Providing a voice for the voiceless

Utah Environmental Congress

February 6, 2004

Diane Freeman,
South Fork Vegetation Treatment Project Team Leader
115 East 900 North
Richfield, UT 84701

Dear Ms. Freeman,

The Utah Environmental Congress (UEC) appreciates this opportunity to provide substantive comments in response to the January 15, 2004 scoping letter we received for the proposed South Fork Vegetation Treatment Project. Please include our comments in the project record and respond to the issues we raise in the development of the site-specific environmental analysis.

Purpose and Need

The analysis for this project should start with a more clearly stated purpose and need. Page two of the scoping letter stats that "The purpose of the proposed action is to reduce the susceptibility of stands to spruce beetle attack and the build up of local populations and to reduce hazardous fuels around private lands east of LeBaron Lake." This description of the purpose sounds three-fold:

- To reduce the susceptibility of these forests to spruce beetle attack.
- To reduce the size of the currently-existing beetle population.
- To reduce the amount of hazardous fuels near the private in-holding

The need for the project is a bit more ambiguous and should be clearly defined. It sounds like the need is to:

- Improve the overall forest health of the remaining adjacent stands of forest.
- Reduce the risk of ignition of an uncharacteristic wildfire on public land that could spread onto the private in-holding. (However, concern about the risk to privately-owned structures is not specifically mentioned.)

If our assessment of the purpose and/or the need for this proposal is incorrect, then we ask that the site-specific environmental analysis clarify this with a well-worded Purpose and Need. We would also like to point out that the proposed treatment units are primarily north, south and west of LeBaron Lake, and not to the east.

Wildfire and spruce beetles

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Throughout the scoping letter there is repeated evidence that the forest is relying upon a basic assumption that is scientifically controversial. The assumption is that Engelmann spruce (ES) stands with a history of high beetle mortality have an increased risk of catastrophic fire. (For example: "The dead and dying trees also create hazardous fuels that could result in uncharacteristically intense and severe wildland fire if a fire were to occur in the area."[1]) We understand that it has been shown that when compared to green ES, recently killed ES that have not yet dropped their needles (sometimes referred to as 'reds') present an increased risk of ignition and spread of stand replacement fire. However, research indicates that dead ES that have dropped their needles may more often present a lower risk of ignition and spread of stand replacement fire than both green and recently killed ('red') ES. We ask that the Forest conduct a rigorous review of the available peer reviewed literature that informs this controversy. The results and analysis of that search should be included in the site-specific environmental analysis that is developed for this project. As a starting point for that search and analysis, we ask that the following two journal articles be included because they researched the fire – beetle relationship in ES dominated subalpine forest in the northern portion of the Utah High Plateaus Eco-Region.

1. A 2003 publication in the journal Ecology presented research that did "not support the long-standing notion that insect-caused mortality increases fire risk, which is also an important consideration in modern forest management following insect outbreaks."[2] This study also found that many decades after the stand replacing beetle event, the intensity of fire was not higher, and may even have been less, when compared to equivalent unaffected nearby ES-dominated stands. The authors also found that despite increases in the dead fine fuels in the beetle-killed ES stands, the fire density had not subsequently increased. These are significant scientific findings that should directly inform this site-specific environmental analysis.

2. In a separate publication in the Journal of Biogeography, these scientists concluded that, "The Lack of increased fire spread or occurrence in beetle-affected stands suggests that a response of fire-hazard mitigation following outbreak may not be necessary in order to maintain a normal fire hazard."[3] Furthermore, in regards to lower intensity wildfires, this research concludes that: "Beetle outbreaks may have a counter-intuitive effect on the potential of low-severity fire to spread. Stands affected by beetle outbreak may experience increased moisture as suggested by the proliferation of mesic under-story herbs (Reid, 1989),[4] and this increase in moisture may actually decrease the potential of low-severity fire to spread in beetle-affected stands." Given NEPA's mandate for rigorous analysis, this research (and subsequent analysis) should be incorporated into this analysis, especially since it casts scientific controversy on assumptions that are being made in the development of this project.

Migratory Bird Treaty Act, Executive Order 13186, and Neotropical migrants

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[1] Scoping letter, page 1

[2] Bebi, P., D. Kulakowski, and T.T. Veblen. 2003. Interactions between fire and spruce beetles in a subalpine Rocky Mountain forest landscape. Ecology 84(2): 362-371. Ecological Society of America

[3] Bebi, P., D. Kulakowski, and T.T. Veblen. 2003. Effects of fire and spruce beetle outbreak legacies on the disturbance regime of a subalpine forest in Colorado. Journal of Biogeography, 30, 1445-1456.

[4] Reid, M. (1989) the response of understory vegetation to major canopy disturbance in the subalpine forests of Colorado. Masters Thesis, University of Colorado, Boulder.

The Migratory Bird Treaty Act (MBTA) makes it unlawful to take, kill, or possess migratory birds, their parts, nests, or eggs.[5] Executive Order 13186 issued in January of 2001 re-instituted the responsibilities of Federal agencies to comply with the MBTA. It is well known that many migratory bird species are currently declining across this region. Compliance with both the MBTA, and Executive Order 13186 is critical for this project.

We recommend the agency conduct a rigorous evaluation using the newest data and research to minimize impacts to migratory birds (and their habitat), including (but not necessarily limited to) a focus on species on the 2002 List of Birds of Conservation Concern and species that are listed among the Partner's in Flight Priority Species. To help meet responsibilities under Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds), we recommend you conduct activities outside critical breeding seasons for migratory birds, minimize temporary and long-term habitat losses, and mitigate all unavoidable habitat losses. If your activities occur in the spring or summer (as is proposed in the scoping letter), we recommend you conduct surveys for migratory birds to assist you in your efforts to comply with the Migratory Bird Treaty Act (16 U.S.C. 703-712) and E.O. 13186. If some portion of your mitigation includes off-site habitat enhancement, it should be in-kind and either within the watershed of the impacted habitat or within the foraging range of the habitat-dependent species.

We remind the Forest that agencies are instructed to "develop and implement, within 2 years, a Memorandum of Understanding (MOU) with the Fish and Wildlife Service (Service) that shall promote the conservation of migratory bird populations." (EO 13186 § 3) Has a current MOU been signed by both agencies? If so, we request a copy be provided within (or as an appendix to) this site-specific environmental analysis, and not simply included in the project file.

Project area

We do appreciate that the Forest provided a functional map with this scoping notice. However this map (and the maps posted on the Fishlake web site) does not indicate that there is a project area boundary. The Forest should include a project area boundary for use in this analysis and mark it clearly on the maps made available to the public. We request an opportunity to provide additional substantive comments after a project area boundary has been made available.

Properly Functioning Condition (PFC) Assessments

The Regional PFC assessment concluded that on a landscape scale Engelmann spruce and mixed conifer forests should have a mixed fire regime, with a mixed severity regime on a 50-80 year cycle and lethal fire regimes on a 100-300 year cycle.[6] The Fire Occurrence map on your web site indicates that there have been very few medium or high intensity fires in the proposed treatment units. Since the proposed action is designed to reduce the risk of large stand replacing wildfires, we are concerned that the proposed action will move the disturbance regime in this area on a trajectory that is even farther out of the historical range of variability. We would like to know when the last mixed severity fire was in each treatment unit, and when the last stand

[5] 16 U.S.C. § 703-712.
[6] Properly Functioning Condition, January 7 2000 Version

replacement fire occurred in each treatment unit. If it has been 100 to 300+ years in any of this area, why is the Forest considering implementing a project that would inhibit stand replacement fires, moving the disturbance regime farther from the historical range? Why is the Forest not proposing prescribed stand replacement and/or medium intensity fires to restore the historical disturbance regime?

We understand that research has found that historic stand replacement fires in this part of the region have periodically approached 400,000 acres in size, and that there is some evidence of this fire history in the stands across the Beaver Ranger District. Since this project is largely an attempt to avoid large fires, the Forest should do a thorough review of the available scientific literature and include the results of that review in the site-specific environmental analysis. This should be accompanied by a rigorous discussion of how any findings from that review should inform the development of the Purpose and Need, Action Alternatives, and the analysis of the Cumulative Effects. We ask that any gaps in the available base of knowledge be highlighted, and the Forest should consider collection of original data that would adequately inform the analysis.

There is a substantial aspen component in 4 out of the 6 treatment units. Aspen is known to be in decline in this area and most assessments (including the PFC) consistently conclude that this is largely due to suppression of stand replacing events such as wildfire and spruce beetle outbreaks. How would the proposed actions affect the trend of aspen decline in this area? How would the proposed actions move the aspen component in the area towards PFC?

Paradigms of forest succession used in the environmental analysis

In site-specific environmental analyses, the Forest Service has a history of relying upon deterministic paradigms of forest succession rooted in Clements's historic research in the Indiana dunes. More recent ecological research has indicated that many forest ecosystems may actually follow more stochastic successional pathways. Will the environmental analysis for this project rely on deterministic or stochastic models of ecosystem succession, or a combination of both? What was the logic behind that decision? The environmental analysis should explore this issue as it relates to assumptions and values that are made about: (1) historic conditions, (2) current conditions and, (3) successional trajectories that may be promoted by the range of alternatives.

Compartmentalizing of actions

We are aware that the Beaver Ranger District has been developing a project in aspen/mixed conifer forests (with an extensive commercial logging component) just north of this proposal, near Elk Meadows and Grizzly Ridge. Detailed maps of the proposed cutting units have been prepared and the analysis has been underway for several years. We are concerned that adjacent commercial logging projects may be separated into separate NEPA analyses, and this might result in illegal compartmentalization of the analyses and an insufficient cumulative effects analysis. Has the Forest considered combining these adjacent projects into one NEPA analysis, and if not, why?

Structure ignition

Is a part of the purpose and need for this project to prevent/ protect improvements from destruction when the next wildfire occurs? If not, why? If so, then we recommend that the proposed action(s) be reconsidered with an eye towards reducing the probability of structure ignition. The vegetation types and structure historically present in the area are adapted to be dependent upon stand-replacement fire regimes that are hot and hard to contain. We believe that this aspect of the project should focus on questions such as "How do we best prepare the people and improvements in this area so that they survive the next wildfire?" … and avoid futile questions such as "How can we prevent/hinder the occurrence of stand replacement wildfires?"

Recent USDA Forest Service research done by Jack Cohen and others indicates that home losses in these forest types can be most effectively reduced by focusing on reducing structure ignitability and fuels in the immediate surroundings (30-60 meters). In USDA Forest Service General Technical Report PSW-GTR-173. 1999, Cohen's research indicated that:

> "The evidence suggests that wildland fuel reduction for reducing home losses may be inefficient and ineffective: inefficient because wildland fuel reduction for several 100 meters or more around homes is greater than necessary for reducing ignitions from flames; ineffective because it does not sufficiently reduce firebrand ignitions."

The research concluded that the direct implications for management activities in the WUI are substantial.

> "The congruence of research findings from different analytical methods suggests that home ignitability is the principal cause of home losses during wildland fires. Any WUI home fire loss assessment method that does not account for home ignitability will be critically non-specific to the problem."

We included this research as attachment #2 because it should inform the decisions to be made with this proposal. We also ask that the Forest incorporate the research and recommendations found in attachment #2, "Wildland-Urban Fire – A Different Approach" and the supporting technical information found at www.firelab.org into this analysis. Furthermore, information found on the Fire Wise web page (www.firewise.org) and by Cohen in 2000[7] indicates that the most common heat source leading to home ignition during wildfires is from firebrands originating as far as one mile away. Research indicates that fuel reduction activities away from the immediate area surrounding structures will do nothing to reduce this most common source of heat leading to structure ignition.

Forest Plan Revision, Roadless Areas and Proposed Wilderness

The Fishlake National Forest is revising its Forest Plan. As a part of that process the Forest is currently producing a draft roadless area inventory to be evaluated for wilderness recommendations to Congress. Forest Planners have indicated that a new draft roadless area

[7] Cohen, J. 2000. Preventing disaster: Home ignitability in the Wildland-Urban Interface. Journal of Forestry 98:15-21.

inventory will be released for public viewing and comment within the month.[8] While we are aware of the fact that none of the proposed treatment units are inside the boundaries of nearby IRAs, we are concerned that land qualifying as roadless on the ground would be entered and harvested in the proposed action. Federal courts have found that this would be an irreversible and irretrievable commitment of resources, and we also believe that it would be strong evidence of biased decision making during your Forest Plan Revision.

To address this concern, we strongly encourage the Forest to modify all action alternatives (including the proposed action) such that there are no mechanical treatments inside the pink cross-hatched areas on the attached map #1. The pink cross-hatching represents the lands in this area that the UEC found to qualify as roadless land to be evaluated for wilderness, pursuant to chapter 7 of FSH 1909.12. We have already submitted GIS coverage to the Forest as comments for the active Forest Plan Revision, and we hereby incorporate that coverage into our comments on this project.

On January 20th, the UEC announced our state-wide Citizen's National Forest wilderness proposal. Earlier in January, we mailed a GIS copy of our Citizen's National Forest wilderness proposal to the Fishlake National Forest Supervisor, and we hereby incorporate that coverage into these comments.[9] If any of the proposed treatment units do enter this wilderness proposal,[10] then we ask the Forest to exclude those affected areas from all action alternatives.

Other Action Alternatives

In addition to modifying the proposed action to stay out of qualifying roadless lands and proposed wilderness, we request that more action alternatives be developed that do not involve such extensive commercial harvest. We would like to recommend that the following two additional action alternatives be included in the analysis.

1) An action alternative that incorporates the following components:

- No road construction, temporary or otherwise. Road access to the area is already extensive.
- No patch cuts and no shelterwood harvests (with or without reserves). There already is an abundance of forest science research on these harvest methods in subalpine forest types. Patch and shelterwood harvest are known to increase ES susceptibility to wind throw. These harvest methods are also associated with increases in undesirable root diseases and tree damage. There are other more appropriate silvicultural techniques to address beetle concerns.
- Consider use and study of various trap tree designs, and compare effectiveness with an adaptive approach, assessed yearly, for a period of 5 years. Recent research by Bentz and

[8] E-mail correspondence and meeting notes for the Roadless/Wilderness TWiG group.
[9] We also have PDF maps and GIS coverage of our roadless area inventory and the Citizen's National Forest wilderness proposal posted to our web page (www.uec-utah.org)
[10] It is not clear at first glance, but it appears that parts of Dry Hollow and Anderson treatment units may enter our Wilderness proposal.

Munson established that this can be highly effective in reducing spruce beetle populations.[11]

- Consider use of limited and well-timed sanitation treatments aimed only at reducing beetle populations and not the stand basal area. Research shows that sanitation treatment is only effective (in reducing beetle populations) for a short window of time, when the beetles/larvae from both brood years are still in the trees. (For example, in some areas this is thought to be the first two weeks of August, and harvest after that does not reduce the beetle population.)
- Consider use and study of a range of different pheromone traps and trap locations. As indicated in Bentz and Munson (2000), effectiveness of pheromone traps was beneficial, but with mixed results – especially in relation to incidental trapping of Clerid beetles. Intelligent project design with this alternative may yield quantitative data that could provide constructive input to future management and pheromone trap design.
- To address current aspen decline and the associated (aspen, spruce, fir) movement away from PFC, consider implementing passive restoration and study its effectiveness in promoting increased vigor of aspen regeneration. Some passive methods could include prescribed natural stand replacement fire and extended rest/exclosure from domestic livestock.
- Evaluate the ignitability of all structures on public and private lands in the area in accordance with the Fire Wise principles. For example, how ignitable are the roof, walls, and deck of structures in the area, on both private and public land? If any do not meet the Fire Wise principles, we recommend that the ignitability of each structure be reduced according to Fire Wise principles (i.e. metal roofing and siding). For alternative materials, you could consider recent FEMA/OES/OSFM research (www.ucfpl.ucop.edu/WDFIRERResearch.htm). Funding for this should be able to be obtained from the National Fire Plan, or other sources.
- Evaluate the landscaping immediately surrounding each structure for ignitability. Where needed, install aesthetically pleasing, native landscaping with low ignition potential.
- Within 30-60 meters of structures, consider where appropriate the benefits/opportunities for non-commercial pruning of the lower branches of larger trees, as opposed to harvest and removal.

2) The second action alternative that we recommend for inclusion in the analysis would be designed to more actively move the poorly regenerating aspen, spruce and fir in the project area towards the PFC.

- The same design as #1 (above), but with the following modifications:
    - Evaluate all structures for ignition potential and implement Fire Wise principles.
    - Prescribed ignition of a stand replacement fire to stimulate a natural mosaic of aspen and conifer regeneration. Use natural regeneration, and rest from domestic grazing until successful regeneration is guaranteed.
    - Actively monitor for beetle population trends. Implement trap trees and pheromone traps as indicated in #1 above.

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[11] Appl. For. 15(3):122-128

Management Indicator Species (MIS)

The Fishlake Forest Plan selected a number of MIS. To best inform the public and the responsible official, the environmental analysis for this project should individually list, disclose, and analyze the population and trend data for all of your MIS, at the project level and at the Forest scale. As you know, MIS act as an umbrella to represent a host of other species. While particular MIS may not be in the project area, potential impacts to MIS would be the same as potential impacts to the species that actually do exist in the project area.

We are especially interested in seeing that the trend data is rigorously analyzed for each of your MIS. Has this been established yet in the project area and at the Forest level? If not, we encourage the Forest to begin collecting this data now so that the Forest will eventually be in compliance with the NFMA and your Forest Plan. Do you have enough data for, and have you run a statistical analysis to determine statistically significant correlations to habitat alteration? What statistical tools do you prefer to use in that process and why? Which ones did you use?

Other important wildlife species

The Fishlake NF is required by NFMA's implementing regulations and other laws to monitor and maintain at least the minimum viable population of all native and desirable non-native wildlife and plants, *including amphibians and tall forbs*. Results from past UEC FOIA requests for monitoring data indicate that the monitoring required by these regulations has not been completed. The Forest needs to do this monitoring and demonstrate in this environmental analysis that minimum viable populations can be attained before implementing the proposed commercial harvest treatments.

Land near this project have been identified by UDWR as critical elk calving grounds, and all of the cutting units are identified as high value summer habitat for elk and high value year long habitat for black bear. This area may also provide important habitat components for Peregrine falcon, Merlin, Kestrel, Golden eagle, and Bald eagle. Effects to these species and their habitats should be considered in the analysis of the affects to the environment. The UEC also recommends that the Fishlake NF consult with UDWR on habitat issues.

How will the proposed actions affect old growth conditions in the area? This analysis should include an assessment and discussion of the extent and quality of the old growth component in the area, and explain how the proposed action would affect that old growth.

Need to prepare an Environmental Assessment (EA) or Environmental Impact Statement (EIS)

The scoping letter does not specifically state whether the Forest anticipates Categorically Excluding (CE) this project in a Decision Memo or if an EA/EIS will be prepared. However, given the large extent of the proposed actions and the numerous affects to the human environment and extraordinary circumstances, we believe that your Directive system[12] and

[12] "If scoping indicates that extraordinary circumstances are present and it is uncertain that the proposed action may have a significant effect on the environment, prepare an EA. If scoping indicates that the

extensive federal case law indicates the need to prepare an EIS, or at least an EA to determine if an EIS needs to be developed.

Roads

36 CFR part 212.1 defines New Road Construction as follows: "Activity that results in the addition of forest classified **or temporary road miles**." **(Emphasis added)** The proposed action involves the construction and reconstruction of many miles of roads and/or temporary roads. The roads management portion of the proposed action triggers the need for this analysis to be informed by your Forest Scale Roads Analysis Report (that analyzed maintenance level 1-3 roads) and a project level Roads Analysis Report that analyzes other roads. As stated in our March 18, 2002 letter to the Beaver District Ranger, we would like to be contacted with an opportunity to provide public input in all Roads Analysis Processes that are initiated on this District.

This should include an accurate and comprehensive assessment of the impacts of current road densities (and proposed road densities) on game and non game wildlife, TES and proposed species for the time period before, during, and after implementation of the proposed action. The roads analysis and the EA/EIS should show the results of a rigorous review of the scientific literature. FSM 7712.11 makes it clear that each Roads Analysis Process and Report must use current and relevant scientific literature concerning the effects of roads. In addition to your own review of the literature, we ask that the Forest consider using the attached list (attachment # 4) of relevant studies and articles during the development of this Roads Analysis Report.

To adequately fulfill the intent of the Roads Analysis process, the Forest should first systematically collect information on the existing unclassified roads in the analysis area. This was not done in the Forest scale Roads Analysis Report. An accurate inventory and map of the unclassified roads will also be needed in order to adequately inform the public and the responsible official of the conditions on the ground when evaluating the decisions to be made with this project.

We appreciate this opportunity to provide substantive comments on this proposal. Being a very special and unique area, the Tushar Mountains are deserving of the most intelligent and well-informed management possible. We look forward to providing additional substantive comments as this environmental analysis progresses. Please keep us on this and all Fishlake National Forest mailing lists.

Sincerely,

Kevin Mueller,
Program/Roadless Area Coordinator

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proposed action may have a significant environmental effect, prepare and EIS" (FSH 1909.15, chapter 30.3 policy (3))

Attachment 2

Reducing the Wildland Fire Threat to Homes: Where and How Much?[1]

Jack D. Cohen[2]

Abstract

Understanding how ignitions occur is critical for effectively mitigating home fire losses during wildland fires. The threat of life and property losses during wildland fires is a significant issue for Federal, State, and local agencies that have responsibilities involving homes within and adjacent to wildlands. Agencies have shifted attention to communities adjacent to wildlands through pre-suppression and suppression activities. Research for the Structure Ignition Assessment Model (SIAM) that includes modeling, experiments, and case studies indicates that effective residential fire loss mitigation must focus on the home and its immediate surroundings. This has significant implications for agency policy and specific activities such as hazard mapping and fuel management.

The threat of life and property losses during wildland fires is a significant issue for Federal, State, and local fire and planning agencies who must consider residential development within and adjacent to wildlands. The 1995 USDA Forest Service *Strategic Assessment of Fire Management* (USDA Forest Service 1995) lists five principal fire management issues. One of those issues is the "loss of lives, property, and resources associated with fire in the wildland/urban interface" (p. 3). The report further identifies "the management of fire and fuels in the wildland/urban interface" as a topic for further assessment. Because this is more than a Forest Service issue, the National Wildland/Urban Interface Fire Protection Program, a multi-agency endeavor, has been established for over a decade and is sponsored by the Department of Interior land management agencies, the USDA Forest Service, the National Association of State Foresters, and the National Fire Protection Association. This program also has an advisory committee associated with the multi-agency National Wildfire Coordinating Group. These examples indicate that the wildland fire threat to homes significantly influences fire management policies and suggests that this issue has significant economic impacts through management activities, direct property losses, and associated tort claims.

The wildland fire threat to homes is commonly termed the wildland-urban interface (W-UI) fire problem. This and similar terms (e.g., wildland-urban intermix) refer to an area or location where a wildland fire can potentially ignite Homes. A senior physicist at the Stanford Research Institute, C.P. Butler (1974), coined the term "urban-wildland interface" and described this fire problem:

> In its simplest terms, the fire interface is any point where the fuel feeding a wildfire changes from natural (wildland) fuel to man-made (urban) fuel. ...For this to happen, wildland fire must be close enough for its flying brands or flames to contact the flammable parts of the structure (p. 3).

In his definition, Butler provides important references to the characteristics of this problem. He identifies homes ("urban") as potential fuel and indicates that the distance between the wildland fire and the home ("close enough") is an important factor for structure ignition. How close the fire is to a home relates to how much heat the structure will receive.

[1] An abbreviated version of this paper was presented at the Symposium on Fire Economics, Policy, and Planning: Bottom Lines, April 5-9, 1999, San Diego, California.

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These two factors, the homes and fire proximity, represent the fuel and heat "sides" of the fire triangle, respectively. The fire triangle—fuel, heat, and oxygen— represents the critical factors for combustion. Fires burn and ignitions occur only if a sufficient supply of each factor is present. By characterizing the home as fuel and the heat from flames and firebrands, we can describe a home's ignitability. An understanding of home ignitability provides a basis for reducing potential W-UI fire losses in a more effective and efficient manner than current approaches.

Ignition and Fire Spread are a Local Process

Fire spreads as a continually propagating process, not as a moving mass. Unlike a flash flood or an avalanche where a mass engulfs objects in its path, fire spreads because the locations along the path meet the requirements for combustion. For example, C.P. Butler (1974) provides an account from 1848 by Henry Lewis about pioneers being caught on the Great Plains during a fire:

> When the emigrants are surprised by a prairie fire, they mow down the grass on a patch of land large enough for the wagon, horse, etc., to stand on. They then pile up the grass and light it. The same wind, which is sweeping the original fire toward them, now drives the second fire away from them. Thus, although they are surrounded by a sea of flames, they are relatively safe. Where the grass is cut, the fire has no fuel and goes no further. In this way, experienced people may escape a terrible fate (p. 1-2).

It is important to note that the complete success of this technique also relies on their wagons and other goods not igniting and burning from firebrands. This account describes a situation that has similarities with the W-UI fire problem.

A wildland fire does not spread to homes unless the homes meet the fuel and heat requirements sufficient for ignition and continued combustion. In the prairie fire situation, sufficient fuel was removed (by their escape fire) adjacent to the wagons to prevent burning (and injury) and the wagons were ignition resistant enough to not ignite and burn from firebrands. Similarly, the flammables adjacent to a home can be managed with the home's materials and design chosen to minimize potential firebrand ignitions. This can occur regardless of how intensely or fast spreading other fires are burning. Reducing W-UI fire losses must involve a reduction in the flammability of the home (fuel) in relation to its potential severe-case exposure from flames and firebrands (heat). The essential question remains as to how much reduction in flammables (e.g., how much vegetative fuel clearance) must be done relative to the home fuel characteristics to significantly reduce the potential home losses associated with wildland fires.

Insights for Reducing Ignitions from Flames

Recent research provides insights for determining the vegetation clearance required for reducing home ignitions. Structure ignition modeling, fire experiments, and W-UI fire case studies provide a consistent indication of the fuel and heat required for home ignitions.

The Structure Ignition Assessment Model (SIAM) (Cohen 1995) assesses the potential ignitability of a structure related to the W-UI fire context. SIAM calculates the amount of heat transferred to a structure from a flame source on the basis of the flame characteristics and the flame distance from a structure. Then, given this thermal exposure, SIAM calculates the amount of time required for the occurrence of wood ignition and flaming (Tran and others 1992). On the basis of severe-case assumptions of flame radiation and exposure time, SIAM calculations indicate that large wildland flame fronts (e.g., forest crown fires) will not ignite wood surfaces (e.g., the typical variety of exterior wood walls) at distances greater than 40 meters (Cohen and Butler [In press]). For example, the incident radiant heat flux, the amount of radiant heat a wall would receive from flames, depends on its distance from the fire. That is, the rate of radiant energy

per unit wall area decreases as the distance increases (*fig. 1.*). In addition, the time required for a wood wall to ignite depends on its distance from a flame front of the given height and width (*fig. 1*). But the flame's burning time compared to the required ignition time is important. If at some distance the fire front produces a heat flux sufficient to ignite a wood wall, but the flaming duration is less than that required for ignition, then ignition will not occur. At a distance of 40 meters, the radiant heat flux is less than 20 kilowatts per square meter, which corresponds to a minimum ignition time of greater than 10 minutes (*fig. 1*). Crown fire experiments in forests and shrublands indicate that the burning duration of these large flames is on the order of 1 minute at a specific location.[3] This is because these wildland fires depend on the rapid consumption of the fine dead and live vegetation (e.g., forest crown fires).

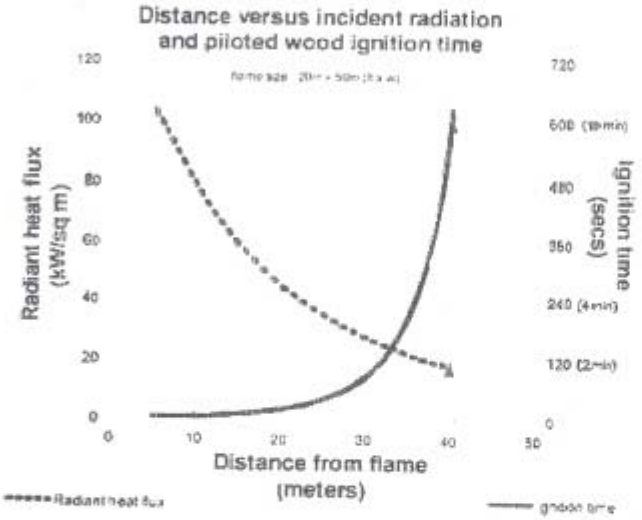

Figure 1
SIAM calculates the incident radiant heat flux (energy/unit-area/time reaching a surface) and the minimum time for piloted ignition (ignition with a small ignition flame or spark) as a function of distance for the given flame size. The flame is assumed to be a uniform, parallel plane, black body emitter.

Experimental fire studies associated with the International Crown Fire Modeling Experiment (Alexander and others 1998) generally concur with the SIAM calculations. Data were obtained from instrumented wall sections that were placed 10 meters from the forest edge of the crown fire burn plots. Comparisons between SIAM calculations and the observed heat flux data indicate that SIAM overestimates the amount of heat received.[4] For example, the SIAM calculated potential radiant heat flux for an experimental crown fire was 69 kW/ sq meter as compared to the measured maximum of 46 kW/sq meter. This is expected since SIAM assumes a uniform and constant heat source and flames are not uniform and constant. Thus, the SIAM calculations for an actual flame front represent a severe-case estimate of the heat received and the potential for ignition. The SIAM distances represent an upper estimate of the separation required to prevent flame ignitions (*fig. 1*).

Past fire case studies also generally concur with SIAM estimates and the crown fire observations. Analyses of southern California home losses done by the Stanford Research Institute for the 1961 Belair-Brentwood Fire (Howard and others 1973) and by the University of California, Berkeley, for the 1990 Painted Cave Fire (Foote and Gilless 1996) are consistent with SIAM estimates and the experimental crown fire data. Given nonflammable roofs, Stanford Research

[3] Unpublished data on file, Rocky Mountain Research Station, Fire Sciences Laboratory) Missoula, Montana.

[4] Unpublished data on file, Rocky Mountain Research Station, Fire Sciences Laboratory, Missoula, Montana.

Institute (Howard and others 1973) found a 95 percent survival with a clearance of 10 to 18 meters, and Foote and Gilless (1996) at Berkeley found 86 percent home survival with a clearance of 10 meters or more.

The results of the diverse analytical methods are congruent and consistently indicate that ignitions from flames occur over relatively short distances—tens of meters not hundreds of meters. The severe-case estimate of SIAM indicates distances of 40 meters or less. Experimental wood walls did not ignite at 10 meters when exposed to experimental crown fires. And, case studies found that vegetation clearance of at least 10 meters was associated with a high occurrence of home survival.

As previously mentioned, firebrands are also a principal W-UI ignition factor. Highly ignitable homes can ignite during wildland fires without fire spreading near the structure. This occurs when firebrands are lofted downwind from fires. The firebrands subsequently collect on and ignite flammable home materials and adjacent flammables. Firebrands that result in ignitions can originate from wildland fires that are at a distance of 1 kilometer or more. For example, during the 1980 Panorama Fire (San Bernardino, California), the initial firebrand ignitions to homes occurred when the wildland fire was burning in low shrubs about 1 kilometer from the neighborhood. During severe W-UI fires, firebrand ignitions are particularly evident for homes with flammable roofs. Often these houses ignite and burn without the surrounding vegetation also burning. This suggests that homes can be more flammable than the surrounding vegetation. For example, during the 1991 fires in Spokane, Washington,[5] houses with flammable roofs ignited without the adjacent vegetation already burning. Although firebrands may be lofted over considerable distances to ignite homes, a home's materials and design and its adjacent flammables largely determine the firebrand ignition potential.

Research Conclusions

SIAM modeling, crown fire experiments, and W-UI fire case studies show that effective fuel modification for reducing potential W-UI fire losses need only occur within a few tens of meters from a home, not hundreds of meters or more from a home. This research indicates that home losses can be effectively reduced by focusing mitigation efforts on the structure and its immediate surroundings. Those characteristics of a structure's materials and design and the surrounding flammables that determine the potential for a home to ignite during wildland fires (or any fires outside the home) can be referred to as home ignitability.

The evidence suggests that wildland fuel reduction for reducing home losses may be inefficient and ineffective: inefficient because wildland fuel reduction for several 100 meters or more around homes is greater than necessary for reducing ignitions from flames; ineffective because it does not sufficiently reduce firebrand ignitions. To be effective, given no modification of home ignition characteristics, wildland vegetation management would have to significantly reduce firebrand production and potentially extend for several kilometers away from homes.

Management Implications

These research conclusions redefine the W-UI home fire loss problem as a home ignitability issue largely independent of wildland fuel management issues. Consequently, this description has significant implications for the necessary actions and economic considerations for fire agencies.

One aspect of the Forest Service approach to reducing the W-UI fire problem is to determine where the problem is and focus fuel management activities in those areas. *The Strategic Assessment of Fire Management* (USDA Forest Service 1995) states:

[5]Unpublished video data on file, Rocky Mountain Research Station, Fire Sciences Laboratory, Missoula, Montana.

> The Forest Service should manage National Forest lands to mitigate hazards and enhance the ability to control fires in the wildland/urban interface. The risk of wildland fire to communities can be lessened by reducing hazards on Forest Service lands adjacent to built-up areas.... Broad-scale assessment processes for the next generation of forest plans should identify high-risk areas related to the wildland/urban interface... The highest risk areas within the United States should be identified and mitigation efforts directed to these locations (p. 20).

It describes a costly, intensive, and extensive W-UI hazard mapping and mitigation effort specifically for reducing home fire losses. As described, this approach is not necessary.

The congruence of research findings from different analytical methods suggests that home ignitability is the principal cause of home losses during wildland fires. Any W-UI home fire loss assessment method that does not account for home ignitability will be critically non-specific to the problem. Thus, to be reliable, land classification and mapping related to potential home loss must assess home ignitability. Home ignitability also dictates that effective mitigating actions focus on the home and its immediate surroundings rather than on extensive wildland fuel management. Because homeowners typically assert their authority for the home and its immediate surroundings, the responsibility for effectively reducing home ignitability can only reside with the property owner rather than wildland agencies.

Mapping Home Loss Potential

The evidence indicates that home ignitions depend on the home materials and design and only those flammables within a few tens of meters of the home (home ignitability). The wildland fuel characteristics beyond the home site have little if any significance to W-UI home fire losses. Thus, the wildland fire threat to homes is better defined by home ignitability, an ignition and combustion consideration, than by the location and behavior of potential wildland fires.

Home ignitability has implications for identifying W-UI fire problem areas and suggests that the geographical implication of the term "wildland-urban interface" as a general area or zone misrepresents the physical nature of the wildland fire threat to homes. The wildland fire threat to homes is not where it happens related to wildlands (a location) but how it happens related to home ignitability (the combustion process). Therefore, to reliably map W-UI home fire loss potential, home ignitability must be the principal mapping characteristic.

Wildland Fuel Hazard Reduction

Extensive wildland vegetation management does not effectively change home ignitability. This should not imply that wildland vegetation management is without a purpose and should not occur for other reasons. However, it does imply the imperative to separate the problem of the wildland fire threat to homes from the problem of ecosystem sustainability due to changes in wildland fuels. For example, a W-UI area could be a high priority for extensive vegetation management because of aesthetics, watershed, erosion, or other values, but not for reducing home ignitability. Vegetation management strategies would likely be different without including the W-UI home fire loss issue. It also suggests that given a low level of home ignitability (reduced wildland fire threat to homes), fire use opportunities for sustaining ecosystems may increase in and around WUI locations.

W-UI Home Loss Responsibility

Home ignitability implies that homeowners have the ultimate responsibility for W-UI home fire loss potential. Because the ignition and flammability

characteristics of a structure and its immediate surroundings determine the home fire loss potential, the home should not be considered a victim of wildland fire, but rather a potential participant in the continuation of the wildland fire. Home ignitability, i.e., the potential for W-UI home fire loss, is the homeowner's choice and responsibility.

However, public and management perceptions may impede homeowners from taking principal responsibility. For example, the Federal Wildland Fire Management, Policy, and Program Review (1995) observes, "There is a widespread misconception by elected officials, agency managers, and the public that wildland/urban interface protection is solely a fire service concern" (p. 23). In the *Journal of Forestry*, Beebe and Omi (1993) concur, stating that, "Public reaction to wildfire suggests that many Americans want competent professionals to manage fire flawlessly, reducing the risks to life, property, and public lands to nil" (p. 24). These statements agree with Bradshaw's (1988) description of the societal roles in the W-UI problem. He observes that homeowners expect that fire protection will be provided by others. Contrary to these expectations for fire protection, the fire services have neither the resources for effectively protecting highly ignitable homes during severe W-UI fires, nor the authority to reduce home ignitability.

An Alternative

Specific to the W-UI fire loss problem, home ignitability ultimately implies the necessity for a change in the relationship between homeowners and the fire services. Instead of all pre-suppression and fire protection responsibilities reading with fire agencies, homeowners should take the principal responsibility for assuring adequately low home ignitability. The fire services become a community partner providing homeowners with technical assistance as well as fire response in a strategy of assisted and managed community self-sufficiency (Cohen and Saveland 1997). For success, this perspective must be shared and implemented equally by homeowners and the fire services.

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Attachment 3

Wildland-Urban Fire—A different approacn

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Abstract—Research results indicate that the home and its immediate surroundings within 100-200 feet (30-60 meters) principally determines the home ignition potential during severe wildland-urban fires. Research has also established that fire is an intrinsic ecological process of nearly all North American ecosystems. Together, this understanding forms the basis for a compelling argument for a different approach to addressing the wildland-urban fire problem. It argues for residential compatibility with wildland fire rather than the necessary prevention of fire encroachment on the community.

Wildland-urban fire occurs when a fire burning in wildland vegetation fuels gets close enough with its flames and/or firebrands (lofted burning embers) to potentially create ignitions of the residential fuels (Butler 1974). Residential fire destruction is the principal problem during wildland-urban fires, but homes that do not ignite do not burn. Recognizing the potential for wildland-urban home ignitions and preventing home ignitions is the principal challenge.

Understanding how homes ignite during wildland-urban fires provides the basis for appropriately assessing the potential for home ignition and thereby effectively mitigating wildland-urban fire ignitions. Fires do not spread by flowing over the landscape and high intensity fires do not engulf objects, as do avalanches and tsunamis. All fires spread by meeting the requirements for combustion—that is, a sufficiency of fuel, heat, and oxygen. In the context of severe wildland-urban fires, oxygen is not a limiting factor so this type of fire spreads according to a sufficiency of fuel and heat. Homes are the fuel and the heat comes from the flames and/or firebrands of the surrounding fires (*fig. 1*). Recent research (*fig. 2*) indicates that the potential for home ignitions during wildfires including those of high intensity principally depends on a home's fuel characteristics and the heat sources within 100-200 feet adjacent to a home (Cohen 1995; Cohen 2000; Cohen and Butler 1998). This relatively limited area that determines home ignition potential can be called the ***home ignition zone*** (*fig. 3*).

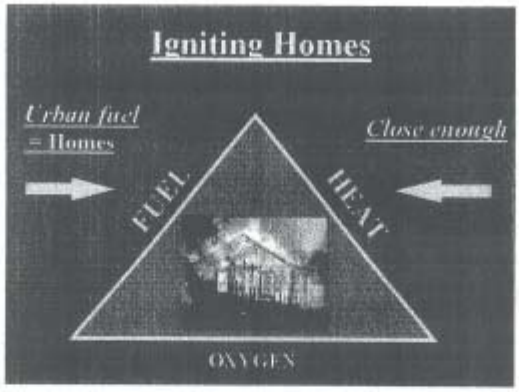
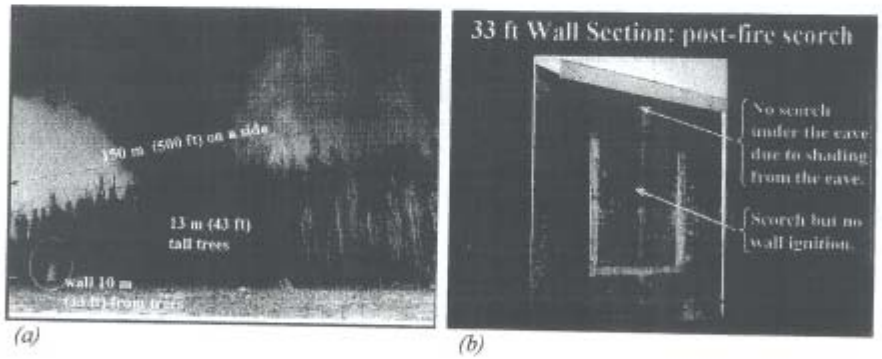


Figure 1—In the context of wildland-urban fires, the homes are the fuel. The heat comes from burning materials adjacent to the home (e.g., vegetation, wood piles, and buildings) and firebrands (lofted burning embers) on the home. How close flames are to the home and whether or not firebrands contact the home determines how much heat the home receives.



(a) *(b)*

Figure 2—Home ignition research over the last several years has exposed wall sections to crown fires. (a) Wall sections were placed at 33, 66, and 98 feet from the forest edge. (b) Ignition of the 33 ft wall section occurred during 3 out of 7 crown fires. No ignitions or significant scorch occurred on wall sections at 66 ft and 98 ft during any crown fire.

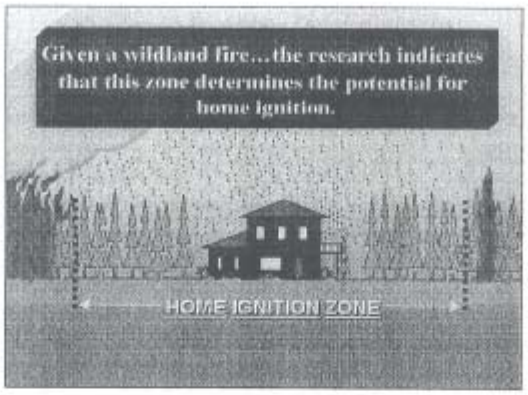


*Figure 3—The **home ignition zone** includes the home and an area surrounding the home within 100 to 200 feet. The potential for ignition depends on the home's exterior materials and design and the amount of heat to the home from the flames within the home ignition zone. Firebrand ignitions also depend on the home ignition zone either by igniting the home directly or igniting adjacent materials that heat the home to ignition.*

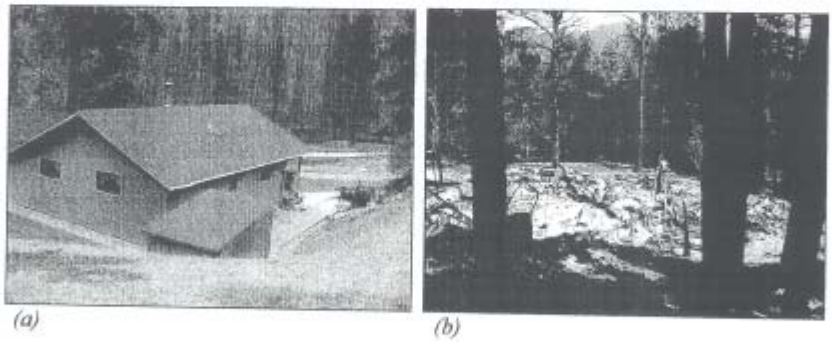
During a wildland-urban fire a home ignites from two possible sources: directly from flames (radiation and convection heating) and/or from firebrands accumulating directly on the home. Even the large flames of high intensity crown fires do not directly ignite homes at distances beyond 200 feet. Given that fires adjacent to a home do not ignite it, firebrands can only ignite a home through contact. Thus, the home ignition zone becomes the focus for activities to reduce potential wildland-urban fire destruction. This has implications for reducing home ignition potential before a wildfire as well as implications for emergency wildland-urban fire response strategy and tactics.

One might argue that preventing the occurrence of wildfires would prevent wildland-urban fire destruction. However, our current understanding indicates that wildland fire is an intrinsic ecological process in nearly all North American ecosystems (Arno and Brown 1989; Wright and Bailey 1982). Wildland fire will always occur in forest and rangeland fire environments and will thus have an impact on people, property and resources. We may have some choice of when and where we have wildland fire, but we do not have the choice of not having wildland fire occurrence. Thus, it is not reasonable to form agency and public expectations for the non-occurrence of wildland fires, including wildland fires encroaching on communities.

Recognizing the inevitability of wildland fire occurrence coupled with how homes ignite during wildland fires suggests a mitigation approach specific to wildland-urban fire. Given a wildland-urban fire, the home ignition zone principally determines the potential for home ignitions. This suggests a management approach that focuses on preventing home ignitions. That is, we reduce a community's vulnerability to wildland fire rather than attempting the elimination of wildland fire encroachment. This implies an approach of community compatibility with wildland fire.

Wildland-urban fire emergency strategy and tactics differ from either the standard wildland or the standard urban fire suppression practices. Wildland fire suppression largely attempts to keep a fire from spreading beyond its current location. That is, keeping the wildfire away from a valued area protects the values at risk. Urban fire suppression initially addresses life safety (principally building occupants) and then fire containment within a portion of the structure and/or prevents adjacent structure involvement. Neither of the wildland nor the urban suppression practices typically provide for home ignition potential reduction given an encroaching wildfire.

Wildland-urban strategy and tactics assume the wildfire may pass through the residential area without wildfire containment. The wildland-urban strategy and tactics principally focus on preparing the home for the wildfire by reducing the potential for home ignition within the home ignition zone. Because of time constraints, most preparation has to occur before a wildfire occurs. Major changes to the home ignition zone (the home and its immediate surroundings) such as replacing a flammable roof and removal of vegetation such as forest thinning cannot occur during the approach of a wildfire. Removal of firewood piles, dead leaves, conifer needles, dead grass, etc. from on and next to the home should also occur seasonally before severe fire conditions (*fig. 4*). The ignition potential of the home ignition zone largely influences the effectiveness of protection during a wildfire. Given low ignition potential and enough time, homeowners and/or wildland-urban suppression resources can make significant reductions in the little things that influence ignition potential before wildfire encroachment. Then, if possible, homeowners and/or wildland-urban firefighting resources can suppress small fires that threaten the structure during and after the wildfire approach.



(a) *(b)*

Figure 4—The home ignition zone principally determines the home ignition potential. (a) This ignition resistant home survived an intense crown to its front (background) and a crown fire of lesser intensity to its side and back. The immediate area next to the home was sprinkled but no suppression action occurred (Montana 2000). (b) This highly ignitable home did not survive a low intensity surface fire (unburned wood rail fence and non-scorched trees in the background). A continuous pine needle fuel bed extended to, through and on this home and its neighbors. No suppression action occurred at this home (Los Alamos 2000).

Agencies need to recognize that wildland-urban fire strategy and tactics are fundamentally different from their traditional tasks. The principal efforts for reducing ignitions focus on the home ignition zone before the wildfire occurrence. Since homeowners largely own the home ignition zone, agencies must function as partners and facilitators for implementing wildland-urban mitigations. During the wildfire, wildland-urban protection activities continue to focus on the home ignition zone for the prevention of home ignitions. Even with ignition resistant homes, protection effectiveness relies on an understanding of how homes ignite during wildland fires along with recognizing operational and logistical fire suppression limitations. These differences suggest the need for wildland-urban fire specialists both before a wildfire and during a wildfire. Before the wildfire, the wildland-urban fire specialist uses home ignition expertise to identify vulnerable residential areas and facilitate community efforts to reduce home ignitability. During wildfires, the specialists work with homeowners and multi-agency wildland-urban fire protection teams to identify and implement effective actions for reducing home destruction during wildfires.

The above article is based on technical information that can be found at *www.firelab.org*

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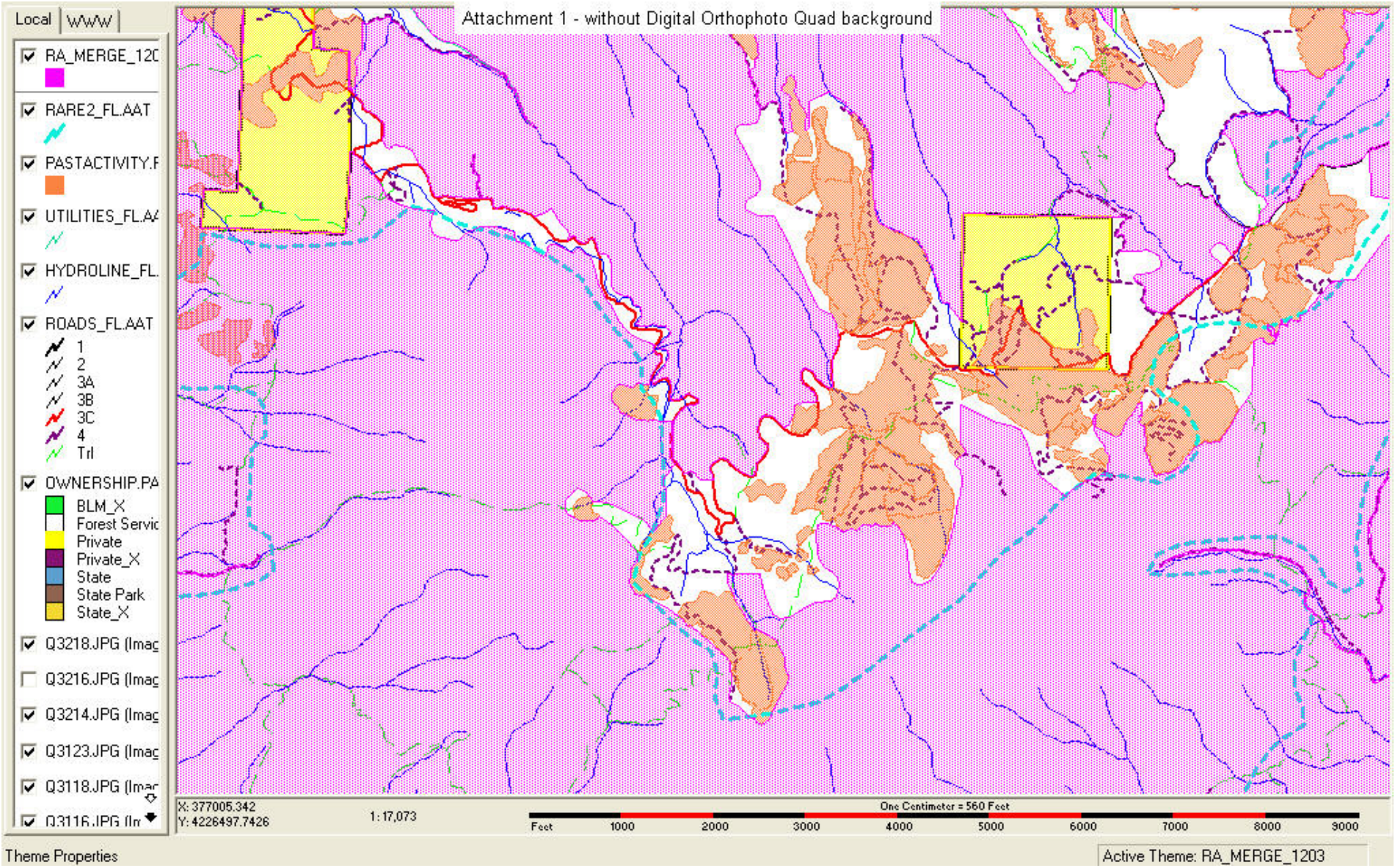
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