
# - Operational Guidelines -

## *HAZARD MITIGATION*

# *BEST MANAGEMENT PRACTICES*

**March 2005**

***Flagstaff Fire Department***
***Fuel Management Program***
***211 W. Aspen***
***Flagstaff AZ 86001***
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# INDEX



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*Destructive wildfires are a reality: they have become more common, more damaging, more costly, and more frightening. Those who live in-and-near our forests, and who believe they are not at risk, are wrong. But the good news is that protecting homes and property from wildfire is relatively simple and easy to accomplish – provided one allows enough time to complete the task*

**MISSION:** Protecting Values At Risk

**GOAL:** Document "Best Management Practices" (BMP's) for Hazard Mitigation activities (Selective Thinning and Prescribed Fire) that enable the Flagstaff Fire Dept (FFD), working at the bequest of the City Council and in cooperation with our many partners, to:

*Primary* -- Reduce threat of catastrophic wildfire, protecting improvements, citizens, emergency responders, and other community/ecosystem values, thereby enhancing community well-being and quality-of-life issues, while reducing financial expenditures required for wildfire response and recovery efforts.

*Secondary* – 1) Improve forest health; including reduction of mortality due to insects, disease, and drought, and

2) Demonstrate regional/national leadership in wildland-urban interface fire management issues and practices.

**AUTHORITY:**

1) Uniform Fire Code – As adopted by the Flagstaff City Council

2) Operating protocols with the AZ Dept of Environmental Quality (ADEQ)

**INFLUENCING FACTORS:** Seven initiatives have influenced development of these BMP's. They are:

1) Community Wildfire Protection Plan (CWPP) [visit www.gffp.org],

2) Recommendations – Governor's Forest Health Advisory & Oversight Councils [visit www.governor.state.az.us/fhc],

3) Urban Wildland Interface Code – As developed by the International Code Conference [visit www.iccsafe.org/e/prodshow.html?prodid=3850503],

4) National Fire Plan [visit www.fireplan.gov/],

5) Western Governor's Association - Forest Health Advisory Committee [visit www.westgov.org],

6) National Firewise Program [visit www.firewise.org], and

7) Northern AZ University – Ecological Restoration Institute [visit www.eri.nau.edu].

**BACKGROUND:** Wildfire is the #1 fire threat to Flagstaff. We experience approximately 100 wildfires per year within the city boundaries, and another 200+ on jurisdictions immediately surrounding our community.

Ponderosa pine forests are extremely well adapted to, and dependent upon, frequent low-intensity wildfires, but they are extremely vulnerable to high intensity fire events. Societal demands and resulting management practices during the past century have created a forest that is now severely overcrowded. Unnatural fuel accumulations, exacerbated by insect, disease, and drought, have resulted in an alarming increase in both the size and severity of wildfires. These fires endanger not only the trees themselves, but also other associated resource values such as wildlife habitat, scenic quality, and watershed capacity. In addition to serious ecosystem damage, a single large-scale fire moving into the city will most-assuredly affect lives and properties, and also inflict serious, and long-term, economic harm.

**APPROACH:** Hazard Mitigation is one-of-four key components of our FUEL MANAGEMENT program. (The other three – *Strategic Planning & Outreach*, *Land Use Planning*, and *Public Preparedness* – are discussed elsewhere: visit www.flagstaff.az.gov/fuelmanagement

Three factors influence fire behavior -- weather, topography, and fuels. Of these, only fuel can be readily manipulated: Hazard mitigation activities, undertaken in a responsible manner and throughout the general area, are vital to ecosystem health and community protection.

Such activities are not meant to eliminate wildfire from the landscape. A century of wildfire suppression, often focused on fire exclusion, has demonstrated conclusively the fallacy of such efforts. Low-intensity fire is required for a healthy ponderosa pine ecosystem, and such fires do not pose a community-wide threat. Reintroduction of such fires requires the re-creation of a forest environment that burns in a healthy, and not-threatening, manner.

***This booklet documents Planning, Site Set-Up, and Implementation (Selective Thinning and Prescribed Fire) BMP's developed by and currently employed by the FFD Fuel Management program on private, city, and county lands***. In addition, the overall spirit of these BMP's is utilized by FFD when engaged on state and federal lands in the general area.

*Objectives* of the Hazard Mitigation BMP's are to:

1. Provide direct professional resource management assistance to customers we service – both within the City and within outlying contract areas,

2. Demonstrate the ability to professionally manage vegetation, utilizing any-and-all hazard mitigation practices, to achieve a FireWise community and environment,

3. Apply pertinent sections of the City's Land Development Code, Uniform Fire Code, Fire Dept policies, and other operating directions and guidelines,

4 Educate and involve decision-makers, home-and-property owners, the business community, service organizations, and special-interest groups,

5. Train Fire Dept personnel, other city employees, and various partners in wildland-urban interface fire management. (In addition to the use of NWCG Position Task Books [PTB], a Dept PTB system has been implemented for other critical skill positions. These include: Fire Technician and Lead Worker (Fuel Management program), Faller [Level A, B, C], and Prescribed Burn Boss Type 3. These PTB's can be found at www.flagstaff.az.gov/fuelmanagement - Documents, and

6. Promote and support similar Hazard Mitigation efforts undertaken by other jurisdictions and agencies.

*Methodology* employed to implement Hazard Mitigation work varies, depending upon the site and who will do the work.

1) Since 1999, in addition to required code compliance, all homes and developments within the City are required to implement Hazard Mitigation measures – primarily selective tree thinning and debris disposal – on the entire property prior to combustible building materials being allowed on-site. Details of this requirement are found in Appendix 1.

2) For many sites, the Fire Dept will generally provide professional assistance including general advice, planning, site set-up, prescribed fire use, and general project oversight at no cost to the property owner.

3) The use of private vendors to conduct actual tree thinning operations (and associated debris-removal, such as chipping and/or hauling) is encouraged, although the owner may do the work as well: In selected cases involving "areas of community value" (ex: churches, museums, schools, medical facilities, etc), the Fire Dept may conduct thinning operations, minus chipping and/or hauling.

4) Only the Fire Dept will conduct Prescribed Fire (Rx Fire) *broadcast burn* operations within the city. Vendors and/or the property owner may conduct these type burns in contract-serviced areas, provided they obtain a "Burn Certificate" from the FFD prior to ignition.

5) In almost all cases, only the Fire Dept will conduct Rx Fire *pile burn* operations within the city. Exceptions have been made dependent upon the experience/capability of the property owner and/or vendor, and the site conditions, but this is a rarity. As with *broadcast burns,* vendors and/or the property owner may conduct these type burns in contract-serviced areas, provided they obtain a "Burn Certificate" from the FFD prior to ignition.

Appendix 2 is the Service Agreement most-often utilized to initiate/implement practices on private land.

**OPERATIONAL PLANNING:** Two general plan types are utilized:

1) Forest Stewardship: In theory, a written plan must be submitted and approved by the Fire Dept prior to implementation of work. In fact, however, approved plans exist for much of the area, so it is likely that a new plan will not be required. In those areas where a new plan is required, the procedure and format found in Appendix 3 is to be utilized.

   When a new plan is developed and presented to the Fire Dept, a city-sponsored review team – consisting of the representatives from city's Community Development Dept and Clean-and-Green program, the AZ State Land Dept and Game-and-Fish Dept, and the US Forest Service – are convened to review the document and conduct a site-assessment. Based upon comments from the review team, the Fire Dept will either issue a "Notice To Proceed", or require modifications in the plan's application.

   Forest Restoration is sometimes contrasted against Hazard Mitigation operations. When planning Hazard Mitigation treatments, one should be mindful of the Position Statement found on the following page:

2) Prescribed Fire (Rx Fire): Due to the relatively small size of most burn projects, as well as their general similarity in goals, fuels, topography, desired fire behavior, and weather requirements, individual burn plans for every site may not be necessary.

   For these "generic" sites, a single burn plan for each burn type – pile or broadcast – will be prepared (or revised from previous ones) on an annual basis. When site conditions dictate otherwise, a specific burn plan will be prepared for that site.

   Appendix 4 contains both the Plan format, as well as the Ignition Day briefing format. Plans will be developed and/or refined using the BEHAVE model, as well as RX WINDOWS. SASEM will be utilized to determine emissions. The National Weather Service Fire Weather Forecast for the Flagstaff area, issued daily, will be the official forecast utilized.

   For planned "Burns of Significance" (usually those over 5-acres in size), the Annual ADEQ) Burn Registration and individual Burn Plan forms are completed and submitted to the State at the beginning of each calendar year. Accomplishment reporting to ADEQ also occurs immediately following each of these type burns. (These forms can be found at www.azdeq.gov/function/forms/appsair.html#burns : "Smoke Management".)

# FLAGSTAFF FIRE DEPARTMENT

## Restoration Based Hazard Mitigation
## Position Statement

*Abstract: Treatments designed to reduce the risk of catastrophic wildfire are compatible with, and in fact complement, the principles of forest restoration. To achieve the later, one must implement the former.*

*Wildfire is a natural event within the southwestern ponderosa pine forest. Its very occurrence is a necessary ingredient to a healthy ecosystem. However, due to past management practices, natural fuel accumulations have been increasing for decades, resulting in an escalating trend in dangerous and destructive wildfires.*

*Unlike other forest issues, catastrophic fire captures the public's attention: it is dramatic, scary, threatening, and awesome, all at the same time. A green tree, even though stressed by overcrowding or infected with dwarf-mistletoe, appears "healthy" to the average citizen: a tree on fire is an all-together different story.*

*The 1996 fire season in our area clearly demonstrated this trend and directed the attention of the public to the plight of our forests and the risk posed by catastrophic wildfire. The result was an energized community, committed to action, who understood that if reduction of the fire threat was not addressed, we could very well find ourselves without anything to restore.*

*Restoration should be viewed as a journey, rather than a destination. One is a goal, the other a treatment designed to move us in that direction. Fuel Management is not subordinate to **R**estoration: it is part of the **r**estoration process.*

*Restoration-based fuel management treatments incorporate the principles of restoration ecology. Practices are designed to reduce excessive numbers of smaller trees, retain large trees, and accept natural fire (or apply prescribed fire to mimic the natural event). More than one treatment, along with other practices, over a period of time may be required to create the conditions necessary for an improvement in overall ecosystem health.*

*Implemented properly, Hazard Mitigation activities are a socially-accepted, and welcomed, practice. Should nothing be done, catastrophic fires will continue to reign unabated. Hazard Mitigation is clearly a step toward restoring healthy ecosystems and creating a sustainable forest and community.*

**SITE SET-UP:** Boundary lines will be determined: if necessary, they will be flagged with surveyor's-tape. Trees to be removed will be marked in one-of-two ways:

1) "Cut" tree mark: the preferred, and most commonly utilized method. Trees to be removed are identified by a spot of blue paint approximately chest-high above ground level.

2) "Leave" tree mark: used only when the number of trees to be removed far exceeds those to be left. With this method, trees to be retained are identified with a spot of yellow paint approximately chest-high above ground level.

Tree marking will automatically occur by Fuel Management staff on those parcels submitted to city staff by the owner for Development Review Board (DRB) processing.

On sites to be cut by the FFD Fuel Management crew, marking is routinely not done. Crew members are trained to identify and remove trees on their own, based upon the Desired Future Condition (DFC) of the site as explained and shown to them beforehand by Fuel Management staff.

**SELECTIVE THINNING:** As indicated above, the use of vendors is encouraged on private land. Some vendors may also provide associated debris disposal through chipping or hauling services. Property owners are encouraged to utilize a written agreement

To facilitate use of private vendors, FFD:

a. conducts periodic vendor-development workshops, focusing on program goals, procedures, techniques, current topics of interest (ex: insect status), etc.,

b. maintains and provides a "Vendor List" " to interested property owners: additional vendors may be found in the phone book, newspaper, etc. Actual use of, or selection of, vendor(s) is the responsibility of the property owner.

Consulting professional foresters may be employed by private citizens to plan and implement work, subject to conditions discussed in Planning – Forest Stewardship, as described earlier. Property owners may also chose to do some or all of the work themselves.

In general, FFD thinning operations (either by the Fuel Management crew or via recommendations to property owners) are characterized by the following:

1. There is no single-focus on tree diameter. While we know from experience that the majority (85+ %) of the trees needing to be removed are under 9-inches in diameter, cutting of larger diameter trees can, and does, occur.

2. On average, approximately 70% of any existing stand is removed during cutting operations. The majority of these trees are 6-inch diameter or less, thereby reducing and/or eliminating the issue of "ladder" fuels.

3. The target tree-density for any-given site following thinning is 60-90 Basal Area. Where possible, trees are not evenly spaced, but are retained in a clumpy-pattern, thereby mimicking the historical pattern of interspersed meadows and tree clusters.

4. Other tree species (aspen, pinon, juniper, oak), where encountered, are usually retained over ponderosa pine.

5. Thinning and debris-piling operational standards are found in Appendix 5.

**PRESCRIBED FIRE:** There is a clear need to conduct prescribed burn operations within-and-adjacent to the City. The challenge is to conduct these operations in a professional manner -- one that balances community acceptance and support with resource need.

If properly managed, the positive affects of prescribed burning are many. However, we can not ignore the potential adverse affects, nor can we blindly accept them as inevitable.

Burns will be conducted so as to ensure operational control and continued public support, involving the aggressive, and routine, application of a variety of mitigation measures. These include:

1. Public Notification. Prior advertisement builds trust, and avoids unpleasant surprises. It allows us to identify neighborhood and individual concerns -- and plan our response -- before ignition. Copies of these are found in Appendix 6.

    a. NEIGHBORHOOD NOTICE: Hand-delivered to homes and businesses adjacent to the burn unit, as well as those most directly impacted by any smoke. Should be done within 1-2 months of planned ignition.

    b. RX FIRE signs are to be placed at access points into the burn unit. SMOKE signs will be utilized when smoke will drift across major roads. Preferably, these will be placed the day prior to ignition.

    c. PERSONAL NOTIFICATION: A listing of those individuals who wish to be personally contacted when a burn is ignited in their neighborhood is maintained and constantly updated: Names are added or deleted based upon response to either the NEIGHBORHOOD NOTICE described above, or previous notification efforts. Notification should occur 2-12 hours before ignition.

    d. MEDIA NOTICE: Faxed to all local media at least 1-3 hours prior to ignition.

e. ALARM NOTICE: Faxed to the Fire/Police Alarm Room, the US Forest Service Dispatch Center, and each FFD station 1-2 hours before ignition.

2. Smoke Management. This is absolutely critical to program success. Three practices are utilized to minimize smoke impacts. They are:

*a. Avoidance:*

1) In areas near schools, burn only when school is not in session or when favorable wind conditions occur so impacts are non-existent.

2) Do not burn in immediate vicinity of Flagstaff Medical Center, nursing homes, or similar occupancies.

3) Do not burn near parks on days when large events are planned.

4) If possible, schedule burns during times when seasonal homeowners will be absent.

5) The FMO or AFMO will decide the appropriate burn size for the day based primarily upon smoke dispersion and neighborhood sensitivity. While no formal maximum #'s are set, they will generally be as follows:

Piles – 150 piles or less per day no more than once every five days in a single neighborshed unless favorable wind conditions are present

Broadcast – 50 acres or less once every week in a single neighborshed.

NOTE: Neighborshed = the area within a neighborhood or geographic area within the city (and surrounding county land) where smoke will accumulate and remain visible for four hours or more following the burn. Particular attention must be paid to anticipated nighttime smoke pooling.

6) If burning adjacent to an occupied business, high density dwelling, etc, notify manager so they may shut down HVAC system(s).

7) For those with legitimate smoke-related health problems who will be seriously impacted by smoke, the Dept will reimburse them for motel and restaurant expenses, not to exceed one night. This must be coordinated and approved by the FMO or AFMO before expenses are incurred.

*b. Dilution:*

1) Burn when ventilation is Good or Excellent, as forecast by the National Weather Service, Flagstaff office (NWS).

2) During burn operation, monitor smoke column and path: adjust ignition speed and duration if necessary.

3) Where conditions permit, conduct burns during summer months. Longer daylight hours and warmer evening temperatures will allow for better overall ventilation.

4) Periodically, rotate ignition and holding forces out of the smoke environment. Utilize smoke filter masks if necessary.

*c. Emission Reduction:*

1) Prior to ignition, if possible, remove wood (ex: firewood), and/or chip-and-remove some material.

2) In general, ignite no earlier than 09:00 am and no later than 2:00 pm.

3) Isolate and avoid ignition of large dead and downed material.

4) Target only those fuels – 1 hr and 10 hr fuels generally – that are most likely to contribute to the spread of a wildfire.

5) Burn when target fuels are dry. Recognize that, as a rule-of-thumb, for every 1% increase in 1000 hr fuel moisture, approximately 3% less smoke will be emitted from the burn site. (NOTE: on occasion, on selected sites, night-time ignition will occur, provided rain-snow is occurring and will continue for the remainder of the night.)

6) Burn only vegetation: avoid other material found on-site.

7) Prior to general ignition, pile woody material: this encourages efficient burning, and produces less smoke than smoldering material.

8) Utilize a backing fire when practical. Recognize that, as a rule-of-thumb, a backing fire, while slower, will consume more fuel in the flaming stage and reduce emissions on a burn unit by an estimated 50%.

9) Where necessary, mop-up and extinguish burning stumps and other large material.

10) If unacceptable or unforeseen smoke issues develop, curtail burning until conditions improve.

11) Recognize the first burn on any particular site will produce the most smoke, due to the consumption of 50-100 years of accumulated fuels. Follow-up burns will produce significantly less smoke.

3. Fire Behavior & Escape:

   a. Burn when relatively safe to do so: fuel, weather, and topography, and ignition patterns should work together to produce flame lengths of 1-3 feet, with rate-of-spreads not to exceed 10 ft/minute (forward) and 2 ft/minute (backing). Scorch heights on trees should not exceed 1/4 their crown height.

   b. Have adequate resources on-hand, or the ability to quickly summon additional resources, to control any escape. Know location of nearest hydrant or other water source prior to ignition.

4. Process:

   1). If necessary:
   a) Complete a written burn plan for the site,
   b) Submit ADEQ required paperwork,
   c) Determine most likely and desired smoke dispersal pattern, as well as neighborshed area,
   d) Develop and distribute a NEIGHBORHOOD NOTICE.

   2) Prepare burn site: This may involve:

   - Thinning of trees.
   - Construction of perimeter control lines.
   - Construction of interior check lines.
   - Isolation of snags, stumps, large downed logs, fence posts, power poles, specimen trees, or other items.
   - Raking deep duff away from base of large living pines.

   3) Within 24 hours of planned ignition, complete the following:

   - Notification of Smoke Sensitive individuals
   - Coordinate burning with adjacent Fire agencies
   - Submit proper ADEQ Burn Request form (if applicable)
   - Landowner Information Sheet (To be given to landowner so they know what to expect following the ignition.).
   - Station Tasking Sheet (To be given to Station responsible for rechecks.)
   - Check NWS fire-weather forecast: visit http://www.wrh.noaa.gov/fgz/fwx/gfwxz.php?sid=fgz&zone=AZZ115
   - Confirm schedule and resource availability.

4) On ignition day:

- Reconfirm NWS fire weather forecast.
- Notify EVERYONE via city email
- Notify Smoke Sensitive individuals
- Notify ALARM, USFS Dispatch, and FFD stations
- Conduct briefing for all assigned resources
- Conduct test burn: monitor fire behavior, fire effects, and smoke dispersal.
- If conditions acceptable, conduct burn operation.
- Take on-site weather observations at least once per hour: monitor smoke impacts utilizing Table 1 shown below.

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**TABLE 1**

Approved by ADEQ for determining smoke index value
for local areas without official monitors

| **CATEGORIES** | **PM2.5 (1-hr ave.) (ug/m3)** | **VISIBILITY** |
|---|---|---|
| | | |
| Good | 0 – 40 | ≥ 10 miles |
| Moderate | 41 - 80 | 6 - 9 miles |
| Unhealthy for Sensitive Groups | 81 - 175 | 3 - 5 miles |
| Unhealthy | 176 - 300 | 1½ - 2½ miles |
| Very Unhealthy | 301 – 500 | ¾ – 1½ miles |
| Hazardous | > 501 | < ¾ mile |

- Face away from the sun
- Determine the limit of your visible range by looking for targets at known distance (miles). Visible range is that point at which even high contrast objects totally disappear.
- Use the values above to determine the local forest fire smoke category.
- Adjust ignition and/or mop-up requirements should values exceed, and/or are projected to remain in an unacceptable category for an extended length-of-time.

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5) Following burn:

- Remove signs.
- Submit ADEQ Burn Accomplishment form by 2:00 pm the following day (if applicable).
- Monitor until declared "out".

**EXEMPTIONS:** Two broad exemptions exist. They are:

1) Utility companies, such as Arizona Public Service, private arborists, and groups such as the Flagstaff Tree Board and City Clean & Green are not required to follow the requirements of this document when selecting, planting, and maintaining individual trees.

2) Hazard Mitigation - State and Federal agencies are not required to follow the requirements of this document for activities on their respective lands, but are encouraged to coordinate these activities with the FFD's Fuel Management program.

**SUMMARY:** The BMP's as detailed in this document permit FFD to respond in a professional, efficient, and sensitive manner to both need and opportunity, while meeting and addressing local issues.

As the practicing experts in interface fuel management, we continually explore ways to improve our program while meeting the critical challenge of long-term resource protection, community well-being, and wildfire hazard reduction.

Revisions to the BMP's are not conducted on a scheduled basis, but may occur at any time due to changes in technology, knowledge-base, or practices proven to enhance our ability to conduct the necessary Hazard Mitigation activities.

For further information, contact the Fuel Management program at any of the following:

FFD-FMO
211 W. Aspen
Flagstaff AZ 86001

(928) 779-7688
(928) 779-7668 FAX

fuelmanagement@ci.flagstaff.az.us

# APPENDIX 1

## Selective Thinning Intra-Divisional Procedure

February 2005

# SELECTIVE TREE THINNING
# INTRA-DIVISIONAL PROCEDURES

*Between the*
*Fire Department – Fuel Management Division*
*&*
*Community Development – Planning Division*

Intent: The Fire Department and Planning Division work cooperatively together to reduce the risk of catastrophic wildfire and improve overall forest health. This Procedure explains the process for planning, approving, and implementing such work, and will be reviewed and revised as necessary in order to improve public safety, protect natural resources, and meet the needs of the citizens of Flagstaff.

Goal: To plan and build a "FireWise" community while ensuring a sustainable, widespread, vigorous, healthy forested environment for future generations, at the same time preserving and protecting the City's natural resources, including floodplains, steep slopes, and visual attributes.

Authority:

Fire Department
- Uniform fire Code - current adopted edition
- Department Operational Guidelines and Procedures
- Hazard Mitigation Best Management Practices – current version

Planning Division:
- Land Development Code (LDC) - current adopted edition

Definitions: Three definitions are critical to understanding these procedures. They are:

*Basal Area* - The cross-sectional area of a tree taken at the "base" of the tree (i.e., measured at 4.5 feet above the ground). Basal area is often used to measure and describe the density of trees within an geographic area using an estimate of the sum of the basal area of all trees cross-sectional expressed per unit of land area (e.g., basal area per acre).

*Forest Stewardship* Plan – A detailed management plan for properties that are either non-developed or where development is being initiated. For the latter, it is required as part of the Development Review Board approval process. Involves treatments, guided by an approved plan, designed to mitigate wildfire risk, while maintaining or improving the physical environment. Involves an inventory and assessment of current conditions.

*Professional Forester* – An individual who is a graduate of an accredited University with a degree in Forest Management or a related discipline and who is actively practicing the profession and holds a "Certified Forester" accreditation from the

Society of American Foresters. An individual meeting these criteria must prepare the Forest Stewardship plan described above.

Treatment: Will vary from parcel to parcel, depending on the condition and location of a site. Acceptable basal area may vary from 40-100 sq. ft. per acre, thereby providing adequate spacing to reduce the risk of catastrophic wildfire and promote forest health.

A) The LDC permits unrestricted removal or those trees meeting the following criteria:

1) substantially within the drip-line of another tree,
2) diseased or infested with insects,
3) damaged, dead, or dying,
4) less than 6 inches in diameter (chest high), and/or
5) intermediate or suppressed.

B) In addition, trees may be removed upon Fire Department concurrence that:

1) are a hazard to life, property, or improvements (including fire),

*Trees meeting these criteria will not be counted against any future or planned development's resource protection requirements as described in the LDC.*

*NOTE: Use of fire to attain resource and/or fuel management objectives are not addressed in this document and are covered elsewhere by Fire Department policies and procedures.*

Process: – Those who wish to implement selective tree thinning activities on their land are encouraged to do so and may be required to submit a Forest Stewardship plan to the Fire Department's Fuel Management Officer (FMO). The plan must address the following items:

1) Address or location of the proposed activity
2) Name, address, and telephone number of both the property owner and the forester who developed the plan.
3) A topographic map showing the site boundaries, location and dimensions of all existing utility service lines, vehicle access points, circulation patterns for timber removal equipment (if necessary), the 100-year floodplain delineation (if present), and the total acreage encompassed in the plan.
4) Current zoning district and Growth Management Guide 2000 land-use designation.
5) Landowner objectives.
6) Resource description, including species, density, and insect/disease and wildfire hazard assessment.
7) Recommended treatments and prescriptions, including proposed density or stocking level of trees, and work schedule.

8) Impacts on fish and wildlife habitat, threatened and endangered species, recreation and aesthetics, soils and drainage, cultural resources, noxious weeds, and wildfire hazard.
9) Summary statement.

Upon receipt of a complete plan, the FMO may distribute to the City's Review Team depending on the size and complexity of the project. The team is composed of representatives from the Fire Dept., US Forest Service, State Land Department, City Clean-and-Green Program, Community Development Division, and AZ Game and Fish.

The FMO (or his designee) will arrange a site-visit (with the Review Team if determined to be needed). For sites five acres or less trees must be marked prior to the site visit. Following this mark, no additional tree marking is permitted. For those sites greater than five acres, a marked test plot of at least 3 acres is sufficient. However, completion of all marking is required before approval will be granted by the FMO (or his designee).

The plan will be reviewed with the following general objectives and issues in mind:

1) Fire management/urban interface
2) Visual impact
3) Forest Health
4) Wildlife habitat
5) Erosion control/ecological restoration
6) Appropriate biomass disposition
7) Future development potential
8) Intent of the LDC
9) Cultural resources

Written comments from the Review Team shall be submitted to the FMO within five working days following the site review. Within three weeks of the site visit, the FMO shall approve, approve with modifications, or deny the proposed stewardship plan. Beginning work before the plan is submitted/approved is subject to enforcement remedies per the Uniform Fire Code.

*If unsuccessful, the applicant may appeal the decision to the City's Building and Fire Code Board of Appeals via submittal of a written letter of appeal within the 10 days of the FMO's decision.*

*Inspection* – On-going work will be monitored by the FMO and/or his designee. Within two weeks of completion, the property owner is to notify the FMO in writing that work has been completed.

Questions: FFD-Fuel Managment
211 W. Aspen Ave.
Flagstaff, AZ 86001
(928) 779-7688
fuelmanagement@ci.flagstaff.az.us

# APPENDIX 2

## Landowner Agreement

**7/98**

# FOREST STEWARDSHIP -- PRESCRIBED FIRE
## *SERVICE AGREEMENT*

**THIS AGREEMENT, made this ___ day of _____, _____, by and between _____, hereinafter refereed to as the LANDOWNER, and City of Flagstaff C/O Flagstaff Fire Department, 211 W. Aspen, Flagstaff AZ 86001, hereinafter referred to as the CITY, and**

**WHEREAS, the CITY has the expertise to provide Forest Stewardship and Prescribed Fire services: and**

**WHEREAS, the LANDOWNER desires to implement Forest Stewardship and/or Prescribed Fire practices described in the Agreement.**

**NOW, THEREFORE, it is hereby agreed that:**

1. **LANDOWNER warrants that he/she is the owner of the property described as follows, or has obtained authority from the owner of said property to grant all rights to the CITY provided for in this Agreement. The property is described as follows:**

2. **LANDOWNER grants to CITY the right of access to the above described property for the following purposes:**

3. **CITY agrees to provide the services specified in Paragraph 2 of this Agreement in consideration for:**

4. **Prior to ignition, LANDOWNER will complete the following measures, as per instructions from CITY during pre-ignition on-site inspection:**

5. **It is understood between the LANDOWNER and CITY that this Agreement shall begin on the date first above written, and shall remain in force until _____.**

6. **This Agreement may be terminated by either party ten (10) days following written notice to the other party.**

7. **CITY will not assign the rights provided for in this Agreement to a subcontractor of its choice without obtaining the approval of the LANDOWNER.**

8. **This Agreement may be extended as mutually agreed to by the LANDOWNER and CITY. All extensions will be written and become part of this Agreement.**

9. **LANDOWNER recognizes the inherent risk of selective tree cutting and/or prescribed fire, including damage to improvement from falling trees, and scorch and death of trees and escape from the intended burn area during prescribed burn operations, and that the CITY is operating within the scope of established practice and policy, and thereby agrees to indemnify and hold-harmless the CITY and employees of the CITY from any actions or results occurring as a consequence of planning and/or implementing the work specified in this Agreement.**

**IN WITNESS WHEREOF the parties hereto have executed this Agreement on the day first above written.**

| | |
|---|---|
| _____ | _____ |
| **LANDOWNER** | **CITY** |

# APPENDIX 3

## Forest Stewardship Plan Format

# FOREST STEWARDSHIP PLAN

**for**

**_____**
**(Property Name)**

**Prepared by:** **_____**
**(Name, Address, Phone)**

**_____**
**(Date)**

**I. INTENT**

**II. OBJECTIVES**

**III. PROPERTY OVERVIEW:**

- **A. Ownership**
- **B. Location**
  1. **Legal Address**
  2. **General Area**
  3. **Access**
- **C. Description**
  1. **Physical Characteristics**
  2. **Acreage**
  3. **Elevation**
  4. **Slope**
  5. **Aspect**
  6. **Climate**
  7. **Site Map**
  8. **Forest History**
  9. **Existing activities and/or improvements**
  10. **Cultural features**
  11. **Surrounding Land-Use**

**IV. ECOSYSTEM DESCRIPTION:**

- **A. General**
- **B. Vegetation**
- **C. Insect and Disease**
- **D. Soils and Erosion**
- **E. Hazards**
- **F. Visual**
- **G. Wildlife**
- **H. Noxious**

**V. VEGETATION MANAGEMENT RECOMMENDATIONS:**

- **A. Treatments**
- **B. Economic Assessment (Estimated):**
- **C. Impacts:**
  1. **Visual**
  2. **Wildlife**
  3. **Soils and Drainage**
  4. **Cultural**
  5. **Wildfire**
  6. **Timber Resource**
  7. **Noxious Weeds**
  8. **Property Values**.

# APPENDIX 4

## Prescribed Burn Plan Format
## (+ Briefing Format)

# FLAGSTAFF FIRE DEPARTMENT

## RX FIRE PLAN

_____
**(Burn Location)**

_____
**(Burn Type)**

**PREPARED BY**

_____
**(Name)**

_____
**Date**

**I. GENERAL INFORMATION --**
- **A. Burn Goals**
- **B. Resource Management Goals**

**II. ORGANIZATION:**

**III. PUBLIC RELATIONS --**
- **A. Notices**
- **B. Individuals**
- **C. Sign(s)**
- **D. Cooperators**

**IV. MANAGEMENT INPUTS --**
- **A. General Information:**
  - **1. Ignition**
  - **2. Holding**
  - **3. Mop-up**
  - **4. Rechecks**
  - **5. Evaluation Procedures**
- **B. Safety Precautions**
- **C. Escape Triggers**

**V. ENVIRONMENTAL INPUTS --**
- **A. Forecast Smoke Dispersion**
- **B. Probability of Ignition**
- **C. Preferred weather forecast for 48 hrs following ignition:**

**VI. EXPECTED FIRE BEHAVIOR:**
- **A. "Phase of the Operational Period**
- **B. Flame Lengths**

# FLAGSTAFF FIRE DEPARTMENT

## *Rx Fire Briefing*

Burn Name: _____

1. Type: Broadcast Pile Other _____ Size: _____

2. Objectives: (circle all that apply)
   a. reduce piled fuel accumulations
   b. reduce 1 and 10 hour fuels by ___%
   c. minimize tree mortality to < ___%
   d. minimize scorch to residual trees
   e. other _____
   f. minimize smoke impacts

3. Burn Boss: _____ (See attached organization chart)

4. PPE and Safety equipment: _____

5. Location of Rx Fire/Smoke Signs:

6. Wx Forecast: Temp _____ RH _____ Cloud cover _____
   Wind Speed: _____ Direction _____ Haines Index _____

7. Hazards: _____
   _____

8. Smoke Impacts: _____
   _____
   **Smoke Sensitive Contacts Notified:**_____ (See list on back)

9. ***Safety Zones/Escape Routes:*** _____
   _____

10. Expected Fire Behavior: Flames: length _____ ROS _____
    Spotting: distance _____ Ign. Prob. ___

11. Communications: Primary _____
    Back-up _____

12. Escape/Cut off: Plan: _____
    _____
    _____
    _____

    Trigger Points: _____

# APPENDIX 5

## Tree Thinning and Debris-Piling Guidelines

# FLAGSTAFF FIRE DEPARTMENT

## *Tree Thinning & Debris Piling Guidelines*

==========

**The following guidelines are for contractors and property owners. Purpose is to standardize job performance, facilitate wood removal, allow for efficient slash disposal, ensure visual quality, and demonstrate quality operations.**

**THINNING:** ***All trees to be limbed, bucked, and stacked at the end of work day ****

- **Stumps shall be no higher than four (4) inches above ground level.**
- **All trees "hung-up" in another tree are to be pulled or cut immediately.**
- **Trees identified for cutting shall be cut unless doing so will endanger sawyer or damage property.**
- **All wood in excess of six (6) inches diameter (large end) shall be bucked into three (3) foot lengths and stacked – neatly and away from residual trees and slash piles. (EXCEPTION – longer lengths for poles or posts allowed if approved by property owner/City.)**

**PILING SLASH:** ***** All slash is to be piled at the end of work day ****

*Location:*

- **Place in open areas, at least ten (10) feet from residual trees or other combustibles (includes old stumps, large logs, other piles, etc).**
- **Avoid placing under powerlines or overhanging tree branches.**
- **NOTE: Extra trees may need to be cut to accommodate pile location: approval required of property owner/FFD.**

*Size:*

- **Shape shall resemble a cone.**
- **Minimum size shall be five (5) feet high x five (5) feet diameter.**
- **Large open areas may allow for larger piles, but in no case shall handpile be in excess of eight (8) feet high x eight (8) feet wide.**

*Construction:*

- **Start by layering tops and small branches: this material is be no more than four (4) feet in length.**
- **Add larger branches, no more than five (5) feet in length: large end toward top of pile.**
- **Compact pile – by standing on or pushing down material – in order to compress material.**
- **Finally, wood less than six (6) inches diameter (large end) and shorter than three (3) feet in length may be added to outside and top of pile. This material should never form the bulk of the pile.**

*Approval:*

- **Completed piles must be approved by FFD prior to completion of project.**

# APPENDIX 6

## Prescribed Fire Notices
## (+ Individual Permit/Certificate)

## ** NEIGHBORHOOD NOTICE **

# Prescribed Burn Operation

### Protecting Values-At-Risk

**The Flagstaff Fire Department will soon conduct a pile/broadcast burn of material on _____ immediately _____ of your neighborhood. The project is designed to reduce the risk of catastrophic wildfire.**

**Burning is dependent upon favorable weather conditions. Ignition may occur at any time in the near-future. Ignition will begin in mid-morning and be completed by early afternoon. Some smoke will be visible into the evening.**

**It is possible that more than one day may be required to complete the work. If so, the days will be staggered so as to reduce the impact of smoke on your neighborhood.**

**If you have questions regarding this, or other Fuel Management efforts, please contact the Flagstaff Fire Dept. at (928) 779-7688.**

# FLAGSTAFF FIRE DEPARTMENT

*ALARM & Cooperator*
*Prescribed Fire Notice*

---

**Burn Name: _____**

**Type Burn: _____ Size: _____**

**Ignition Date: _____ Ignition Time: _____**

**Distance and Bearing from Mt. Elden Lookout:**

**Location: District:**
**General Area:**
**Street Address:**
**Legal: T R S**

**Expected Duration: Flames -- _____**

**Smoke -- _____**

**Expected Fire Behavior: _____**

**Comments:**

Contact: _____ Telephone #: _____

## Property Owner's Information Sheet
# Following a Prescribed Burn

1. Fire Behavior Expectations:

   A. Duration of: Flame – _____ Smoke – _____

   B. Type of Activity Likely to be Observed: _____

2. You Should Be Concerned If:

   A. Active flame is next to line and/or sparks are blowing over the line.
   B. Flaming/smoldering material is rolling downhill across the line.
   C. You notice a general increase in activity over time, rather than a decrease.
   D. Fire is climbing up a tree – alive or dead.
   E. Fire has crossed the control lines.

3. Your Responsibilities:

   A. Monitor the fire on a daily basis by walking the perimeter and noting where the hot spots are.
   B. Answer any questions from curious neighbors.
   C. Call for help if needed.

4. Contacts:

   A. Responsible Fire Station: Sta. # ____ Phone: _____

   B. Paul Summerfelt
   Fuel Management Officer
   779-7688 x 7283 Office
   214-4808 pager

   Mark D. Shiery
   Asst. Fuel Management Officer
   213-5182 pager

   C. ALARM Dispatch Center: 911 (For Immediate Response by Fire Department Engine)

# FLAGSTAFF FIRE DEPARTMENT

## OPEN-BURN

***Hazardous Fuel Reduction***

---

**GENERAL:** TYPE: ____ **PERMIT (in City)**
____ **CERTIFICATE (out of City, but within Response area)**

**#: FM-_____**

---

**DATES:** Effective _____ ; Expires _____

**ISSUED BY:** **FLAGSTAFF FIRE DEPARTMENT**
**211 W. Aspen Ave**
**Flagstaff AZ 86001**
*(928) 779-7688*

**SITE INFORMATION:**

**Owner's Name:**
**Mailing Address:**
**Phone:**
**Property Location:**
**Type of Burn:** **Pile (# ____) / Broadcast (___ Acres)**
**Material to be burned:** **Needles, limbs, branches**

---

**EMISSION REDUCTION TECHNIQUES:**

**-- Utilize wood products (firewood, post-and-pole, etc)**
**-- Allow material to dry (minimum of 4 months)**
**-- Avoid "tight-packing" (needles only) and inclusion of soil in piled material**
**-- Extinguish material at end-of-day**

---

## REQUIREMENTS:

**1. PRIOR TO IGNITION, APPLICANT MUST:**

**A. Contact property owners immediately adjacent to burn-site advising them of planned operation.**

**B. Contact:**

**1) ALARM (City Dispatch) – 774-1414, and**

**2) Fire Station: #1 – 556-1270 #2 – 556-1272**
**#3 – 526-2644 #4 -- 526-2550**
**#5 – 556-1274 #6 – 556-1326**

**Be prepared to give the following information:**
**-- # (FM-_____)**
**-- Location of burn**
**-- Your Name (Responsible party)**
**-- Phone # where you can be reached during burning**
**-- Estimated time of ignition and completion**

**NOTE -- Applicant may proceed with ignition UNLESS permission is denied based upon the following:**

- **Fire Danger is too high to safely burn**
- **Smoke dispersal or winds for that day are unfavorable**
- **Emergency operations are underway elsewhere in the City/area.**

**3) FLAGSTAFF Dispatch (U.S. Forest Service) – 527-3552**

**2. DURING OPERATION:**

**A. The Responsible Party must be on-site at all times during burning, And must have the following items on-site:**

**-- A valid burn permit. (A copy is acceptable)**
**-- A shovel, rake, or similar tool for each adult on-scene**
**-- Immediate access to a phone should a fire emergency occur**

**B Only piled vegetation (ie - brush, needles, woody material) may be burned. No trash, petroleum products, hazardous materials, tires, etc., or other material that generates dense, black smoke may be involved.**

**C. Ignition is limited to the following times: 10:00 am to 2:00 pm**

**D. The following conditions are imposed:**

**1) On-site water source with sufficient hose to reach site, and a line, at least 18 inches wide, dug to mineral soil completely surrounding the burn pile. Line is to be no more than two feet from pile perimeter; <u>OR</u>**

**2) A minimum of two inches of snow cover that is not forecast to melt for at least 48 hours after ignition.**

**E. You may be directed to extinguish fire at any time should smoke become a problem or weather conditions pose an unacceptable risk.**

**3. UPON COMPLETION:**

***A.*** **Each day, applicant MUST re-contact:**
**1) ALARM**
**2) Fire Station # __**

**B. No later than April 15th, complete the report shown below and return it by either method:**

**By Mail: FFD-FMO**
**211 W. Aspen**
**Flagstaff AZ 86001**

**By FAX: 928-779-7668**

---

## <u>OPEN BURN REPORT</u>

**NAME:** _____
**#:** **FM-**_____
**DATE Submitted** _____
**DATE(s) of Burning:** _____