Aspen Restoration and Social Agreements

An Introductory Guide for Forest Collaboratives in Central and Eastern Oregon

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Red-naped sapsuckers prefer aspen for nesting, and the cavities that these woodpeckers create are used by many other species of birds and mammals.
Introduction

Quaking aspen (*Populus tremuloides*) is one of the few hardwood trees found outside of riparian areas across central and eastern Oregon. Although aspen makes up less than 1% of total acres in Oregon's eastside forests, it supports a disproportionate amount of wildlife, plants, and insects compared to surrounding coniferous forests. Aspen stands and ecosystems are one of the most biodiverse habitat types in the conifer forest systems of central and eastern Oregon; second only to riparian areas for species richness and diversity. Yet the total acres of aspen ecosystems and habitat have decreased greatly (possibly by as much as 80%) and are at risk of disappearing across some regions (see Section 4: Aspen in Central Oregon and the Blue Mountains). Many forest collaborative groups in the region have voiced an interest in addressing aspen restoration on their public lands of focus or Collaborative Forest Landscape Restoration (CLFR) projects. These groups consist of diverse stakeholders who work together to support forest restoration on public lands for mutual ecological, economic, and social outcomes through consensus-based dialogue and decision making. This often occurs during the management agency’s planning or NEPA process. Although the agency retains final decision-making authority, common ground agreements that collaboratives achieve can assist in identifying socially acceptable restoration treatments, and are intended, in part, to reduce the likelihood of objections and litigation.

In Oregon, some collaboratives have been working on forest restoration in partnership with the Forest Service and Bureau of Land Management for more than a decade. However, nearly half of the groups have originated since 2011 and are relative newcomers working on their first projects. Collaborative groups with a longer history often have built more trust and are able to work on more contentious issues. For newer groups that have recently formed, it can be productive to focus on issues where some agreement already exists or may be easier to obtain. In so doing, they develop relationships and trust that will allow them to work on more challenging issues in the future. Aspen restoration can be a good choice of focus for relatively new collaboratives, since most people like and value aspen. Additionally, many organizations around Oregon have been working on aspen restoration for years and can provide support (see Section 5: Priority for Restoration).

This document highlights the social and ecological importance of aspen, provides some basic information on aspen restoration, and points the reader to in-depth science synthesis papers to
assist with restoration guidelines and developing collaborative input. It may help collaboratives start a conversation and move toward social agreement on why, how, and where to prioritize aspen restoration; and the tools and approaches provided may also be useful for other issues.

How to Use this Document

Social Agreement

Many collaboratives begin by developing social agreement around restoration treatments within a particular project planning area. Social agreements, sometimes called “zones of agreement”, are a way that some collaboratives seek to capture their dialogue and clearly articulate their areas of agreement, often in written form. Many groups draft a written document that clearly delineates the group’s areas of social agreement and where they do not agree at a given point in time. Documenting group agreements in this way ensures clarity among group members as well as between the collaborative group and the agency.

For convenience and simplicity, we use “social agreement” and “zones of agreement” interchangeably in this document. All collaborative groups do not use this terminology, and definitions may differ. In general, “social agreement” refers to a less formal set of agreements that may or may not be clearly documented in writing. In contrast, “zones of agreement” refer to a written document that details the group’s areas of agreement.

Often, groups begin by finding agreement on a project-by-project basis. They build trust as they discuss issues within a particular place. As a group collaborates on more projects, its project-level agreements may begin to have many commonalities. These overlapping common agreements can then be framed around specific issues, such as restoration of specific forest types. The benefit of such an issue-based approach to social agreement is that the science used and agreements may be applied to the relevant issues wherever they appear beyond a particular project’s geographic boundaries, increasing efficiency in future projects, if collaborative stakeholders and the agency are comfortable working at larger scales.

Collaborative groups are each unique, and their pathways to building social agreement and the form that agreement takes will vary widely. Moreover, social agreement is dynamic and may change over time as new science emerges and different stakeholders engaging or disengage from the collaborative process.

Collaborative groups often find it helpful to have a template or example as a starting point and guide for discussion, from which they can begin developing their own place-based considerations. The tools outlined in this document provide a menu of options from which collaboratives can pick and choose as they chart their unique path toward agreement. With this in mind, we have provided a list of reasons why aspen is important (see Section 1: Social and Ecological Framework) as a starting point for discussing your group’s unique values related to aspen. You may choose to
engage your group in discussing aspects of the list with which they do and do not agree. The example zones of agreement document (Section 2) is available for you to use in a similar manner and may assist you in clarifying not only what activities members support/oppose but also why they hold those positions.

**Aspen Science**

Throughout this document, you’ll find some basic scientific and ecological information on aspen. This information can help inform discussions about desired conditions and outcomes of aspen restoration in your area. Specific citations to support the scientific statement are given in parentheses at the end of each sentence with the full citation listed under References at the end of the document. Feel free to use these citations or share them with your Forest Service partners for their environmental analysis (NEPA). Please note that this document is intended as a primer, not a comprehensive synthesis of available science. The science provided here is for conversations among stakeholders and general discussions of aspen ecology and restoration. Stakeholders looking for aspen science to support projects and analysis will need to dig more deeply into the research or management guides. For those who want more aspen science, we recommend three Oregon-specific aspen management guides and their associated citations. They are listed in Appendix A, #1-3 and frequently cited throughout this document.
Stand Alone Sections

This document is divided into five stand-alone sections, each designed to support specific purposes for collaborative groups. To ensure that each can be used separately, there is some redundancy between sections. Here we provide a summary and “how to use” introduction for each section.

Section 1: A Social and Ecological Framework

This section outlines a process for clarifying a collaborative group’s social values. It provides a list of commonly voiced values along with a detailed description and explanation of each value. Collaborative groups may choose to use the list of values in this section as a starting point for discussion about their group’s own, unique list of values. Members may refer to and expand upon this list to clarify their own values.

Section 2: Towards Social Agreement

This section details key components of collaborative processes that build social agreement. Facilitators and key leaders in the group may use this section to enhance and/or add to their current tool kit for building social agreement. It provides guidance for effective preparation for field trips and meetings and offers a Menu of Tools for enhancing discussion and moving toward agreement.

Section 3: Social Agreements for Aspen

This section offers a barebones “straw man” list of possible aspen agreements. Collaborative groups may use this as a starting point for discussion. By adding, removing or clarifying key points, groups can more readily draft their own agreements.

Section 4: Science and Ecology of Quaking Aspen

This section offers an introduction to the ecology of aspen. Many scientific citations are included, and this should provide support for those collaboratives or aspen committees wanting to get further into the science to support their restoration efforts.

Section 5: Example Zones of Agreements for Aspen

This provides a look at aspen zones of agreement with the supporting science and discussion points built into each one. Provided here for committee work or leaders to help with discussion when questions about each zone come up around the science to support it or where to go for further support.
Section 1:
A Social and Ecological Framework
This section outlines a process for clarifying a collaborative group’s social values. It provides a list of commonly voiced values along with a detailed description and explanation of each value. Collaborative groups may choose to use the list of values in this section as a starting point for discussion about their group’s own, unique list of values. Members may refer to and expand upon this list to clarify their own values.

**Why is Aspen Socially and Ecologically Important?**

Below we provide a list that collaborative groups might use as a starting point for discussing why aspen restoration might be prioritized by the diverse stakeholders at their table. Members of a collaborative often embrace different social values. When all stakeholders openly share their social values related to aspen, a list of all participants’ values can be generated. The process of voicing and discussing values can help to find common ground. It also encourages further discussion about the ecological context and can help collaboratives refine their agreements and identify where differences remain (see Section 2: Processes that Support Development of Social Agreement).

Here is a common list of reasons land managers and stakeholder groups work to restore aspen around the Intermountain West. Please note that because ecological processes and biodiversity can be a social value for some stakeholders, we have merged social and ecological values in some conversations. What would your group add, change, or take away?

1. Biodiversity Hotspots
2. Wildlife
   - Woodpeckers and Cavity Nesters
   - Elk and Deer
   - Mammalian and Avian Diversity
   - Mammalian Predators
   - Avian Predators
3. Understory Plants and Vegetation
4. Livestock Grazing
5. Recreation
6. Cultural and Archaeological
1. Biodiversity Hotspots

Within the coniferous forests of central and eastern Oregon, aspen stands are biodiversity hotspots in that they provide a disproportionate amount of habitat for plants and wildlife. The soil in many aspen stands provide increased nutrients and water, driving a diversity of fungi, flowering plants, vegetation types, insects, and small mammals, which in turn drive multiple food webs. These highly productive sites also contain complex overstory. Aspen stands have more bird, mammal, plant, and insect species than any other forest type.
2. Wildlife

Wildlife – Woodpeckers and Cavity Nesters

Aspen are a preferred by many woodpeckers because of the tree’s soft wood and predisposition to heart-rot and other fungi. This makes the trees: (1) easily excavated for nesting cavities, and (2) attractive to diverse insects, the woodpeckers primary food source. As cavity excavators, woodpeckers (primarily the red-naped sapsucker and northern flicker) play a critical role in creating nesting and roosting habitat for other species. The diverse group of birds and small mammals that depend upon the woodpeckers are considered to form a cavity nesting guild or nest web. Many cavity nesters prefer aspen trees, which accounted for more than 90% of nest sites in some northwest studies of nesting birds in conifer forests.

Many species of woodpeckers prefer aspen for nesting and roosting cavities. Many aspen trees can have multiple cavities in them (right; photo: Trent Seager). Those cavities become habitat for secondary cavity nesters such as the tree swallow (upper middle; photo: Ron Larson). Woodpecker species may forage in aspen even when they don’t nest there (downy woodpecker, lower middle; photo: Trent Seager); others, like the pileated (left) are known to roost in aspen during non-breeding season (photo: Ron Larson).
Wildlife – Elk and Deer

Aspen stands provide important habitat for elk and deer during spring, summer, and fall. These wild ungulates use aspen stands for cover, calving/fawning, and foraging. Elk are grazers and browsers, eating grasses and forbs when available and switching to woody plants by late summer. Deer are predominately browsers and require woody plants year-round. Aspen stands can provide a rich understory of grasses, herbs, and forbs in addition to shrub layers. The aspen sprouts are a high protein food source for elk and deer, especially during fall when other woody browse and grasses lose their nutritional quality. At some elevations, aspen stands exist within elk winter range and the sprouts are a preferred browse species. Elk will sometimes eat the bark and cambium of aspen when other food is scarce. Since aspen stands are visited by many wild ungulates, bull elk and buck mule deer will use aspen saplings and trees for antler rubbing and scent marking.

Bull elk and his harem of cows (upper) forage in an aspen stand in early fall. The grasses have lost their nutritional value, but aspen sprouts are high in protein year-round. Note the barking (scaring) where the elk ate the aspen bark and cambium in past years. Mule deer, like the bucks pictured here (lower) are browsers and depend upon shrubs year-round.
**Wildlife – Mammalian and Avian Diversity**

Across Oregon, aspen have both higher diversity and density of bird species when compared to the surrounding coniferous forests. While most cavity nesters depend on large diameter and mature trees, many songbirds and passerines nesting in aspen depend on the understory, shrub, and midstory structure for nest placement and protection. Aspen stands within a conifer forest are considered biodiversity hotspots for small mammals. Many wildlife species use aspen stands for foraging even when they nest or den in other nearby habitats.

Many species of birds and mammals use aspen stands, including the dusky grouse (lower right; photo: Trent Seager), warbling vireo (upper right; photo: Robert Miller © used by permission) and yellow-pine chipmunk (left; photo: Trent Seager). Note the use of: downed aspen logs by birds and mammals, seeds for food, and midstory for nest structure.
Wildlife – Mammalian Predators

Bear claw marks are commonplace on aspen trees across Oregon. Black bears forage on the insects, grasses and flowers, berry producing shrubs, and wildlife prey species found in aspen stands. Bears may also use aspen as ‘nurse trees’ for their cubs when the mother is out foraging. Many other predators, including the bobcat and cougar, are also drawn to the high density of small mammals and prey species concentrated in aspen stands. While most predators don’t den in aspen stands, they frequent them for foraging and scent marking, making them an important part of their home range.

Black bear may use aspen as nurse trees for their cubs (upper right; photo: Jennifer Hall © used with permission). Other predators such as the cougar (lower left) and bobcat (right) also use aspen as part of their home range for pursuing prey species and scent marking.
Wildlife – Avian Predators

The high amount of plants and insects found in aspen stands drives multiple food webs. Not surprisingly, the resulting dense and diverse prey species draw in avian predators. The northern goshawk and Cooper’s hawk (shown below), both use aspen stands to hunt for small birds and mammals. In National Forests across central and eastern Oregon, research found that many goshawk nesting and foraging areas included aspen stands and wet meadows complexes. Nocturnal raptors, like the owls shown below, also frequent aspen stands for foraging during both the breeding and non-breeding seasons.

Fledgling Cooper’s hawk (upper left) hunting from the top of an aspen tree on the Malheur National Forest during fall migration (Photo: Trent Seager). Northern goshawks (upper right) commonly nest near aspen and aspen-meadow complexes in the dry conifer forests (Photo: Robert Miller © used with permission). Great-gray owls (lower left) are found on many National Forests in Oregon and depend on open areas in the forest, such as aspen-meadow complexes. Great-horned owls (lower right) are drawn to the small mammal populations in aspen stands.
3. Understory Plants and Vegetation

Aspen stands can have a wide range of grasses, forbs, and shrubs growing under them. The flowering plants attract pollinators, feed insects, and help create the basis of a food web for many species of birds and mammals. The shrubs are important forage for wild ungulates and provide structure for understory nesting birds. Over 32 plant communities have been identified in aspen stands across Oregon. The deciduous leaves that quake in the wind provide partial shade that is very different from the nearby conifer forests.

Flowering plants are an important part of aspen ecosystems, as they attract pollinators, provide nectar and food, and become the basis of a food web that many birds depend upon (photo: Trent Seager).
4. Livestock Grazing

The increased forage in and around aspen stands is of high value to grazing cattle, sheep, and other livestock. In the late 1800s, Irish and Basque shepherders in central and eastern Oregon found prime grazing lands among the large aspen stands rich with grasses, forbs, and shrubs. Currently, available forage on Forest Service land has decreased from historical levels due to ecological changes, largely driven by fire suppression.

Increased forage found in and around aspen stands is attractive to livestock, including the cattle pictured here. While cattle can eat aspen sprouts, they prefer the grasses and other forage. In the lower picture, note the aspen sprouts that are escaping herbivory height (8') and becoming small trees even though they are part of a grazing allotment on the Malheur National Forest (photo: Trent Seager).
5. Recreation

People are drawn to aspen for many reasons, including the fall color, the open understory for camping, and the nearby streams and open spaces for fishing and hunting. Birders spend hours in aspen stands looking for the diversity of birds using small cavities and holes in the trees. Aspen are popular in both developed and nondeveloped campsites, and draw visitors into the mountain sides during fall when leaf color and change is at its peak.

Aspen are commonly associated with springs, adding to the value of recreation. Shown here, Eric White at a springs that ties into an aspen meadow complex and is part of a trail system on National Forest land (photo: Emily Jane Davis)
6. Cultural and Archaeological

Oregon’s aspen have a rich history of use by people, in some cases the history is carved into the bark. Indians and early American settlers used aspen bark and buds for medicinal purposes. Irish and Basque sheepherder’s left arborglyphs (carvings in bark) on aspen trees that can still be seen today. Most of these can be dated to the 1920s and 1930s, but some arborglyphs in the Blue Mountains date back more than 125 years. American settlers sometimes chose aspen stands as homestead sites, as shown by log cabin remnants and other archaeological signs.

Old homestead cabins can be found within or close to aspen stands. While the cabin picture here (lower) may have been originally placed around larger aspen trees, new trees have grown across time and continue to surround it. Arborglyphs (carvings in bark), such as the one shown here from an aspen tree on the Malheur National Forest (upper), can be found in aspen stands around central and eastern Oregon (photo: Trent Seager).
Section 2: Towards Social Agreement
This section details key components of collaborative processes that build social agreement. Facilitators and key leaders in the group may use this section to enhance and/or add to their current tool kit for building social agreement. It provides guidance for effective preparation for field trips and meetings and offers a Menu of Tools for enhancing discussion and moving toward agreement.

Processes that Support Development of Social Agreement

Collaborative agreements emerge through dialogue that integrates scientific information and social values. The dialogue occurs in a variety of settings, including field trips, meetings, and workshops. Dialogue culminates in a group decision-making process that clearly outlines, verbally and then in writing, areas of group agreement. While the processes groups use to develop agreement may vary, they typically involve the following key components (not necessarily in this order):

- Build and maintain trust: honoring relationships by interacting with honesty, transparency and respect
- Share values: identifying the existing range of social values and interests
- Get the picture: building shared understanding of the context of aspen in the area and management implications using locally appropriate data and science
- Seek agreement: documenting group agreements and what falls outside them
- Share widely: working across collaboratives to share ideas, best practices and zones of agreement
- Learn and adapt: monitor, learn, and revisit agreements as needed
Through all these processes, it is important to use collaborative approaches that honor ground rules such as respectfully listening to others’ points of views, engaging with honesty and transparency, and embracing a solution-oriented approach. This creates a safe environment in which collaborative members can openly disagree and share ideas and perspectives. Skilled facilitation can help protect the integrity of the collaborative process.

**Build and Maintain Trust**

Collaboration relies on mutually respectful, trust-based relationships among group members and between the group and the agency. It is good practice to adopt and uphold ground rules that outline practices that support honesty, transparency and respect among members as well as between members and the agency. Documents that clearly spell-out a collaborative’s mission, values, membership criteria, and decision-making and dispute resolution processes provide additional clarity, reducing the likelihood that trust will be damaged through misunderstandings or a lack of procedural ambiguity. Competent, neutral facilitation builds trust by equitably integrating all views and values into a conversation. Informal social events that allow members to “rub elbows” outside of collaborative conversations go a long way toward building relationships and allowing members to see each other as people rather than as positions.

**Share Values**

It is important to openly explore the range of values and concerns about aspen in the group. To keep track of the values and concerns, good note taking should be employed and information may be synthesized from past field trip and meeting notes, or from the comments that surface in public scoping documents. In addition, a collaborative may wish to gauge their agency partners’ values around aspen, and willingness and ability to use any collaborative input and zones of agreement on aspen before embarking.

During these conversations, it is important to understand not only what an individual supports or opposes (their position), but also why she holds that particular view (underlying reason and interest). For example, if a stakeholder shares a position that no conifers >21”dbh should be cut, you can explore why, and their desired outcome. In this case, it may be retention of large diameter or old growth conifers because old growth conifers increase biodiversity, help with natural processes on the landscape, and were historically present to a larger extent before fire suppression.

Identifying the reasons behind positions clarifies what information and available science to bring into next steps. In the example provided, scientific information about >21” dbh conifers in relation to biodiversity and natural processes on the landscape would be helpful, as would available agency data about numbers of >21” dbh conifers historically present within that particular landscape.

Incorporating available science can help place stakeholder values in the context of scientific understanding. Treating science as a tool to persuade stakeholders to change their values or views may undermine social learning processes and trust. To be effective, collaborative conversations should instead focus on mutual understanding and respect for each other’s values.
Get the Picture

**Build shared understanding of context and available science**

Stakeholders are likely to want a picture of the current situation of aspen on the landscape. Some common questions that stakeholders might have could include:

- How much aspen do we have on this Forest/district? Is that a lot or a little?
- Where is it distributed?
- How has it been managed in the past?
- What condition is it in?
- What challenges its health?
- How has this changed over time/from historic range of variability?

To address these questions, the following resources are recommended:

- Information about current conditions: *Map of known aspen stands in the project area, district, etc.*
- Information about past and current management activities: *Past management history, relevant allotment information, ungulate population data, species of concern in the area, etc.*
- The appropriate agency specialists: *Depending on the conversation, this may include silviculturists, wildlife biologists, range conservationists, hydrologists, etc.*
- Relevant science: *Research that informs the underlying concerns of stakeholders.*
- Neutral and/or trusted scientists or resource specialists: *These scientists/specialists can assist the group in working through conflicting science and other information, identifying what is most applicable on a particular landscape, and which findings have been successfully replicated or held across time.*

**Integrating science and values**

During and after the available data have been shared, stakeholders should have opportunities to link what they have learned to their values. These forums are most productive when participants agree to not take positions and instead share their desired outcome, underlying reasons and values, and how these relate to what they have learned. It may be helpful to ask stakeholders to share what they have learned that relates to each other’s values, rather than solely sharing what they want to see and the “evidence” that they now feel backs up their interests. For example, Stakeholder A might be asked to recount what he values and want to see happen, and Stakeholder B might be asked to then describe anything that she heard and learned that would help inform Stakeholder A’s interests and meet their goals. Having neutral scientific advisors/specialists present, as well as skilled facilitation, may help keep this dialogue from turning into a “science duel” and/or straying far from the data that were actually shared and the group’s goals.
Aspen Crosswalk Tables – Examples of How to Work with Science and Differing Values

Discussion Points: Integrating Science and Social Values

This discussion explores the balance between two important values: the value for enhancing aspen habitat by removing competition (conifers) and the value of providing diverse habitat for wildlife by retaining conifers within and around aspen stands. Both are ecologically important and science informs both. Rather than becoming a tug of war, collaborative discussion can identify what the group agrees is an appropriately balanced approach.

- What is the primary management objective at this site?
- Are there specific wildlife habitat needs at issue?
- How does placing this site in the context of the larger landscape inform our thinking?
- How many acres do the aspen cover, and what percentage is that of the total project area?
- Can we have an open discussion of economics related to conifer removal and value to industry?
- Define the sideboards:
  - How many conifers can we remove while still improving aspen? (e.g., at what point does removing the last conifers no longer improve aspen?)
  - How many conifers can we leave? (e.g., at what point does leaving as many conifers as possible start to inhibit stand recovery or persistence?)

Example 1: Conifer Removal

<table>
<thead>
<tr>
<th>Position</th>
<th>Value</th>
<th>Discussion Questions</th>
</tr>
</thead>
</table>
| No removal of conifers >21” dbh from within aspen stands. | **Wildlife habitat and diversity:**  
  - The presence of conifers within the aspen stand enhances habitat diversity and benefits wildlife. | • What is the primary management objective at this site?  
  • Are there specific wildlife habitat needs at issue on this site?  
  • How does placing this site in the context of the larger landscape inform our thinking?  
  • What are the sideboards: (a) How many conifers can we remove while still improving aspen? (e.g., at what point does removing the last conifers no longer improve aspen?); and (b) how many conifers can we leave? (e.g., at what point does leaving as many conifers as possible start to inhibit stand recovery or persistence?)  
  • Can we have an open discussion of economics related to conifer removal and value to industry? |
| Concern about role of economics in the decision to remove conifer. | **Priority habitat:**  
  - Aspen stands are a priority for restoration, as they are biodiversity hotspots and provide critical habitat to elk, deer, and other wildlife.  
  - Aspen need moisture, and competition by conifers will impede their longevity. | |
| Remove all conifers from within aspen stands and thin around the stand. | | |
Discussion Points: Integrating Science and Social Values

This discussion examines the compatibility of diverse values on the landscape within an economic and ecological context. The economics related not only to the value of forage within aspen to cattle ranchers, but also to the cost of fencing and fence maintenance compared to the long-term benefit to aspen stands. Fencing costs raise the issue that not all stands can be fenced, so prioritizing stands for fencing often becomes an important issue. Key questions include:

- What time of year and for how long are cattle in this allotment?
- How is this site related to water-use by cattle within this allotment?
- What are the elk and deer populations and usage in this area (summer/migration/winter range)?
- What is the availability of funds and other resources for fencing and fence maintenance?
- What alternatives to fencing might have similar benefits without the associated costs?
- Would parties be interested in middle ground that meets most of everyone’s needs? Fencing short-term to release sprouts into trees (5-10 years) followed by removal of fencing. This could allow new recruitment of overstory trees and then allow wildlife and livestock access (and intermediate disturbance) to meet both sets of needs.

Example 2: Fencing around Aspen Stands

<table>
<thead>
<tr>
<th>Position and Rationale</th>
<th>Values</th>
<th>Discussion Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspen stands should be fenced.</td>
<td>Habitat Complexity:</td>
<td>What time of year and for how long are cattle in this allotment?</td>
</tr>
<tr>
<td>Rationale: Fencing prevents ungulate browsing and livestock grazing and ensures sprouts survive to create a multi-age stand</td>
<td>• Aspen stands that have a complex overstory, midstory, and understory are more productive and support more wildlife and food webs.</td>
<td>How is this site related to water-use by cattle within this allotment?</td>
</tr>
<tr>
<td>Aspen stands should not be fenced.</td>
<td>Economic Value:</td>
<td>What is the availability of funds and other resources for fencing and fence maintenance?</td>
</tr>
<tr>
<td>Rationale: Fencing is expensive and difficult to maintain. Fencing is not always effective. Fencing creates problems for ranchers and hunters. Wild ungulate and cattle grazing creates short-term disturbances that enhance plant diversity in the long run.</td>
<td>• Browse surrounding aspen stands is of economic value to livestock.</td>
<td>What alternatives to fencing might have similar benefits without the associated costs?</td>
</tr>
<tr>
<td></td>
<td>Plant Diversity:</td>
<td>Would fencing short-term to release sprouts into trees (5-10 years) followed by removal of fencing meet both sets of needs?</td>
</tr>
<tr>
<td></td>
<td>• Disturbance caused by browse leads to increased diversity.</td>
<td></td>
</tr>
</tbody>
</table>
Seek Agreement

At some point, groups will want to try to capture their dialogue and areas of agreement. An expedient place to start may be review of notes from previous meetings/field trips/workshops and documentation of existing group agreements. Grouping these notes together on a group website or share drive with past resources and presentations or compiling them into a pdf can facilitate easier access and use for stakeholders.

From these notes, a draft written agreement could be developed. One possible approach is to seek group approval for this, obtain their input on desired format, and form a subcommittee of diverse members to collectively draft the document and bring it back for full group discussion. Documentation can take many forms and examples are available upon request from individual collaborative groups. For instance, a group might prepare desired outcomes and management approaches for a specific project area, or it might articulate broader restoration principles for a specific plant association group and the conditions under which these principles could be applied.

In finalizing the agreement document, you will want to ensure that you follow your collaborative processes and decision making principles, clearly capture the agreements and lack thereof in the meeting notes, and have clear shared understanding of when a decision has been made. Ensure the document is finalized with all necessary revisions and made widely available to the group and agency partners.
Share Widely

Although each collaborative group works within a specific geography, many issues have regional salience. Rather than reinventing the wheel, it behooves each group to learn from their surrounding colleagues and peers. Cross-collaborative learning may be as informal as an exchange of emails and phone calls, requesting information and/or documents on specific topics. Additional avenues include attending other collaboratives’ meetings, field trips and workshops; presenting at regional events; and engaging in networking opportunities. It can be particularly beneficial to share Zones of Agreement and discuss the processes used that were used to develop them. Ensure that you understand the specifics of others’ agreements: e.g., where they do and do not apply, how they were achieved, etc.

Learn and Adapt

It is expected that agreements may change due to emerging science, changes in group composition and trust, location-specific issues in new planning areas, shifts in agency policy or approaches, and/or new monitoring data. Early agreements can serve as foundational building blocks, which can be modified to reflect new interests and understandings. It is important, however, to strike a balance between keeping agreements dynamic and not dismantling them so entirely or frequently that the process of developing agreement becomes less worthwhile to stakeholders. We recommend building a deliberate process for revisiting past agreements and undertaking social learning into collaborative monitoring programs.
Menu of Tools

Field trips to past aspen treatments:
- Review the existing and desired conditions
- Review treatment history
- Observe the current conditions
- Assess level of satisfaction with on-the-ground outcomes
- Identify key points of dis/agreement and lessons learned

Field trips to aspen stands in project planning areas
- Observe existing conditions
- Discuss desired conditions
- Discuss possible treatment options
- Identify the range of social values
- Identify key points of dis/agreement

Invite aspen researchers on field trips
- Inform the above discussion with additional scientific data and expertise
- Expand or clarify agreements where possible

Draft a straw-man list of group agreements for group discussion
- Use field trip and meeting notes to synthesize a draft list of agreements
- Discuss and refine by committee
- Bring to full group for discussion and clarification
- Refine accordingly

Host or attend science-based workshop
- Identify key points where additional science input may provide clarity
- Invite experts to present research or data to illuminate these issues
- Create a forum for discussion and expand or clarify agreements where possible

Written document formalizing areas of agreement
- Document the group’s existing areas of agreement in writing
Section 3:
Social Agreements for Aspen
This section provides an example zones of agreement (ZOA) document for aspen that can be used as a “straw-man” by a collaborative groups as they explore their own areas of agreement, as described earlier in this document (see Introduction: How to Use this Document). You may choose to engage your group in discussing which aspects of this template they agree with and which they don’t.

**Example Zones of Agreement**

1. **Priority Habitat**
   Aspen stands are a priority for restoration, as they are biodiversity hotspots and provide critical habitat to wildlife. Aspen supports more birds, plants, and wildlife diversity than any of Oregon’s eastside conifer forests.

2. **Habitat Complexity**
   Aspen stands that have a complex overstory, midstory, and understory are more productive and support more wildlife and food webs. Stands that are missing one or more of those story components should be prioritized for restoration.

3. **Habitat Transition**
   The area around the aspen stand should be treated to provide shrubs, aspen sprouts, and open habitat that is important for wildlife, livestock, and aspen persistence.

4. **Conifer Encroachment and Retention**
   Conifers that encroach the stand can outcompete the aspen trees and sprouts, so should be removed. Leaving some conifers can increase wildlife habitat and diversity.

5. **Over Browsing and Grazing**
   Chronic browsing or grazing from wild ungulates and livestock can suppress aspen sprouts and remove the mid story and future overstory. When needed, fencing, deterrents, and alternate grazing patterns should be used.

6. **Mapping and Placement on the Landscape**
   Aspen stands in project areas should be mapped so restoration can be prioritized, spatially analyzed for connectivity, and condition of a stand can be put into context of status of nearby stands (which ones are persisting versus which ones are decadent).
7. **Aspen Expansion**

Oregon has lost up to 80% of its aspen cover. Most stands have been diminished in size and many have been lost all together. Expansion of aspen stands should be the priority and approach rather than preserving existing trees and acreage.

8. **Resistance and Resilience**

Aspen are more resistant to drought and stressors and more resilient to fire and disturbance when they are restored to multi-storied stands with open areas around them.

9. **Genetic Diversity and Seeds**

Current aspen stands expand through cloning and root sprouting, limiting diversity. Aspen seeds can provide new genetics on the landscape if seedlings can persist.
Section 4: Science and Ecology of Quaking Aspen
This section offers an introduction to the ecology of quaking aspen. Many scientific citations are included, and this section should provide support for those committees wanting to get further into the science of aspen to support their restoration efforts.

Ecology of Aspen

Quaking aspen is the most widespread hardwood tree species in North America, and of particular importance to land managers in the Intermountain West (Sheperd et al. 2001). In central and eastern Oregon, aspen is one of the only hardwood tree species that is found outside of riparian areas. Aspen is shade intolerant, primarily reproduces through clonal root sprouting (suckering), and is moisture demanding even as it grows across dry and moist forested landscapes. This makes aspen susceptible to drought where individual trees or entire stands might be lost (Hogg et al. 2008, Worrall et al. 2010). Aspen evolved on fire-prone landscapes and is fire adapted. Fire removes competing conifer trees, kills mature aspen stems, stimulates root-sprouting, and increases moisture and forage at the landscape level which disperses herbivores (Seager et al. 2013b, Shinneman et al. 2013). Additionally fire creates bare mineral soil that is needed for aspen seed to successfully germinate.

In the drylands and forests of the Intermountain West, aspen provide a disproportionate amount of habitat for wildlife (DeByle 1985, White et al. 1998). Aspen and the associated plant communities (aspen ecosystems) support diverse biota across multiple food webs. These ecosystems are biodiversity hotspots for small mammals (Oaten and Larsen 2009), songbirds, and primary and secondary cavity nesters (Martin et al. 2004). The rich understory provides increase forage for livestock and wild ungulates, with aspen sprouts being preferred browse species for elk and deer during fall and winter. Chronic and excessive browsing of sprouts can suppress recruitment of aspen into overstory trees, leading to stand decline and eventual loss (Swanson et al. 2010, Seager et al. 2013b).

Aspen can reproduce vegetatively, where buds form on the roots and sprout, forming clonal suckers (or aspen sprouts) that are genetically identical to the parent tree. These aspen sprouts can appear as far out as the parental root system reaches. The aspen sprouts are connected to the parental root system, allowing them to grow quickly. While originally thought to be rare, research now shows that aspen trees produce seed regularly. Both the pollen and the seed can travel long distances on wind, allowing aspen seedlings to establish multiple miles from any source (Long and Mock 2011). Unless genetic testing is done, nearby aspen stands cannot be assumed to be identical clones or related. A study on the Umatilla National Forest in the Blue Mountains found that while most stands were a single clone, others were made up of multiple clones (Shirley and Ericson 2001).
Drivers and Suppressors of Aspen Regeneration and Growth

Aspen sprouting (root suckering) can be initiated by many complex interactions with the environment and the parent tree. Different drivers may be occurring in different stands depending on the limiting factors.

A review of Oregon aspen studies found the most successful driver of aspen in Oregon has been (1) removal of competing conifers and (2) release from herbivory (Seager et al. 2013a, Table 1.0). While the science gives support and specific details for restoration, most land managers have been practicing this 1-2 approach for decades (Shirley and Ericson 2001, Strong et al. 2010, Swanson et al. 2010). Since conifer removal represents a release of moisture, light, and nutrients all at one time, it is challenging to know which one had the greatest effect. Additionally, it is important to remember that aspen growth and survival may be driven by genetics (Lindroth and St. Clair 2013). Here we provide a list of drivers and suppressors of aspen along with a brief explanation and scientific context.

**Moisture** – the deep soils in some aspen stands can hold snowmelt moisture into the summer months. This allows increased sprouting and overstory growth. By contrast, drier parts of the stand or stands with more shallow soils will face moisture limitation, which can be exacerbated when competing with encroaching conifers. Aspen need moisture late into the growing season (August), and can be limited in growth and sprouting. Release of moisture by encroaching conifers has been shown to increase aspen sprout density and persistence of overstory (Shirley and Ericson 2001, Jones et al. 2005, Swanson et al. 2010, Seager et al. 2013a). Normal and high precipitation years are not as much of a concern as periodic or multi-year droughts. Restoration planning should include aspen moisture needs during dry years.
Light – aspen are shade intolerant. Conifer shading decreases sprout density, sprout survival, and can kill mature aspen by overtopping them (Jones et al. 2005, Seager 2010). An increase in light through conifer removal can stimulate suckering and reinvigorate aspen overstory (Jones et al. 2005). Light is more of a limiting factor in dense dry mixed conifer and cool moist conifer forest types, whereas moisture is the limiting factor in hot dry and warm dry forests.

Chronic Herbivory – high densities of aspen suckering can tolerate browsing pressure from livestock and wild ungulates (Swanson et al. 2010). However, chronic herbivory (high levels across multiple years) suppresses aspen sprouts, increases disease and stress, and may remove the midstory and future overstory cohorts of aspen trees. Release from herbivory through fencing, jackstraw, alternate grazing patterns, removal of livestock, or other herbivory deterrents can effectively release aspen sprouts even after years of suppression (Seager et al. 2013a). Research shows that different herbivory deterrents may be effective on different landscapes, giving managers multiple options to choose from, including fencing, jackstraw, alternate grazing patterns, removal of livestock, deer and elk herd management, among others (Seager et al. 2013b).

Disturbance – moderate soil disturbance from conifer removal and logging activity can stimulate higher levels of aspen root sprouting. Natural disturbances such as late frost, leaf defoliators, or other impacts on aspen overstory can also stimulate high-density root sprouting. The complete removal of the aspen overstory, known as clear-fell coppicing, releases all lateral roots to sprout (Shepperd 2001) including in stands that have already faced severe drought and dieback (Shepperd et al. 2015). Fire, even low severity, causes the greatest density of root sprouting (Shinneman et al. 2013). Restoration of Oregon’s eastside forests may include multiple disturbance activities (Franklin et al. 2013). Increased aspen sprout density can attract more herbivores. A northeast Oregon study found that removal of conifers, fire, or soil disturbance activities may need to be followed by fencing or other deterrents to assure sufficient aspen recruitment (Endress et al. 2012).

Temperature – new research shows that temperature doesn’t play as important a role in increasing sprout density as was previously thought (Frey et al. 2003). However, temperature does play a key role in helping aspen sprouts grow to gain height. Stands with warmer temperature (access to sunlight through decreased conifer overstory) have sprouts that grow sooner and grow taller during the season (Frey et al. 2003). Conifer shading decreases sprout density, sprout growth, and soil temperatures (Wall et al. 2001).

Aspen in the Oregon East Cascades and Blue Mountains

Although widespread across central and eastern Oregon, aspen accounts for less than 1% of all forested lands, though may be up to 5% of forested areas within specific projects (Swanson et al. 2010). These small aspen stands in Oregon are quite different from the aspen stands found in the Rocky Mountain Region, where they can grow as extensive parklands and montane forests.

In the Rockies, aspen can grow as large forests on mountainsides, fed by annual snowpack and summer rain. In that environment, aspen can compete against conifers in establishing as forest
Colorado Aspen Forest

Aspen forest covering the hillside on Grand Mesa, Colorado. Note: (1) the dead patches of aspen from drought show how densely the stands are stocked; and (2) the conifer trees make up less than 10% of the aspen forest and are in the high moisture drainage. Photo: Trent Seager.

Oregon Aspen Stand

Aspen stand (small patch) after treatment of conifer removal on the Deschutes National Forest (Crescent Ranger District). Note: (1) even with the stand expanding, it is still less than one-quarter of an acre; and (2) the aspen are growing in the swale, where the soil is deeper and has more moisture. This is typical of aspen in Oregon, and very different from the Colorado photo above. Photo: Trent Seager.
types, and do so as seral stands regenerating after stand replacing fire events and stable stands that persist without disturbance (Rogers et al. 2013).

In Oregon, aspen primarily grow in small patches near seeps and water sources, usually with deep soil. These stands sprout annually even without fire, yet remain as small patches and not forest-types (see comparison photos above). Due to this difference, forest collaborative groups, the Forest Service and other partners in Oregon should use caution when applying silviculture prescriptions or research findings from other Intermountain Regions (e.g., the Rocky Mountains) if their findings are tied to biophysical settings different from those found on the eastside of Oregon (see Seager et al. 2013a).

Small, Discrete Stands

Throughout the forests of central Oregon and the Blue Mountains, aspen primarily occur as small (<1 acre), discrete stands associated with meadows or within a conifer forest matrix. Aspen in Oregon can occasionally exist as large, pure stands such as those found on Steens Mountain, as widespread mixed stands such as those found in Baker County, or as extensive stands connected through large meadow systems as those found in the Klamath Basin (Seager 2010, Swanson et al. 2010, Seager et al. 2013a). These are the exception in Oregon, and most National Forests are managing small, isolated aspen stands.

It is important to note that on the Malheur, Umatilla, Wallowa-Whitman, and Deschutes National Forests only 1-5% of all aspen stands are >10 acres, and they contain low aspen basal area (Seager 2010, Swanson et al. 2010).

Historical Conditions

It is difficult to document the historical condition of aspen on the landscape because it is such a short-lived tree species (<150 years). Additionally, most of central and eastern Oregon has a history of fire suppression (Agee 1993, Franklin et al. 2013) and wild ungulate irruptions (exponential growth in population) during the first half of the twentieth century (Leopold et al. 1947, Salwasser 1979, Peek et al. 2001, Seager et al. 2013b), which altered aspen regeneration and recruitment. Historical photos that identify placement and extent should help guide landscape level restoration. With on-going changes in precipitation and summer temperatures (global climate change), the focus should be on desired conditions and resiliency rather than restoring to historical or current conditions.

Local Forest Service offices may have maps and information on aspen stand locations, extent, size, and condition across the decades. Additionally, Forest Service technical reports and papers may contain information to help collaborative groups better understand aspen stand conditions from 20-30 years ago (Kovalchik 1987).

Current Condition and Need: Extensive Loss in Oregon

Multiple studies on aspen across diverse forest types in Oregon have found that aspen have declined in extent (overall acreage) and spatially (locations) across diverse landscapes (Wall et al. 2001, Shirley and Erickson 2001, Bates et al. 2006, Swanson et al. 2010, Seager 2010, Seager
et al. 2013a). Research from the Rocky Mountain region shows that aspen loss can vary greatly spatially and temporally, with some landscapes showing an increase or stable amounts of aspen cover while others show greater loss (Kulakowski et al. 2013). The loss of aspen in the west has varying estimates, with Oregon’s loss being estimated to be 50-80% in some areas (Seager 2010, Swanson et al. 2010, Seager et al. 2013a), with recent loss of 25% of aspen cover that was present in the 1940s (Di Orio et al. 2005) and 95% of remaining stands showing encroachment by conifers (Sankey 2009). Restoration of aspen in Oregon that began twenty years ago noted that loss was occurring at a rapid rate (Shirley and Erickson 2001). Future predictions show loss of Oregon’s current aspen cover by more than 90% by 2030 (Rehfeldt et al. 2009). Land managers and scientists are in agreement that loss of aspen in Oregon’s eastside has been significant, and its restoration should be prioritized (Swanson et al. 2010, Franklin et al. 2013, Seager et al. 2013a).

**Aspen in Landscape-level Disturbance**

When landscape level disturbance (fire, logging, understory thinning) occurs in a dry forest ecosystem that is out of its historical range of variability, there can be an increase in natural processes that include: water retention, nutrient release and cycling, and biomass production (Agee 2003, Keane et al. 2009). This larger scale forest or landscape-level disturbance can help aspen by:

- dispersing livestock and wild ungulates through increased forage
- releasing more moisture during spring snowmelt to be captured in the deep soils of the aspen stands
- decreasing conifer competition for light, moisture, and soil resources in and around aspen stands (Smith et al. 2011)

If restoration efforts for Oregon’s eastside forest are to help restore different dry forest ecosystems (e.g., dry pine, dry mixed conifer, moist mixed conifer) to a more resilience state of structure, patterns, and disturbance regimes (Franklin et al. 2013), land managers and associated collaborative groups should consider the role those efforts can play in helping restore aspen to a more resilient state especially at a landscape scale (Seager et al. 2013a).
Section 5: Example Zones of Agreement for Aspen with Science and Supporting Documentation
This provides a look at aspen zones of agreement with the supporting science and discussion points built into each one. Provided here for committee work or leaders to help with discussion when questions about each zone come up around the science to support it or where to go for further support.

Example ZOA with Science and Supporting Documentation

1. Priority Habitat

Social Statement and Agreement

Aspen stands are a priority for restoration, as they are biodiversity hotspots and provide critical habitat to wildlife. Aspen supports more birds, plants, and wildlife diversity than any of the conifer forest types in central and eastern Oregon.

Science Background

Priority for Restoration:
Aspen restoration has been a priority for National Forests across central Oregon and the Blue Mountains for many years (Shirley and Ericson 2001, Strong et al. 2010, Swanson et al. 2010, Seager 2010). Increasing, restoring, or integrating aspen and hardwood restoration was included in the Forest Plans of the Deschutes, Ochocho, Malheur, Umatilla, and Wallowa-Whitman National Forests (USDA Forest Service 1989, 1990a, 1990b, 1990c, 1990d). Additionally, the Rocky Mountain Elk Foundation, Blue Mountains Elk Initiative, and Oregon Hunters Association have all prioritized aspen as an important habitat to restore within forest restoration and separately when it may not be reached in time through larger forest projects (see organizational websites). On a larger scale, the effort to prioritize aspen restoration is highlighted in many Blue Mountain and Eastside Restoration strategies (Franklin et al. 2013, USDA Forest Service 2010, USDA Forest Service 2013, Stine et al. 2014).
Biodiversity Hotspots and Critical Wildlife Habitat:
Aspen stands provide critical wildlife habitat (DeByle 1985), are biodiversity hotspots for small mammals (Oaten and Larsen 2009), host diverse amounts of nesting and foraging birds (Flack 1976, Martin and Eadie 1999, Martin et al. 2004). In Oregon, aspen supports more wildlife diversity than surrounding forest types (Dobkin et al. 1995, Strong et al. 2010, Swanson et al. 2010, Seager et al. 2013a).

Key Points of Discussion

• Prioritize aspen depending on current amount within Ponderosa Pine, Dry Mixed Conifer, and Moist Mixed Conifer
• Desired Conditions
• Tools to use to reach desired conditions

For Further Information

• Aspen Biology, Community Classification, and Management in the Blue Mountains (Swanson et al. 2010)
• Land Manager’s Guide to Aspen Management in Oregon (Strong et al. 2010)
• Aspen Restoration Strategy for the Fremont-Winema National Forest (Seager et al. 2013)

The aspen shown here have retreated to a wet meadow to escape pressure from competing conifers. In the absence of fire, logging and girdling can help restore these aspen-meadow complexes by opening up the overstory and releasing moisture and light. Aspen stands like this one in central Oregon, that are persisting but are limited in size, should be prioritized for restoration and expansion (photo: Trent Seager).
2. Habitat Complexity

*Social Statement and Agreement*

Aspen stands that have a complex overstory, midstory, and understory are more productive and support more wildlife and food webs. Stands that are missing one or more of those story components should be prioritized for restoration.

*Science Background*

Structurally complex aspen stands provide more habitat for more diverse wildlife species (Rogers et al. 2014, Shepperd et al. 2006). An aspen restoration strategy in Oregon outlined the different sizes of stands (acres), trees sizes (dbh), and understory, midstory, and overstory structure that specific species of birds and mammals require (see Seager et al. 2013a). While aspen stands can persist for decades without an understory or midstory structure, they are not providing complex habitat for many wildlife species and are at-risk of being lost when the overstory becomes decadent (Strong et al. 2010, Swanson et al. 2010).
Key Points of Discussion:

• Do the aspen stands provide the right habitat (understory, midstory, overstory) for the wildlife species that are prioritized?

For Further Information

• Size of Stands and Trees for Specific Avian and Mammal Use of Aspen Ecosystems (Seager et al. 2013)
3. Habitat Transition

Social Statement and Agreement

The area around the aspen stand should be treated to provide shrubs, aspen sprouts, and open habitat that is important for wildlife, livestock, and aspen persistence.

Science Background

The greatest area of aspen sprouts and shrubs is the area around the aspen stand, sometimes called the aspen sprouting zone or regeneration periphery (Keyser et al. 2005, Seager 2010). Elk, deer, and other wildlife species depend on open areas or connectivity of open spaces for migration and movement across a landscape. Aspen stands and aspen-meadow complexes were more extensive and played a critical habitat role historically. Open space around the aspen stand allows it to expand, be more resilient, and to provide habitat for species that depend upon it (Shepperd et al. 2006, Swanson et al. 2010, Seager et al. 2013a).

The area between aspen stands and the surrounding conifer forest can be important wildlife habitat. These open areas fill with shrubs, grasses, aspen sprouts, and become connectivity. In this recent restoration effort on the Fremont-Winema National Forest, understory plant response is already occurring out into the transition zone. Note that the old growth ponderosa pine were retained for ecological and social reasons (photo: Emily Jane Davis).
Key Points of Discussion

- Different forest types associated with aspen have different transition habitats
- Some landscapes need meadows and open areas restored in addition to aspen, and transition habitat can help with that

For Further Information

- Aspen Biology, Community Classification, and Management in the Blue Mountains (Swanson et al. 2010)
- Ecology, Biodiversity, Management, and Restoration of Aspen in the Sierra Nevada (Shepperd et al. 2006)
- Trembling aspen response to a mixed-severity wildfire in the Black Hills, South Dakota, USA (Keyser et al. 2005)
4. Conifer Encroachment and Retention

Social Statement and Agreement

Conifers that encroach the stand can outcompete the aspen trees and sprouts, so should be removed. Leaving some conifers can increase wildlife habitat and diversity.

Science Background

In the absence of fire and other disturbances, conifer encroachment had greatly impacted aspen stands across Oregon (Wall et al. 2001, Bates et al. 2006, Seager 2010, Strong et al. 2010, Swanson et al. 2010). Retention of some conifers may increase avian diversity (Griffis-Kyle and Beier 2003, Seager et al. 2013a). Old growth ponderosa (>150 years) was shown to have little impact on aspen recruitment, as were openly spaced conifers (Seager 2010). Conifers showing old growth characteristics (Franklin et al. 2013) and potentially replacement old growth conifers should be retained in and around the aspen stands, as long as their density doesn't impact aspen persistence and expansion (Seager 2010, Seager et al. 2013a).

Conifer removal with retention of older pine (and replacement pine) showing release of moisture, light, and soil resources for this aspen in central Oregon. The open area around the stand provides a sprouting zone and transition habitat (shrub and open space) between the aspen and conifers (photo: Trent Seager).
Key Points of Discussion

- What conifer association type is around the aspen, and which conifers are old growth and fire resistant?
- After removal of conifer < 150 years, what density is left?
- What wildlife species are being managed for that use conifers within aspen?

For Further Information

- Restoration of dry forests in eastern Oregon (Franklin et al. 2013)
- Aspen biology, community classification, and management in the Blue Mountains (Swanson et al. 2010)
- Land Manager’s Guide to Aspen Management in Oregon (Strong et al. 2010)
5. Browsing and Grazing

Social Statement and Agreement

Chronic browsing or grazing from wild ungulates and livestock can suppress aspen sprouts and remove the midstory and future overstory. When needed, fencing, deterrents, and alternate grazing patterns should be used.

Science Background

Elk and deer use aspen stands for food and cover throughout the seasons. Healthy aspen stands should have plenty of sprouts, allowing up to 50% of sprouts to show signs of herbivory from elk and deer. Chronic herbivory (high levels over decades of time) suppress the sprouts. This removes the midstory and stops new cohorts of small diameter aspen trees from recruiting into the overstory (Seager et al. 2013) and suppresses shrubs and understory plants that are important for wildlife habitat (White et al. 1998). Increased forage across the landscape should help disperse elk and...
deer herds, decreasing their herbivory impact on aspen. For the short-term, fencing or other deterrents (jackstraw, coarse woody debris) can help exclude these ungulates. After 10-15 years, sprouts should be trees and above the height of elk herbivory (8’ or 2.5m). Not all National Forests have livestock grazing. Cattle and livestock use of aspen on National Forest land is usually limited to grazing season. Research shows that early season use of aspen was least impactful on sprout growth and survival (Jones et al. 2009). Areas that experience late season grazing should be considered for resting the following year or have short early season grazing. This is of particular importance in areas where fencing can be avoiding by alternate grazing strategy. In the areas so large that fencing creates an economic barrier, deterrents or removal of livestock should be considered until aspen recovers (Seager et al. 2013b).

**Key Points of Discussion**

- Local herbivore suite (elk, deer, livestock) and density
- Historical numbers of wild ungulates and livestock across time
- Fencing types already in use
- Effectiveness of fencing, alternate grazing, jackstraw
- Local data/information from resource specialists, permittees, hunters

**For Further Information**

1. **Herbivores and Aspen - Fencing**
   - Blue Mountains studies in Aspen biology, community classification, and management in the Blue Mountains by Swanson and coauthors (2010).

2. **Patterns and consequences of ungulate herbivory on aspen in western North America** (Seager et al. 2013b).

3. **Effectiveness of Fenced Exclosures in Aspen Restoration**
   - Blue Mountain study in Wallowa County; Chapter 5 in Land Manager’s Guide to Aspen Management in Oregon by Strong and coauthors (2010).
6. Mapping and Placement on the Landscape

Social Statement and Agreement

Aspen stands in project areas should be mapped so restoration can happen in context of placement on the landscape and condition of nearby stands.

Science Background

Mapping of aspen stands allows for spatial analysis to answer many ecological and scientific questions about: landscape-level restoration, connectivity and permeability. Aspen stands with diverse structure and varying size support more wildlife (Seager et al. 2013a). Some decadent aspen stands may need to be reinitiated through prescribed fire, clear-fell coppicing (cutting aspen overstory), or other overstory or root disturbance (Shepperd 2001). Such disturbances greatly increase clonal root-sprouting density and area, allowing the stand to expand. Mapping stands allows for spatial analysis of stands in a watershed or project area to emphasize diverse size (acres) and trees sizes (dbh).

Key Points of Discussion

- GPS points for each stand on the landscape is a good start
- Mapping stand boundaries is more effective, but more expensive
- Data on stand condition should match across districts for comparison

For Further Information

- Aspen Restoration in the Blue Mountains of Northeast Oregon (Shirley and Erickson 2001)
- Aspen Polygon Maps for Prioritizing Treatment on the Fremont-Winema National Forest (Seager et al. 2013)
- Size of Stands and Trees for Specific Avian and Mammal Use of Aspen Ecosystems (Seager et al. 2013)
7. Aspen Expansion

Social Statement and Agreement

Oregon has lost up to 80% of its aspen stands. Most stands have been diminished in size and many have been lost all together. Expansion of aspen stands should be the priority and approach rather than preserving existing trees and acreage.

Science Background

Aspen stands can expand through their sprouting zone (area around the stand), which can be as far out as 100 to 150 feet out from the last mature stem during successful treatment (Shepperd 2001). Aspen can sprout prolifically when moisture, light, and herbivory pressure are released (Seager et al. 2013a, and see Section 4: Science and Ecology of Quaking Aspen). Expansion of aspen stands makes them more resistant to disturbances, resilient to drought and climate change, and better meets the historical range of variation (HRV) of aspen occurrence (acreage, placement) on most National Forests in Oregon.

Aspen stand expanding even with old growth ponderosa pine and snag retention. Note the density of aspen sprouts and height even from the small number of overstory trees. Aspen can expand 100-150’ out from the last mature tree, though sprouting may occur across many years as soil moisture increases. Photo: Trent Seager.
**Key Points of Discussion**

- Areas around aspen stands that show soil, slope, or other factors that indicate aspen expansion would work
- Look in the immediate area around the stands for downed aspen logs (carcasses) or snags (skeletons) to show historical extent of the stand
- Connected meadows, drainages, or grasses-wet areas may contain remnants of aspen to show historical extent and connectivity

**For Further Information**

- *Aspen Restoration in the Blue Mountains of Northeast Oregon* (Shirley and Erickson 2001)
- *Aspen Polygon Maps on the Fremont-Winema National Forest* (Seager et al. 2013) – showing the extent of aspen in meadow systems and in corridors
8. Resistance and Resilience

Social Statement and Agreement

Aspen are more resistant to drought and stressors and more resilient to fire and disturbance when they are restored to multi-storied stands with open areas around them.

Science Background

The effect of increased frequency, duration, and severity of drought on aspen includes widespread occurrence of root mortality and crown loss in mature stands (SAD) in the Rocky Mountain region (Worrall et al. 2013). Efforts around the western US have focused on increasing aspen sustainability by moving past restoration to resiliency (Rogers et al. 2013). Still, climate projections suggest drought will drive substantial loss of aspen across its current distribution (Worrall et al. 2013), including much of Oregon (Rehfeldt et al. 2009). Moisture can be increased at the stand scale to support aspen persistence, growth, and expansion during normal and drought years by removing competing conifers (Jones et al. 2005, Seager 2010, Swanson et al. 2010, Seager et al. 2013a). Aspen that occur in small patches (such as those in Oregon) depend on fire to remove competing conifers more than to reinitiate the aspen stand (Kurzel et al. 2007). Fire suppression has increased competition stress on aspen (Seager 2010) leading some managers to mimic fire through conifer removal (Jones et al. 2005). Aspen stands that have competing conifers removed show increased resiliency as measured by increase in: basal area, stand size, and recruitment of midstory and overstory (Seager 2010). Multi-storied and aspen stands with recruiting sprouts were more likely to persist during drought and other disturbances (Worral et al. 2010, Seager 2010).
Key Points of Discussion

- Consider how climate change and associated drought, increased heat stress, and altered precipitation patterns (rain instead of snow) might effect aspen stands in the project area
- Assess stands for recruitment and multi-storied structure to see if diverse ages of aspen trees are present
- Consider a buffer zone around the stand to protect it from fire and other disturbances, and thus preserve existing structure
- Fire may not be needed to reinitiate the stand (kill the overstory and send root system into dense sprouting) but historically did remove conifer competition and release moisture into the system

For Further Information

- The Effects of Herbivory, Conifer Encroachment, and Coarse Woody Debris on Aspen Persistence in the Central Oregon Cascades (Seager 2010)
- Removal of Encroaching Conifers to Regenerate Degraded Aspen Stands (Jones et al. 2005)
- Aspen Biology, Community Classification, and Management in the Blue Mountains (Swanson et al. 2010)
9. Genetic Diversity and Seeds

Social Statement and Agreement

Current aspen stands expand through cloning and root sprouting, limiting diversity. Aspen seeds can provide new genetics on the landscape if seedlings can persist.

Science Background

Aspen resiliency can be increased through greater: stand area, stem density, and stem age classes, and thus most restoration efforts focus on existing stands (Seager et al. 2013a). However, current aspen genetics might have originated under a different climate pattern during a previous era (Long and Mock 2011), though new stems and root systems grew between fire, disturbance, or stem senescence (~ 100 years). Aspen genetics show diverse responses to climate change, herbivory and other stressors (Lindroth and St. Clair 2013). This may be more important than previously thought, as predicted climate scenarios suggest stressors that may decrease available aspen habitat (Worrall et al. 2013). In a burned area that had not previously contained aspen, seedlings were found inside an exclosures in the Blue Mountains (Swanson et al. 2010), showing the importance of both finding aspen seedlings and protecting them. With aspen seeding events occurring in Oregon, new genetics and new locations should be seen as important to aspen persistence, as they could offer insight into where aspen can establish and grow during current (and thus more likely, future) climate stressors. To better understand seeding potential, it is important to: delineate aspen clones, assess landscape genetics, and look at the adaptive variation of those individual clones (Mock et al. 2013), some of which has occurred in Oregon (Shirley and Erickson 2001).

Key Points of Discussion:

• Consider if aspen stands in proximity (same watershed) represent both male and female clones
• Note where local land managers have documented aspen seeding on the landscape
• Consider planting clones of a different sex if the watershed or district only has clones of the same sex
• Areas that were burnt by wildfire or prescribed fire should be considered and/or surveyed for aspen seedlings. If found, consider options for protection.

For Further Information

• Aspen Biology, Community Classification, and Management in the Blue Mountains (Swanson et al. 2010)
• Establishment, persistence, and growth of aspen (Populus tremuloides) seedlings (Romme et al. 2005)
• Sexual Reproduction, Seeds, and Seedlings (McDonough 1985)
Aspen seedlings provide new genetics and may establish in new areas. When found, they should be protected until they escape browse height (8’ or 2.5m) or become a small stand of multiple trees.
References


Appendix A

Further Resources


*Note:* To find any of the above publications on-line or in another format, search for the title, author’s name, and publication date on Google, Google Scholar or any search engine. For non-government publications that may not be available for free, we recommend Utah State University’s Digital Commons Aspen Bibliography (http://digitalcommons.usu.edu/aspen_bib/) where hundreds of aspen publications are available to read.