Module 5:
Fuels Reduction Strategies

Introduction

This module covers fuels reduction concepts and practices. The main focus is on strategies for HIZ Zone 3 and beyond (away from the defensible space), but the material is also relevant to practices in HIZ Zones 1 and 2. The module builds on the Fire Science and Home Protection Strategies modules. The content is most directly applicable to CFA participants who are landowners with acreage in Zone 3, but it is also relevant to all CFA participants in their capacity as volunteers.

Key topics include objectives and methods of fuels reduction, principles of fire-resistant forests, maintenance, planning and prioritization, integration with other objectives, and where to go for help. Basic principles and methods are similar across the state, but there are significant local variations in fuels types and treatment methods.

Room setup

Typical schoolroom setup or half-moon/cabaret style if small-group exercises are used. (See "Room setup," page 7)

Total time needed

Classroom: 2 hours

Field: 4 to 5 hours

Equipment needed

Classroom

- Computer with PowerPoint
- Projector and screen

Field

- Flip chart and easel

Background resources

- Videos
  - ❏ "Forest Fact Break: Forest Fire" (1:40): A quick and simple explanation of current wildfire issues. Entertaining! https://www.youtube.com/watch?v=zNoqpqbeJ3M
  - ❏ "Yosemite Sequoias Need Fire" (2:55): Nice, short National Geographic introduction to the use of prescribed fire to manage fuels and restore giant sequoia forests. http://video.nationalgeographic.com/video/yosemite-sequoias-fire
  - ❏ "Federal Forestland in Oregon" (6:47): Featuring OSU's Stephen Fitzgerald among others, this video focuses on wildfire and treatments to reduce fire severity on federal lands in central and eastern Oregon. http://www.youtube.com/watch?v=Nr2qU2kBPWs
- Narrated PowerPoint presentations covering the main topics in the CFA fuels reduction module
  - ❏ Intro
  - ❏ Objectives
  - ❏ Fuels reduction methods for forests and rangelands
  - ❏ Fuels reduction: where?
  - ❏ Integrating fuels reduction with other objectives
  - ❏ Roads, access, and water
- Unscripted presentations
  - ❏ *Fuels Reduction Effectiveness Case Studies*: Brief, unscripted PowerPoint presentation that focuses on how different types of fuels reduction treatments affect fire behavior, based on recent wildfires around the American west.
- Publications
  - ❏ *Reducing Fire Risk on Your Forest Property* (PNW 618) https://catalog.extension.oregonstate.edu/pnw618

- ❑ *A Land Manager's Guide for Creating Fire-Resistant Forests* (EM 9087) https://catalog.extension.oregonstate.edu/em9087

Host prep

- ■ Recruit instructor(s) and panelists
- ■ Familiarize instructors with objectives, content, agenda, and structure of session
- ■ Communicate with CFA participants to confirm location and time
- ■ Make sufficient copies of all handouts
- ■ Reserve classroom
- ■ Confirm projector and laptop for the video
- ■ Set up room
- ■ Prepare refreshments (if applicable)
- ■ Identify field sites
- ■ Select desired in-class exercises, field demonstrations, and field exercises
- ■ Organize field tour transportation
- ■ Do a practice field tour with instructor(s)

Class prerequisites

Prework should consist of reviewing the background resources listed in this lesson plan. In particular, participants should review the videos "Yosemite Sequoias Need Fire," "Forest Fact Break: Forest Fire," and "Federal Forestland in Oregon." They should also scan *A Land Manager's Guide to Fire-Resistant Forests* (EM 9087). The self-assessment worksheet in the Fuels Reduction Strategies materials is a good way to help participants retain what they have learned.

Learning objectives

Participants will:

- ■ Analyze objectives for fuels reduction
- ■ Describe the four principles of fire-resistant forests
- ■ Compare and contrast typical fuels reduction and slash disposal methods and some of their pros and cons
- ■ Recognize the importance of location and spatial context in fuels reduction
- ■ Brainstorm ideas for how fuels reduction can be integrated with other objectives

Behavior objectives

Participants will:

- ■ Explain basic fuels reduction concepts and options to home- and landowners and the public, and refer those interested to additional sources of information
- ■ Assess fuels reduction needs and develop a plan of action to address these needs as part of their wildfire preparedness plan

Delivery methods

- ■ Lecture
- ■ Discussion
- ■ Field tour and site visits
- ■ Large-group or small-group exercises
- ■ Demonstrations

Instructor guidance

We recommend that most of this module be spent in the field. Participants are likely to be more engaged and retain more information in a field setting than if they learn about the topics in the classroom. However, the recommended agenda includes an introductory lecture and discussion on fuels treatment strategies.

Sample agenda

Location: Designated meet-up location

9:00 a.m. Welcome, review agenda and objectives for the day, and introductions. Find out what questions participants have from the readings and other prework.

9:15 a.m. Introductory presentation on fuels treatment strategies

10:30 a.m. Break

10:45 a.m. Depart for field tour

Lunch at a convenient location

Stop #1) Treated and untreated forest

Stop #2) Fuels treatment methods on public lands, strategic locations

Stop #3) Fuels treatments on private lands

2:30 p.m. Demonstrations of fuels treatment techniques

3:00 p.m. Field exercise: fuels reduction assessment of a property

3:45 p.m. Wrap up and adjourn. Field tour concludes.

Content outline

- HIZ Zone 3 brief review
  - Away from the homesite
- Objectives are to modify fire behavior (reduce intensity and rate of spread, resulting in lower severity) and facilitate suppression. Contrast fire-resistance with "fire-proofing."
- Review the four principles for creating fire-resistant forests
  - Reduce surface fuels, increase height-to-crown base, reduce crown density, retain large trees of fire-resistant species
- Fuels reduction methods
  - Thinning, pruning, mechanical (slash buster, etc.), grazing. Discuss methods, equipment, costs, pros and cons.
  - Regionally important fuels types and treatment methods (forest, woodland, chaparral, range; eastern, southwest, northwest Oregon; etc.)
  - Slash disposal options: chipping, removal, pile and burn, lop and scatter, others
  - Prescribed underburning
  - Importance of location and surroundings (spatial context); priority locations for treatment in Zone 3 (e.g., ridges and upper slopes)—tie in with fire behavior concepts, role of topography
  - Importance of maintenance; life span of treatments, need and methods for re-treatments (e.g., sprout clump control)
- Integrating fuels reduction with other objectives
  - Forest grazing, wildlife, forest health, watershed function
- Where to go for help
  - Technical assistance
  - Cost share and other assistance
  - Finding contractors to do the work
  - Doing it yourself
- Volunteer opportunities
  - Discuss possible volunteer opportunities related to what was learned in the module
    - Facilitate neighborhood identification of fuels treatment needs
    - Organize neighborhood work parties
    - Work with agencies to address fuels concerns

Exercises

There are several options for exercises for this module, both in the classroom and outside in a field tour. Field tour demonstrations and exercises may be done in conjunction with a field tour for modules 1 through 3 or could stand alone. CFA facilitators and instructors should choose options that work best for their group but might not use every exercise.

Self-assessment worksheet

Participants complete the worksheet in class, answering self-assessment questions during interactive presentation.

Matchstick forest demonstration

This demonstration reviews and builds on concepts learned in the fire science module. Use the "matchstick" forests to demonstrate various aspects of fire behavior and fuels reduction. For example, create a denser arrangement of matches to simulate an unthinned forest next to a sparser arrangement that simulates the effects of thinning. This could be a demonstration or hands-on exercise.

Field tour demonstration #1

Illustrate concepts in the field by showing participants 2 to 4 sites that contain each of the following elements. Some may be combined.

1. Untreated forest, ideally one that has burned and shows variable fire effects including high-severity fire
2. Fire-resistant forest, ideally one that was treated and underburned in a wildfire
3. Examples of various fuels treatments such as mowing, mastication, piling and burning, or

underburning, focusing on regionally relevant fuels types and treatments

4. Examples of treatments with strategic placements, e.g., on ridgelines or along roads
5. Public land where large scale fuels treatments have taken place
6. Private property examples of fuels treatment
7. Include a discussion of factors that foresters consider when deciding which trees to remove and which trees to retain

Field tour demonstration #2

The instructor, host, and/or a volunteer demonstrate fuels treatment methods, especially those applicable to landowners. Examples: pruning, hand piling of slash, pile burning, chipping, using a brushcutter or other tools to cut re-sprouting vegetation, and using a weed wrench or similar tool to uproot Scotch broom or other highly flammable invasive weeds. The demonstration should include a discussion of proper techniques as well as equipment options. If feasible, give volunteers opportunities to try out the hand tools and perhaps construct a slash pile.

Field exercise (30 to 45 minutes) – Divide into small groups (3 to 6 people per group). Each group will complete a fuels reduction assessment and action plan for a property or other defined area. They should evaluate the relative fuel hazard and identify locations for and types of fuels reduction. See fuels reduction assessment form (page 90) for detailed instructions.

May combine with field visits for modules 1 through 3

Alternative delivery methods

In the hybrid approach, the main content is covered in the scripted PowerPoint on fuels reduction basics. Participants could review this presentation online, as well as video clips and other publications and presentations listed under "Background resources and Materials." The field trip topics and exercises could be covered during the onsite field session. Then, to complete the module, participants would fill out the self-assessment form and complete relevant sections of their wildfire preparedness plan.

You may combine this field tour with field visits for modules 1 through 3.

Suggested homework

For homework, participants should complete the Zone 3 section of their wildfire preparedness plan.

Self-assessment questions

A self-assessment worksheet is included in the materials for this module (page 89).

Fuels Reduction Strategies Materials

Photo: Dave Powell, Bugwood

slide deck

Citizen Fire Academy

Fuels Reduction

Max Bennett, OSU Extension, Oregon State University

Oregon State University

Oregon State University Extension Service

Presentation objectives

After this module, you will understand and be able to describe:

- The objectives of fuels reduction
- The four principles of fire-resistant forests and woodlands
- Typical fuels reduction methods for forests, woodlands, chaparral, rangelands
- Priority locations for fuels reduction
- Integrating fuels reduction with other objectives

We're focusing on fuels reduction *beyond* the HIZ/DF

Fuels reduction objectives

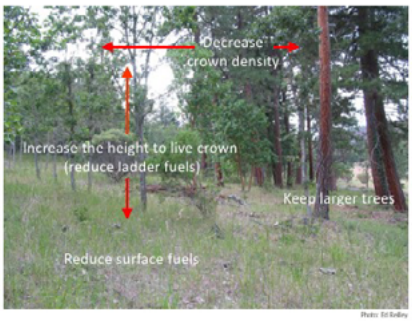
- Modify fire behavior
  - Reduce rate of spread
  - Reduce fire intensity (flame length)
- Make it easier for firefighters to suppress the fire
- Reduce damage to resources & property (trees, wildlife, watersheds, etc.)
- "Make your property less inviting to fire, and more inviting to firefighters"
- ~~"Fireproofing"~~

Example

Squire Fire, July 2002
Jackson County, Oregon

Untreated

Commercially thinned, piled, piles burned



Fuels reduction before and after

Before

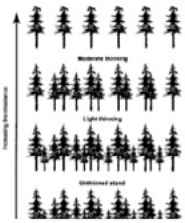
After

Fuels reduction in forests and woodlands

Thinning
Pruning
Slash treatment
Prescribed fire

Thinning

- Thinning subordinate trees mimics natural stand mortality (and mortality caused by natural surface fires).
- The larger codominant and dominant trees are left, which are more fire-resistant.

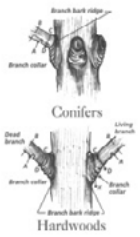


"Thinned from below"

Pruning

- Prune up to 8 to 10 feet or more
- Leave enough foliage for good tree vigor
  - Rules of thumb
- Treat slash
- Often combined with thinning

Pruning guidelines



- Use sharp tool
- Avoid flush cuts and coat hangers
- Prune conifers late summer through winter
- Prune hardwoods during dormant season
- No wound dressings

Slash treatment

Utilization
Lop and scatter
Pile and burn, swamper burn
Masticate
Chip
Haul away

Utilization

Sawlogs

Post and poles

Utilization summary

- Reduces woody material, but mostly pole size or larger
- Fine fuels left on site unless whole tree yarded
- Potential to offset cost of treatment
- Labor/cost tradeoffs between gathering material and leaving it in the woods

Lop and scatter

Pile and burn

Swamper burning

Pile and burn summary

- Effectiveness
- Costs
- Burn-day windows
- Risk of holdover fires
- A leading cause of wildfire!

Chipping

- Effectiveness
- Costs
- Slope and access
- Uses for chips

Haul Away

- Biomass
- Compost/landfill

Prescribed fire (underburning)

Before and after underburning

Prescribed fire key points

Fuels reduction in chaparral, rangeland, and grassland

Mastication
Mowing
Grazing
Prescribed fire

Brush – "mastication"

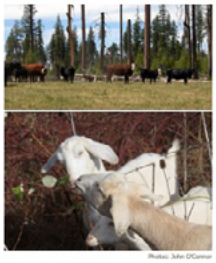
Mowing bitterbrush

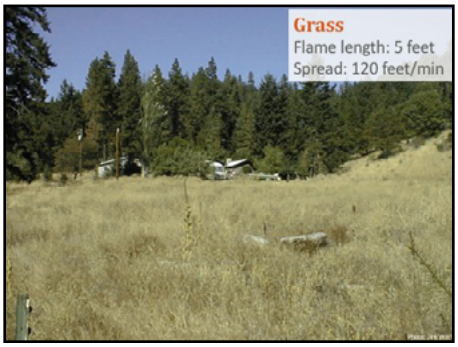
Mastication: What does the research say?

- Relatively cost effective
- Reduces crown fire potential
- May not reduce fire severity
- Equipment may result in soil displacement and compaction, but this can be mitigated
- Material acts as mulch
- No evidence of short-term effects on soil microbes or nitrogen
- Alteration of wildlife habitat

Grazing/browsing

- Cattle and sheep can help reduce grass and other fine fuels
- Goats and sheep browse woody vegetation
- Can be effective
- Require intensive management





Grass
Flame length: 5 feet
Spread: 120 feet/min

Grass

- Grazing
- Mowers or string trimmers
- Observe fire season restrictions

Mowed grass, timber litter
Flame length: 1 foot
Spread: 3 feet/min

Lifespan of fuels treatments can be short

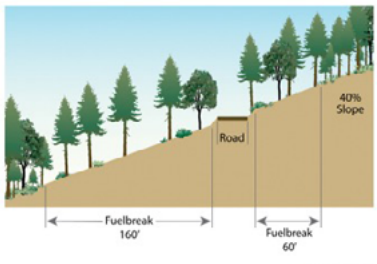
Maintenance methods

Fuels reduction: Where?

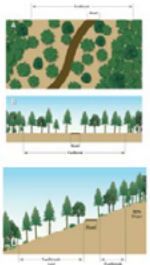
Because you probably can't afford to do it everywhere (if you have a larger property)

Along ridgelines

Above and below roads



Shaded fuelbreaks



Photos: Max Bennett, © Oregon State University

Diagrams: © Oregon State University

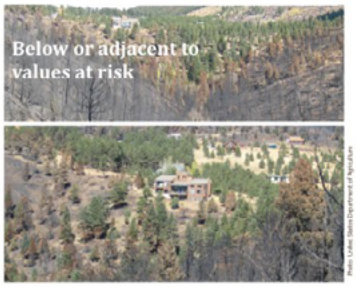


Figure 48. An example of a homeowner treating both canopy and surface fuels around their home that resulted in low burn severity to the vegetation. Note the low burn severity resulting from a surface fire to the left of the home even as an intense fire approached the home as shown in the top photo (photos: Dave Steensmann (middle and bottom), Mary Alston (top)).

Photo: Lolkes (State Department of Agriculture

Lower priorities

- Riparian corridors
- Other sensitive areas
- North slopes
- More remote locations

Photo: Max Bennett, © Oregon State University

Integrating with other objectives

Wildlife
Forest health
Aesthetics
Grazing

Wildlife patch retention

Break up continuity of fuels

Photo: Marty Main

Retain patches, break up fuel continuity

Photos: Ed Hildy

Retain deciduous shrub species

Photo: Max Bennett, © Oregon State University

Timber production

- Fuels reduction is usually compatible
- Focus fuels treatments in tactically important locations

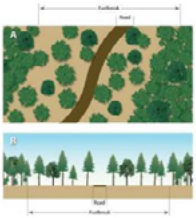


Diagram: © Oregon State University

Retain some snags and logs

Photo: Max Bennett, © Oregon State University

Photo: Chris Schnopf, Bugwood.org

Fuels reduction can promote tree vigor and resistance to pests

Photo: Stephen Fitzgerald, © Oregon State University

Aesthetics and privacy

In the eye of the beholder, but...

- Variation in tree sizes
- Retention patches
- Separate patches; reduce fuel continuity

Photo: Max Bennett, © Oregon State University

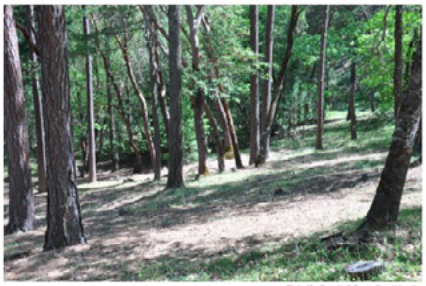


Photo: Max Bennett, © Oregon State University

Grazing

Fuels treatments promote grass growth and reduce slash.

Photo: Chris Schnepf, Bugwood.org

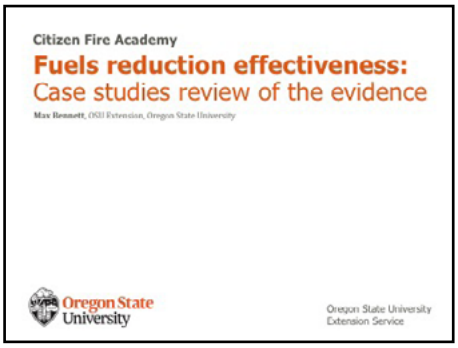
Review and wrap-up

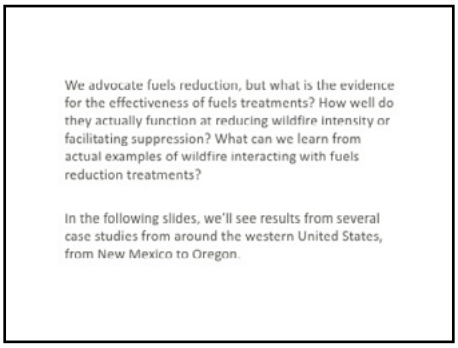
- Goal of fuels reduction is to modify fire behavior, reduce negative effects, make it easier to suppress, not to "fireproof"
- Make your forest/woodland or rangeland more fire-resistant by:
  - Reducing surface and ladder fuels
  - Spacing out tree crowns
  - Retaining the largest, most fire-resistant trees

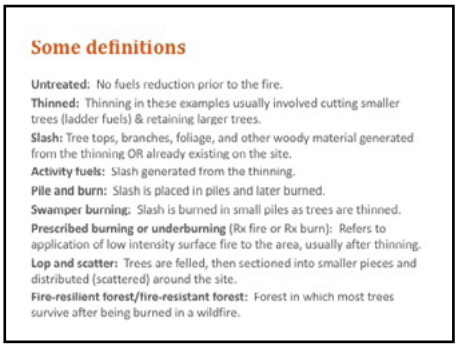
Review and wrap-up (2)

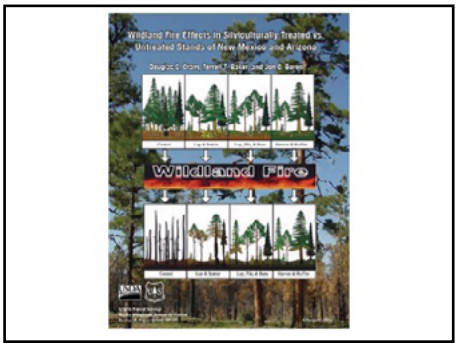
- Many fuels reduction methods, each with pros and cons
- Focus fuels reduction in priority areas
- Fuels reduction can be integrated and is compatible with many other objectives: wildlife, grazing, timber, forest health, aesthetics, privacy, etc.

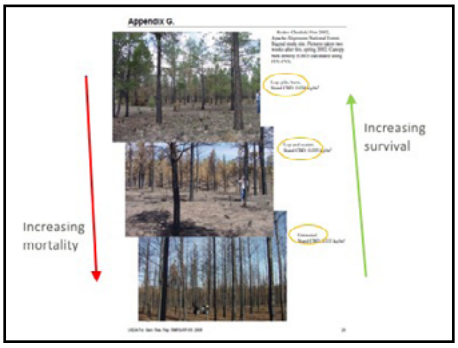
slide deck

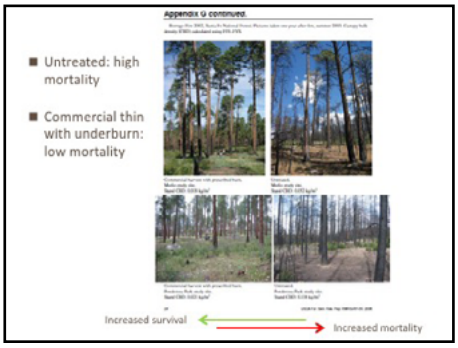

Citizen Fire Academy
Fuels reduction effectiveness:
Case studies review of the evidence
Max Bennett, OSU Extension, Oregon State University
Oregon State University
Oregon State University Extension Service

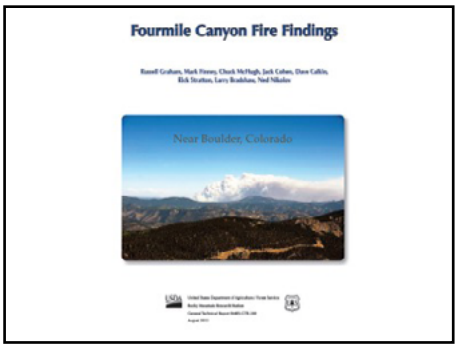

We advocate fuels reduction, but what is the evidence for the effectiveness of fuels treatments? How well do they actually function at reducing wildfire intensity or facilitating suppression? What can we learn from actual examples of wildfire interacting with fuels reduction treatments?
In the following slides, we'll see results from several case studies from around the western United States, from New Mexico to Oregon.

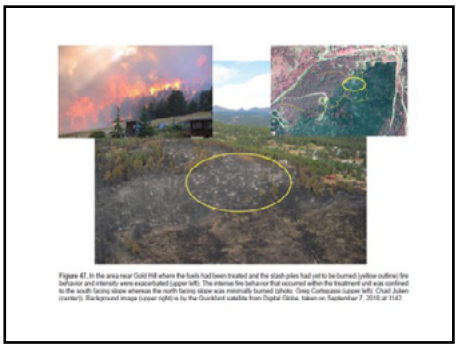

Some definitions
Untreated: No fuels reduction prior to the fire.
Thinned: Thinning in these examples usually involved cutting smaller trees (ladder fuels) & retaining larger trees.
Slash: Tree tops, branches, foliage, and other woody material generated from the thinning OR already existing on the site.
Activity fuels: Slash generated from the thinning.
Pile and burn: Slash is placed in piles and later burned.
Swamper burning: Slash is burned in small piles as trees are thinned.
Prescribed burning or underburning (Rx fire or Rx burn): Refers to application of low intensity surface fire to the area, usually after thinning.
Lop and scatter: Trees are felled, then sectioned into smaller pieces and distributed (scattered) around the site.
Fire-resilient forest/fire-resistant forest: Forest in which most trees survive after being burned in a wildfire.

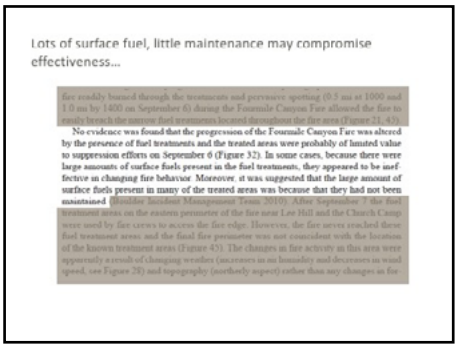

Wildland Fire Effects in Silviculturally Treated vs. Untreated Stands of New Mexico and Arizona
Wildland Fire

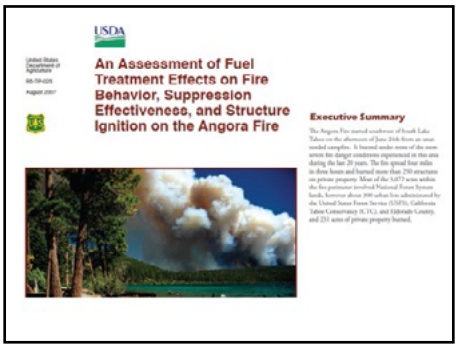

Appendix G.
Increasing survival
Increasing mortality

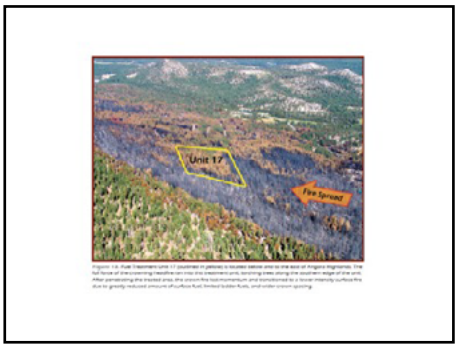

Appendix G continued.
Untreated: high mortality
Commercial thin with underburn: low mortality
Increased survival
Increased mortality

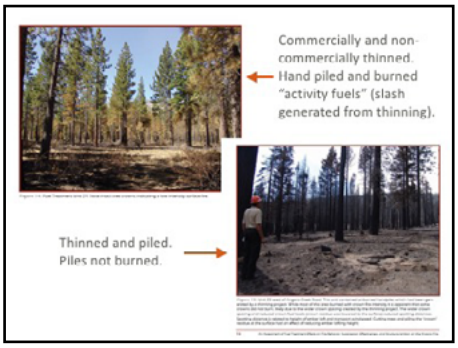

Fourmile Canyon Fire Findings
Near Boulder, Colorado

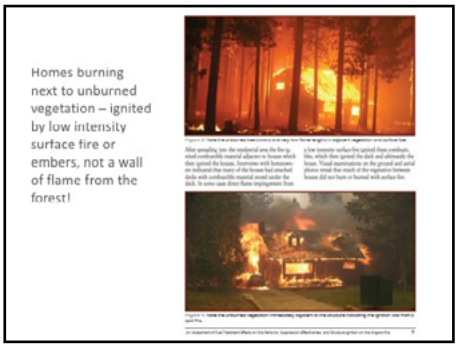


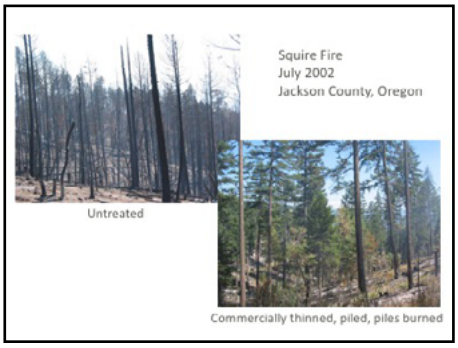

Lots of surface fuel, little maintenance may compromise effectiveness...


USDA
An Assessment of Fuel Treatment Effects on Fire Behavior, Suppression Effectiveness, and Structure Ignition on the Angora Fire
Executive Summary


Unit 17
Fire Spread







Conclusions from case studies

- In almost all cases, fire behavior was modified in treated (fuels reduction) stands compared to untreated stands.
- Thinning followed by prescribed underburning is the "gold standard" of fuels reduction. Intense wildfires including crown fires that entered forests that had been thinned and underburned generally dropped to the ground and even went out. Most of the trees in the treated area survived.
- Forests that were thinned, piled, and burned had significantly lower fire intensity and increased tree survival compared to untreated stands.
- Stands that were thinned and where the activity fuels were piled but not burned, or where the slash was lopped and scattered, generally showed a reduction in crown fire compared to untreated stands, but these stands often experienced intense surface fires and high levels of tree mortality.
- Thinning in the absence of surface fuel treatment sometimes increased tree mortality compared no treatment.
- **Conclusions:** Thinning alone may reduce crown fire but not necessarily tree mortality. Treatment of surface fuels is critical in creating fire-resilient stands.
- Treatments must be maintained!

Principles of fire-resilient forests emerging from these and other studies

To create and maintain a fire-resilient forest:

- Reduce surface fuels
- Reduce ladder fuels
- Reduce crown density
- Retain large, fire-resistant trees