springs

Suggested Tree Marking Exception Code: "S"

Identifiable Circumstance

Seeps are locations where surface-emergent groundwater causes ephemeral or perennial moist soil or bedrock, where standing or running water is infrequent or absent and that exhibit vegetation and other biological diversity adapted to mesic soils.

Springs are small areas where surface-emergent groundwater causes ephemeral or perennial standing or running water, wet or moist soils and that exhibit vegetation and other biological diversity adapted to mesic soils or aquatic environments (Feth and Hem 1963).

Problem Statement

Seeps and springs exhibit unique, often isolated biophysical conditions that can sustain unique, mesic-adapted biological diversity and can facilitate endemism and speciation. Springs also provide water and other habitat to terrestrial wildlife. Due to the absence of frequent fires in the presence of livestock grazing, the establishment of large post-settlement trees may reduce available soil moisture (Simonin et al. 2007) and block the sunlight necessary to support the unique biophysical conditions associated with seeps and springs.

Removal of these trees may constitute a relatively small part of an overall seep and spring restoration effort when compared to addressing root causes of overall degradation. Thinning alone without addressing other sources of degradation is unlikely to restore seeps and springs (Thompson et al. 2002).

Ecological Objectives

(1) Conserve and restore the biophysical conditions in seeps and springs upon which terrestrial, mesic-adapted and aquatic native biological diversity depend.

Criteria

Large (>16"dbh) post-settlement ponderosa pine trees may be removed to conserve the unique biophysical attributes of seeps & springs according to these criteria:

(1) Where large trees' roots are encroaching on mesic soils associated with a seep or spring, or such trees' drip lines are overlapping or nearly overlapping a seep or spring

such that its shading compromises the integrity of a spring's unique biophysical attributes, and

(2) Where removing the trees does not conflict with existing recovery/conservation plan objectives for managing sensitive, threatened or endangered species or their habitat.

Note: Where there is evidence of pre-settlement trees having grown in similar root and crown proximity to said seep or spring in the past, leave an equivalent number of large replacement trees.

Riparian

Suggested Tree Marking Exception Code: "R"

Identifiable Circumstance

Riparian areas occur along ephemeral or perennial streams or are located down-gradient of seeps or springs. These areas exhibit riparian vegetation, mesic soils, and/or aquatic environments.

Problem statement

Riparian areas exhibit unique biophysical conditions that can sustain unique, mesic-adapted or aquatic biological diversity. Riparian areas and the streams, springs and seeps connected to them often harbor imperiled species and can be sources of endemism. Riparian areas also provide water and other habitat to terrestrial wildlife. In the absence of frequent fires and in the presence of livestock grazing, water development projects and other factors, large post-settlement trees may have established and grown within riparian areas such that they compromise available soil moisture or light that support those unique biophysical conditions. However, it is likely to be a very rare circumstance that trees of any size will need to be removed from forested riparian zones.

Cutting of any trees within riparian areas should minimize impacts by following Best Management Practices (BMPs).

Whenever possible, large trees identified for cutting should be left onsite as snags or downed logs.

Removal of these trees may constitute a relatively small part of an overall riparian area restoration effort when compared to addressing fundamental causes of overall degradation. Thinning alone without addressing other sources of degradation is unlikely to restore riparian areas.

Ecological Objectives

Conserve and restore the biophysical conditions in riparian habitat upon which terrestrial and aquatic native biological diversity depend.

Criteria

Large (>16"dbh) post-settlement ponderosa pine trees may be removed to conserve the unique biophysical attributes of riparian areas according to these criteria:

(1) Where large trees are growing (rooted) within a riparian area and compromising available soil moisture or light that support that area's unique biophysical conditions, and

(2) Where removing the trees does not conflict with existing recovery/conservation plan objectives for managing sensitive, threatened or endangered species or their habitat.

Notes: Where there is evidence of pre-settlement trees having grown in similar root and crown proximity to said riparian in the past, leave an equivalent number of large replacement trees.

There may be additional areas and/or circumstances identified for riparian restoration through a site specific agreement-based, collaborative process as described in the 4FRI Charter.

Wet Meadows

Suggested Tree Marking Exception Code: "WM"

Identifiable Circumstance

High-elevation streamside or spring-fed meadows occur in numerous locations throughout the Southwest. However, less than 1% of the landscape in the region is characterized as wetland (Dahl 1990), and wet meadows are just one of several wetland types that occur. Patton and Judd (1970) reported that approximately 17,700 ha of wet meadows occur on national forests in Arizona and New Mexico.

These areas may be referred to as riparian meadows, montane (or high-elevation) riparian meadows, sedge meadows, or simply as wet meadows. Wet meadows are usually located in valleys or swales, but may occasionally be found in isolated depressions, such as along the fringes of ponds and lakes with no outlets. Where wet meadows have not been excessively altered, sedges (*Carex* spp.), rushes (*Juncus* spp.), and spikerush (*Eleocharis* spp.) are common species (Patton and Judd 1970, Hendrickson and Minckley 1984, Muldavin et al. 2000). Willow (Salix) and alder (Alnus) species often occur in or adjacent to these meadows (Long 2000, 2002, Maschinski 2001, Medina and Steed 2002). High-elevation wet meadows frequently occur along a gradient that includes aquatic vegetation at the lower end and mesic meadows, dry meadows, and ponderosa pine or mixed conifer forest at the upper end. These vegetation gradients are closely associated with differences in flooding, depth to water table, and soil characteristics (Judd 1972, Castelli et al. 2000, Dwire et al. 2006). While relatively rare, wet meadows are believed to be of disproportionate value because of their use by wildlife and the range of other ecosystem services they provide. Wet meadows perform many of the same ecosystem functions associated with other wetland types, such as water quality improvement, reduction of flood peaks, and carbon sequestration.

Problem statement

Wet meadows are one of the most heavily altered ecosystems. They have been used extensively for grazing livestock, have become the site of many small dams and stock tanks, have had roads built through them, and have experienced other types of hydrologic alterations, most notably the lowering of their water tables due to stream downcutting, surface water diversions, or groundwater withdrawal (Neary and Medina 1996, Gage and Cooper 2008). In the presence of livestock grazing and hydrologic changes, large post-settlement trees may have established and grown within wet meadows such that they compromise available soil moisture or light creating unique biophysical conditions.

Removal of these trees may constitute a relatively small part of an overall wet meadow restoration effort when compared to addressing root causes of overall degradation. Thinning alone without addressing other sources of degradation is unlikely to restore wet meadows.

Ecological Objectives

Conserve and restore the biophysical conditions of wet meadows upon which terrestrial native biological diversity depend.

Criteria

Large (>16"dbh) post-settlement ponderosa pine trees may be removed to conserve the unique biophysical attributes of wet meadows according to these criteria:

(1) Where large trees are growing (rooted) in a wet meadow, and

(2) Where removing the trees does not conflict with existing recovery/conservation plan objectives for managing sensitive, threatened or endangered species or their habitat.

Note: Where there is evidence of pre-settlement trees having grown in similar root and crown proximity to said wet meadows in the past, leave an equivalent number of large replacement trees.

Encroached Grasslands

Suggested Tree Marking Exception Code: "EG"

Identifiable Circumstance

Encroached grasslands are herbaceous ecosystems that have infrequent-to-no evidence of pine trees growing prior to settlement. The two prevalent grassland categories in the 4FRI landscape are montane (includes subalpine) grasslands and Colorado Plateau (a subset of Great Basin) grasslands, with montane grasslands being most common (Finch 2004). A key indicator of grasslands is the presence of mollisol soils, which are typically deeper with higher rates of accumulation and decomposition of soil organic matter relative to soils in the surrounding landscape. Grasslands in this region evolved during the Miocene and Pliocene periods, and the dark, rich soils observed in grasslands today have taken more than 3 million years to produce. In addition to their association with mollic soils, grasslands in this region are maintained by a combination of climate, fire, wind desiccation, and to a lesser extent by animal herbivory (Finch 2004).

Typical montane grasslands in this region are characterized by Arizona fescue (Festuca arizonica) meadows on elevated plains of basaltic and sandstone residual soils. Montane grasslands are the most naturally fragmented grasslands in the region, ranging from thousands of acres in size (e.g., in the White Mountains, Baker 1983) down to only a few acres. They generally occur in small (<100 ac.) to medium-sized (100 to 1000 ac.) patches. Historic maintenance of the herbaceous condition in these grasslands is subject to some debate though appears to be primarily driven by periodic fire. The cool-season growth of Arizona fescue also plays a large role in maintenance of parks and openings by directly competing with ponderosa pine seedlings.

Identification of grasslands in this region should use a combination of the Terrestrial Ecosystem Survey, Southwest Regional GAP Analysis, Brown and Lowe Vegetation Classification (Brown and Lowe 1982; TNC GIS Layer 2006) among other existing vegetation and soils data.

This exception category will require an iterative process of collaborative mapping, field verification, and refinement. There is debate about where and how much the grassland-forest mosaic shifts over time and space. There are also questions about whether some recently-burned areas are early seral forests or stable grasslands, whether or how they may be surrogates for historical grasslands, and if or how that should factor into the overall retention of forest cover. Recognizing the importance of montane grassland restoration, we encourage all parties to seek resolution to these issues on a case-by-case basis through field visits, literature review, and/or discussion.

Problem statement

Prior to European settlement, pine trees rarely established in grasslands because they were either outcompeted by production of cool-season grasses or killed by frequent fire (Finch 2004). In the late 1800s, unsustainable livestock grazing practices significantly reduced herbaceous cover, releasing competition pressure on pine seedlings. Coupled with the onset of fire suppression in the early 1900s, pine trees rapidly encroached and recruited into native grasslands (e.g., Allen 1984, Moore and Huffman 2004, Coop and Givnish 2007).Pine encroachment into grasslands has contributed to a significant loss of biodiversity (Stacey 1995) and wildlife habitat particularly for grassland-dependent species such as pronghorn. Plant diversity is particularly important in grassland ecosystems: grassland plots with greater specie diversity have been found to be more resistant to drought and to recover more quickly than less diverse plots (Tilman and Downing 1994); this resilience will become even more important in a warming climate. Pine tree removal, restoration of fire, and complementary reductions in livestock grazing pressure are all necessary to restore structure and function of native grasslands.

Ecological Objectives

(1) Enhance, maintain, and restore naturally functioning grasslands.

(2) Ensure native grassland composition, increase native species diversity, improve resilience to drought.

(3) Restore natural fire regime.

Criteria

Large (>16” dbh) post-settlement ponderosa pine trees may be cut and/or removed to restore the unique biophysical attributes of grasslands according to these criteria:

(1) Where existing grasslands are being encroached, and large trees are interfering with overall restoration objectives, and

(2) Where removing the trees does not conflict with existing recovery/conservation plan objectives for managing sensitive, threatened or endangered species or their habitat.

Note: There may be additional areas and/or circumstances identified for grassland restoration through a site specific agreement-based, collaborative process as described in the 4FRI Charter.

Aspen Forest & Woodland

Suggested Tree Marking Exception Code: “AF”

Identifiable Circumstance

Quaking aspen (*Populus tremuloides*) occurs in small patches throughout the 4FRI area. Bartos (2001) refers to three broad categories of aspen: (1) stable and regenerating (stable), (2) converting to conifers (seral), and (3) decadent and deteriorating. Almost all of the aspen occurring within ponderosa pine forests of the 4FRI area exists as seral aspen, and regenerates after disturbance both through root sprouting and rarely from seed production (Quinn and Wu 2001). Favorable soil and moisture conditions maintain stable aspen over time. Aspen stands have been mapped across the entire 4FRI area and map layers are available from existing databases.

Problem Statement

Aspen occurs within ponderosa pine forests, and is ecologically important due to the high concentration of biodiversity that depends on aspen for habitat (Tew 1970, DeByle 1985, Finch and Reynolds 1987, Griffis-Kyle and Beier 2003). In addition, stable aspen stands serve as an indicator of ecological integrity (Di Orio and others 2005). However, aspen is currently declining at an alarming rate (Fairweather and others 2008).

The loss of fire as a natural disturbance regime in southwestern ponderosa pine forests since European settlement has caused much of the aspen-dominated lands to succeed to conifers (Bartos 2001). Other factors contributing to gradual aspen decline over the past 140 years include reduced regeneration from browsing by livestock and introduced and native wild ungulates in the absence of natural predators like wolves (Pearson 1914, Larson 1959, Martin 1965, Jones 1975, Shepperd and Fairweather 1994, Martin 2007). More recently, aerial and ground surveys indicate more rapid decline of aspen, with 90% mortality occurring in low elevation aspen sites and over 60% mortality observed in mid-elevations. Major factors thought to be causing this rapid decline of aspen include frost events, severe drought, and a host of insects and pathogens (Fairweather and others 2008) that have served as the “final straws” for already compromised stands.

Removal of encroaching pine trees constitutes part of an overall aspen restoration effort. Thinning alone without addressing other sources of degradation, such as excessive herbivory is unlikely to successfully restore aspen forests.

Some stakeholders expressed that considerable uncertainty exists around fire regimes for aspen in ponderosa pine, and that research questions remain unanswered around the prevalence of mixed-severity fire and its ecological role as a driving force for aspen stands at the top of its elevational range, and on steep slopes within this vegetation type.

Ecological Objectives

(1) Conserve and restore aspen forests and woodlands within 4FRI area by restoring appropriate fire regimes and decreasing competition from ponderosa pine.

(2) Protect regeneration, saplings, and juvenile trees from browsing.

Criteria

Large (>16"dbh) post-settlement trees may be cut in conifer-encroached seral aspen stands according to the following criteria:

(1) Where current post-settlement ponderosa pine tree numbers are above and beyond residual targets (identified using pre-settlement conifer tree evidences), and

(2) Where fire cannot be used safely and effectively to regenerate or maintain aspen, or

(3) Where site visitation and/or data collection and analysis indicates the need for encroachment mitigation, and

(4) Where removing large trees does not conflict with existing recovery/conservation plan objectives for managing sensitive, threatened or endangered species or their habitat

Note: There may be additional areas and/or circumstances identified for aspen restoration through a site specific agreement-based, collaborative process as described in the 4FRI Charter.

Ponderosa Pine/Gambel Oak Forest (Pine-Oak)

Suggested Tree Marking Code: "P-O"

Identifiable Circumstance

A number of habitat types exist in the southwestern United States that could be described as pine-oak. Ponderosa pine forests are interspersed with Gambel oak trees in locations throughout the 4FRI area in a habitat association referred to as PIPO/QUGA (USFS 1997, USDI FWS 1995). Specifically, any stand within the Pinus ponderosa series where ≥10% of stand basal area consists of Gambel oak (*Quercus gambelii*) ≥13 cm (5 in) diameter at root collar (drc) is considered to be pine-oak within the 4FRI area (USDI FWS 1995). In southwestern ponderosa pine forests, Gambel oak has several growth forms distinguished by stem sizes and the density and spacing of stems within clumps. These include shrubby thickets of small stems, clumps of intermediate-sized stems, and large, mature trees that are influenced by age, disturbance history, and site conditions (Brown 1958, Kruse 1992, Rosenstock 1998, Abella and Springer 2008, Abella 2008a). Different growth forms provide important habitat for a large number of varying wildlife species (Neff and others 1979, Kruse 1992).

Gambel oak provides high quality wildlife habitat in its various growth forms, and is a desirable component of ponderosa pine forests (Neff and others 1979, Kruse 1992, Bernardos et al. 2004). Gambel oak enhances soils (Klemmedson 1987), wildlife habitat (Kruse 1992, Rosenstock 1998, USDI FWS1995, Bernardos et al. 2004), and understory community composition (Abella and Springer 2008). Large oak trees are particularly valuable since they typically provide more natural cavities and pockets of decay that allow excavation and use by cavity nesters than conifers. In addition to its important ecological role, Gambel oak has high value to humans as it is a popular fuelwood that possesses superior heat-producing qualities compared to other tree species (Wagstaff 1984).

Problem Statement

Although management on public lands with regard to oak has changed to better protect the species, illegal fuelwood cutting of Gambel oak and elk and livestock grazing negatively impact oak growth and regeneration (Harper et al. 1985, Clary and Tiedemann 1992, Rick Miller, 1993, unpublished report) and continues to result in the removal of rare, large diameter oak trees (Bernardos et al. 2004).

A literature review by Abella and Fule (2008) found that Gambel oak densities appear to have increased in many areas with fire exclusion, especially in the small and medium-diameter stems (<8" dbh). Chambers (2002) found that Gambel oak on the Kaibab and Coconino National Forests was distributed in an uneven-aged distribution, dominated by smaller size classes (<5 cm dbh) and few large diameter oak trees. Because of Gambel oak's slow growth rate, there may be little opportunity for these small Gambel oak trees to attain large diameters (>85 cm) (Chambers 2002).

Pine competition with oak has been identified as an issue in slowing oak growth, particularly for older oaks (Onkonburi 1999). Onkonburi (1999) also found that for northern Arizona forests, pine thinning increased oak incremental growth more than oak thinning and prescribed fire. Fule (2005) found that oak diameter growth tended to be greater in areas where pine was thinned relative to burn only treatments and controls. Thinning of competing pine trees may promote large oaks with vigorous crowns and enhanced acorn production (Abella 2008b), and may increase oak seedling establishment (Ffolliott and Gottfried 1991).

Ecological Objectives:

(1) Maintain and restore all growth forms of Gambel oak, focusing on enhancing and maintaining larger, older oak trees.

(2) Restore frequent, low intensity surface fire to ponderosa pine-Gambel oak forests.

(3) Restore and maintain brushy thicket, pole and dispersed clump growth forms of Gambel oak by allowing natural self-thinning, thinning dense clumps, and/or burning.

(4) Protect Gambel oak growth forms from fuel wood cutting, damage during restoration treatments including thinning and post thinning slash burning.

Criteria

In pine-oak, which occurs when ≥10% of the stand basal area consists of Gambel oak >13 cm (5 in) diameter at root collar, large (>16 dbh) post-settlement ponderosa pine trees may be removed to conserve oaks according to these criteria:

In MSO restricted habitat:

(1) Within MSO habitat and designated critical habitat, the Recovery Plan for the Mexican spotted owl should be followed to improve key habitat components and primary biological factors, which includes Gambel oak, or

Outside MSO restricted habitat: where large post-settlement trees' drip lines or roots overlap with those of Gambel oak trees exhibiting drc of >12"; and

(2) Where removing the trees does not conflict with existing recovery/conservation plan objectives for managing sensitive, threatened or endangered species or their habitat.

Within Stand Openings

Suggested Tree Marking Exception Code: "WSO"

Identifiable Circumstance

Within Stand Openings are small openings (generally 0.05 to 1.0 acres) that were occupied by grasses and wildflowers before settlement (Pearson 1942, White 1985, Covington and Sackett 1992, Sanchez-Meador et al. 2009). Pre-settlement openings can be identified by the lack of stumps, stump holes, and other evidence of pre-settlement tree occupancy (Covington et al. 1997). These openings are most pronounced on sites with heavy textured (e.g., silt-clay loam) soils (Covington and Moore 1994). Current openings include fine scaled canopy gaps. It is not necessary that desired within stand openings and groups be located in the same location that they were in before settlement (the site fidelity assumption). Trees might be retained in areas that were openings before settlement, and openings might be established in areas which had previously supported pre-settlement trees. The within stand opening criteria described here are distinct from and should not be considered as guidance relating to regeneration openings. The stakeholder group does not support the cutting of large trees to create regeneration openings.

Problem Statement

Within stand openings appear to have been self-perpetuating before overgrazing and fire exclusion (Pearson 1942, Sanchez-Meador et al. 2009). Fully occupied by the roots of grasses and wildflowers as well as those of neighboring groups of trees, these openings had low water and nutrient availability because of intense root competition (Kaye et al. 1999). Heavy surface fuel loads insured that tree seedlings were killed by frequent surface fires, reinforcing the competitive exclusion of tree seedlings (Fulé et al. 1997). These natural openings appear to have been very important for some species of butterflies, birds, and mammals (Waltz and Covington 2004). Often the largest post-settlement trees, typically a single tree, became established in these natural within a stand opening as soon as herbaceous vegetation was removed by overgrazing (Sanchez-Meador et al. 2009). Contemporary within stand openings or areas dominated by smaller post-settlement trees should be the starting point for restoring more natural within stand heterogeneity.

Ecological Objectives

(1) Conserve and restore openings within stands to provide natural spatial heterogeneity for biological diversity.

(2) Break up fuel continuity to reduce the probability of torching and crowning.

(3) Restore natural heterogeneity within stands.

(4) Promote snow-pack accumulation and retention to benefit groundwater recharge and watershed processes at small scale.

Criteria

Large (>16” dbh) post-settlement ponderosa pine trees may be removed to restore the unique biophysical attributes of within stand openings according to these criteria:

(1) When the presence of such trees would prevent the re-establishment of sufficient within stand openings to emulate natural vegetation patterns based on current stand conditions, pre-settlement evidences, desired future conditions, or other restoration objectives, and

(2) Where desired openings are tentatively identified as ≥0.05 acre (these openings should be established wherever possible by enlarging current within stand openings or where small diameter trees are predominant), and

(3) Where removing the trees does not conflict with existing recovery/conservation plan objectives for managing sensitive, threatened or endangered species or their habitat.

Note: It is not necessary that within stand openings and groups be located in the same location that they were in before settlement. That is, trees might be retained in areas that were openings before settlement, and openings might be established in areas that had previously supported pre-settlement trees.

Heavily Stocked Stands with High Basal Area Generated

By a Preponderance of Large Young Trees

Suggested Tree Marking Exception Code: “LYT”

Identifiable Circumstance

The stakeholder group could not identify with sufficient clarity and agreement the identifiable circumstances under which large removal would take place. We aim to have this completed by early May 2011.

Problem Statement

In stands where pre-settlement evidences, restoration objectives, community protection, or other ecological restoration objectives indicate much lower tree density and BA would be desirable, large post-settlement pines may need to be removed to achieve post-treatment conditions consistent with a desired restoration trajectory. In stands where evidences indicate that higher tree density and BA would have occurred pre-settlement, only a few large pines may need to be removed. Many of these areas would support crown fire, and thus require structural modification to reduce crown fire potential and restore understory vegetation that supports surface fire.

Ecological Objectives

(1) Restore natural heterogeneity of forest, savannah and grasslands at the landscape scale.

(2) Restore natural heterogeneity within stands.

(3) Break up canopy fuel continuity to reduce the probability of torching and crowning and restore herbaceous fuel continuity to carry surface fire.

Criteria

Large (>16” dbh) post-settlement ponderosa pine trees may be removed to meet restoration objectives according to these criteria:

(1) The stakeholder group could not identify with sufficient clarity and agreement the criteria under which large tree removal would take place. We aim to have this completed by early May 2011.

V. Description of Desired Next Steps and Ongoing Collaborative Clarification of OGP&LTRS

Eight of the exception categories listed in this document have been clarified such that they can be operationalized "programmatically", that is, the process of mapping and selecting areas for exceptions is ready to be tested with real data in specific areas. This means that the stakeholder group considers the guidance offered for these exception categories sufficient to operationalize large tree retention/removal per these criteria across the 4FRI area. This process will require the participation of stakeholders and USFS team members to ensure that the suggested process in this document achieves the stated restoration objectives, and is not burdensome in its approach and mechanics.

The "Large Young Tree" exception category listed in this document will require additional collaborative analysis and clarification. Thus far, the group has discussed an opportunity and a need to carry these discussions forward with a combination of additional site visits to representative areas, analysis of USFS stand data, and further exploration of ForestERA remote sensing data that could inform our collective sense of the distribution and extent of areas exhibiting circumstances necessitating large tree removal, and an efficient means of analyzing data and selecting areas for treatment.

Recognizing the importance of finding additional clarity and agreement for these exception categories, the group intends to pursue additional field and data-centered explorations of these exception categories in 2011, working closely with the Forest Service to ensure that additional analysis occurs in a coordinated fashion, and that additional recommendations can be operationalized in a straightforward fashion. Analysis and visitation schedules are intended to be developed by March, 2011, and completed by May 6, 2011.

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Appendix 1 – Reservations

From Scott Harger, Coconino NRCD
From: Scott Harger [mailto:cannonbone@msn.com]
Sent: Friday, March 04, 2011 6:57 PM
To: Windy Greer
Subject: Re: Old Growth Protection and Large Tree Retention Strategy Document for Stakeholders' review

Dear Windy, and LTRS Sub-Group of the LSWG:
I appreciate the accelerated effort to push this document for timely delivery to the USFS.
I like the descriptions captured here for the large tree strategy overview and rationale for the document and the 8-of-9 exception categories whose language appear to be resolved. Except for some very turgid prose in section V that can be edited, I can support this draft as a partial or preliminary version, subject to review of the 9th exception. Otherwise, I can support approval of this final draft without conditions. I would also support it if "Problem Description" were changed to "Management Issue" or "Concerns driving the Exception" or something that doesn't suggest that habitats are problems.

Scott Harger
Range Conservationist
Coconino NRCD
Flagstaff, AZ
928.527.9050

From Scott Hunt, Arizona State Forester
From: Scott Hunt [mailto:ScottHunt@azsf.gov]
Sent: Friday, March 11, 2011 12:00 PM
To: Windy Greer; 'Ethan Aumack'; Ed Smith
Cc: Kevin Boness
Subject: RE: Old Growth Protection and Large Tree Retention Strategy Document for Stakeholders' review

Thank you Ed and Ethan for the dedicated work on this strategy. The State Forestry Division agrees with reservations on this large tree retention policy. The arguments against diameter caps that you provided in the policy capture most of our reservations. We have two additional items we wish to offer for consideration:

-In the category “Seeps and Springs” under criteria: there should be an allowance for removal of large trees a considerable distance from the seep or spring to help invigorate infiltration and flow. Distance will need to be determined by the effective area that benefits the seep or spring.

-We believe a consideration needs to given for stands that may have a healthy understory of regenerated ponderosa pine with an overstory of trees that are heavily infected with dwarf mistletoe. Objectives for this type of stand may encourage and favor the vigorous, healthy understory. Removal of the larger trees that are infected would be required to meet the stand objectives.

We will look forward the opportunity to comment on the Larger Young Tree removal category when it is developed. Thanks again for all your time and effort.

Scott Hunt