Fire Planning Issues in the Cooper Planning Area
Mt. Hood National Forest and Adjacent Lands

Pacific Biodiversity Institute

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Introduction

The Cooper Area Fuels Reduction Collaboration Group has been meeting since July 23, 2005 in an attempt to develop a strategy for reducing the potential for wildfire and forest health issues to cause harm to forests and homes in the Evans Creek/Cooper Spur Area on the east side of Mt. Hood.

The area is composed of a mixture of federal, county and private ownerships (Figure 2). Most of the area is forested. Mixed conifer forests with diverse species composition predominate. A mixture of successional states is present. Much of the private and county land has been clearcut in the past and is in various stages of regrowth. Significant cutting has also occurred on National Forest land in the area, but significant uncut, mature and old-growth forest remains. To the north of the planning area are lava beds. To the east of the planning area lie agricultural and rural residential lands in the Hood River Valley.

The Collaboration Group has written a draft goal statement to guide their efforts. The goal includes:
"…reduce the severity of wildfire in order to protect residences, historic structures and reduce the threat of fire spread to outside areas. …maintaining a diverse forest and protect scenic values."

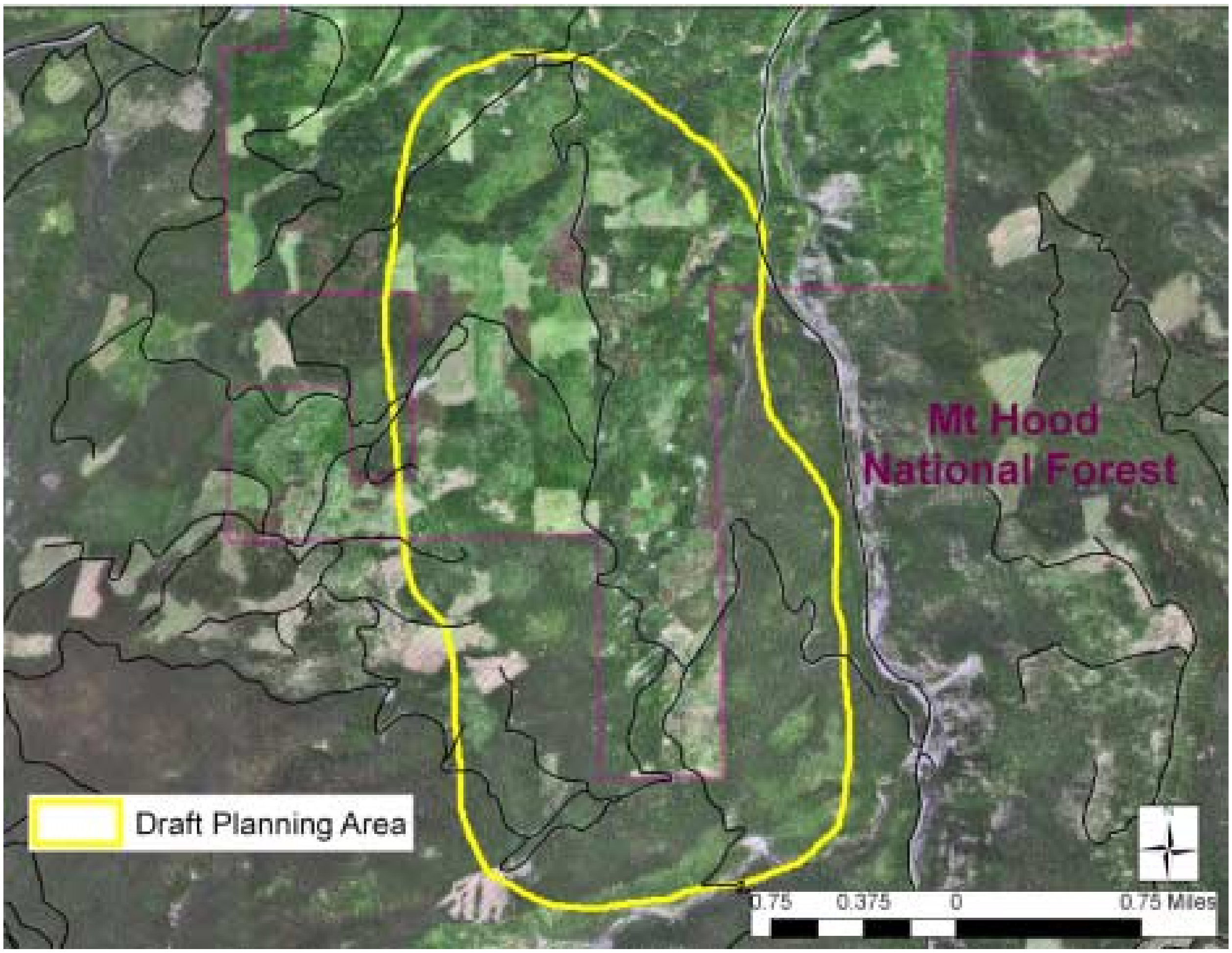
The Collaboration Group has also begun to delineate a Wildland Urban Interface (WUI) boundary for the project area (Figure 1). Though the final extent and locations of this boundary are not yet known, the WUI boundary will be significant in determining priority areas for community fire protection activities and fuels treatment projects.

Wildland Urban Interface Zone

The USDA and USDI definition for the Urban Wildland Interface Community, as published in the Federal Register (USDA/USDI, 2001) identifies two types of communities on which federal agencies should focus. The first is the Interface Community, which includes highly populated areas with densities of 250 or more people per square mile. The second is the Intermix Community, which includes moderately populated areas with 28-250 people per square mile.

The Cooper Planning Area only has a few full-time residences, and the population is probably less than that of the Intermix Community as defined by the Federal Register definition. Therefore, the Cooper Planning Area probably does not meet the technical definition as being a low population density Urban Wildland Interface Community. It is more appropriately described as a low-density rural area with scattered residences in a forest matrix. The number of full-time residents is low and the total number of structures is also quite low. It is important to keep this in mind when designing a wildfire strategy for the area. If the area was populated with a denser human population and there was more investment in infrastructure and housing, the area would warrant more federal attention in reducing any wildfire hazards to the area. Other areas in the Hood River Valley do qualify as WUI communities, and these areas should be the highest priority for federal attention to reducing wildfire hazards.

Figure 1. The draft WUI boundary was created by the Cooper Planning Area Fuels Reduction Collaboration Participants using unknown criteria.



For the sake of the Cooper Area Fuels Reduction Collaboration Group proceeding with its assessments and planning in the Cooper Spur Project Area, it may be advisable for this group to alter the title of its perceived “Wildland Urban Interface” boundary to something more appropriate to the landscape situation. Something along the lines of a “zone of forested private and public lands with a low rural population density” may be more fitting.

Also, at current the draft “WUI” boundary extent seems to have relied on undocumented criteria in its development, which may need to be better defined. It would seem logical for the planning area boundary to be drawn at a standardized buffer distance from the residences in this area. As of now, the boundary seems arbitrarily placed.

Land Ownership Boundaries

As seen in Figure 2, there is significant disagreement, particularly in regards to a large piece of Hood River County property, between the US Forest Service ownership map and the ownership data maintained by Hood River County. Such disagreements between ownership maps from various land management agencies are a common occurrence, and interagency cooperation should be encouraged to resolve these discrepancies. The creation of an accurate and indisputable ownership map for the project area will be critical in assessing and planning successful wildfire risk reduction activities.

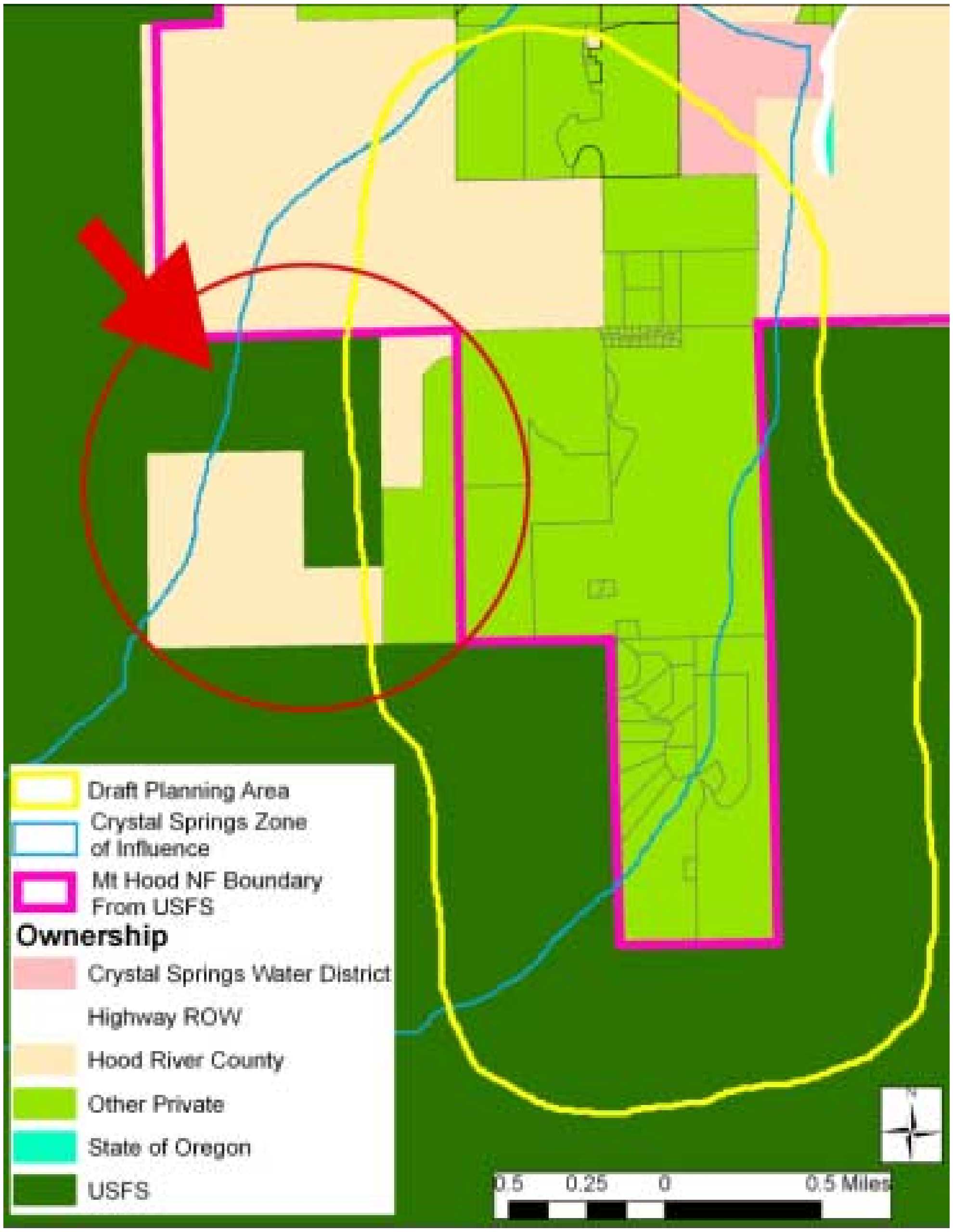


Figure 2. Area of boundary disagreement between USFS and Mt Hood County data.

Successful Fire and Fuel Management

Planning for ways to reduce wildfire risk to communities and historic structures is an important element of modern land management. Wildfire risk management is most successful if it is based on the best available science and incorporates reliable information on the ecological characteristics of the target landscape. It is also important to have explicit social and ecological objectives that are realistic and readily achievable with existing management techniques (Finney and Cohen 2003).

Finney and Cohen (2003) show that successful fire and fuel management is dependent on having realistic goals and expectations and then applying fuel treatments at the appropriate scale to the appropriate source of the problems. They clearly state that it is impossible for fuel treatments alone to stop fires from burning or spreading. They also state that structure loss (i.e., homes burning) is highly dependent on the properties of the structure and its immediate surroundings – not the condition of the larger landscape. Primary responsibility for structure protection resides with the owners of the structure and immediate property, not with public land management agencies. But public agencies can help in many ways to encourage and facilitate actions taken by the community and private landowners. Fire preparation actions on public lands should be carefully coordinated with commensurate fire preparation activities on private lands.

Findings

Peter Morrison from Pacific Biodiversity Institute examined the area on three dates: June 15, 2004; August 31, 2005; and September 1, 2005. The following is his assessment of the planning area and the forest health and wildfire issues that are present. Maps of his survey routes and photo stop locations are presented in Figures 3a and 3b.

Condition of Homes and the Surrounding Forest

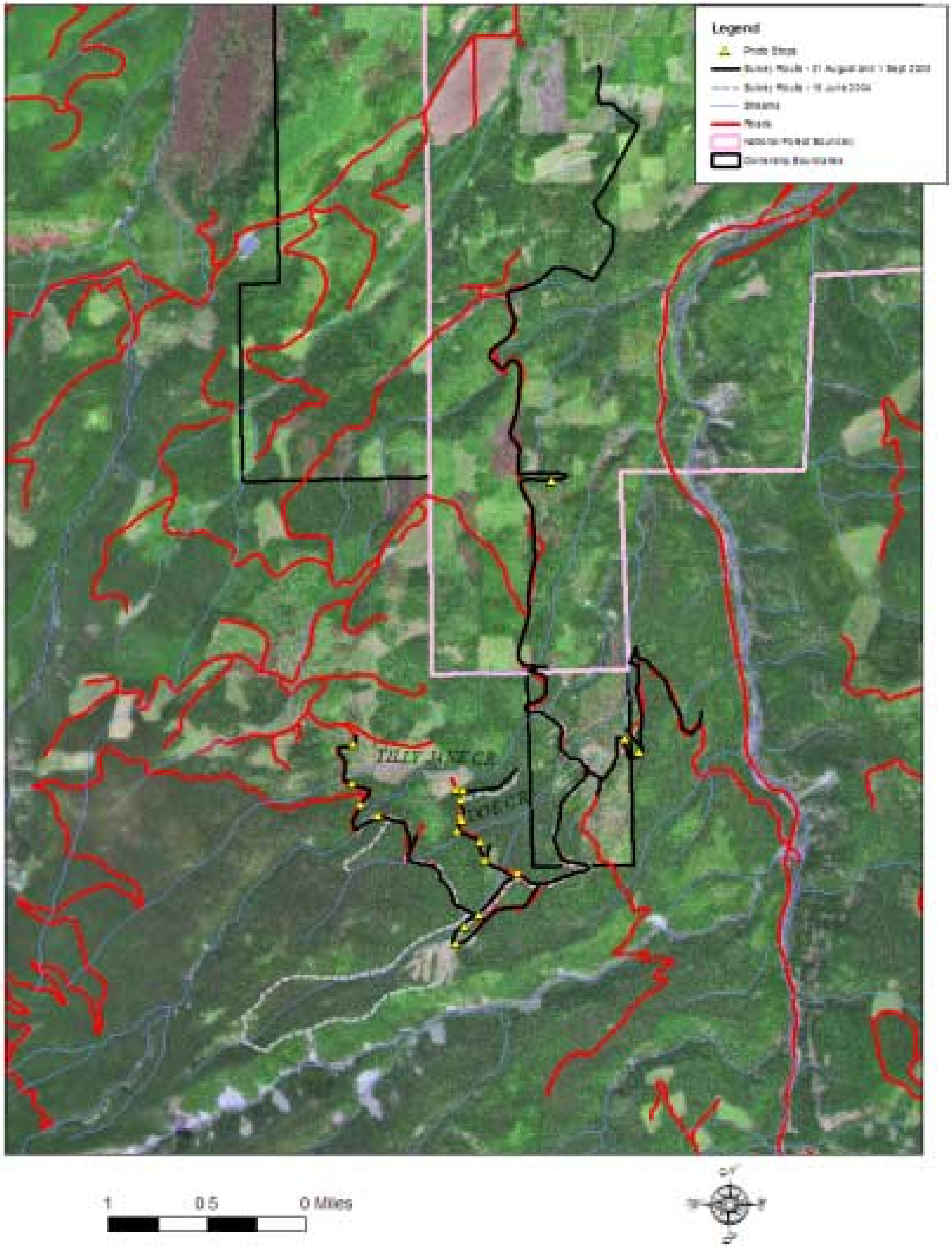


Figure 3a. Field survey routes from 2004 and 2005. The US Forest Service ownership boundary is incorrect and needs correction, but is used here for reference.

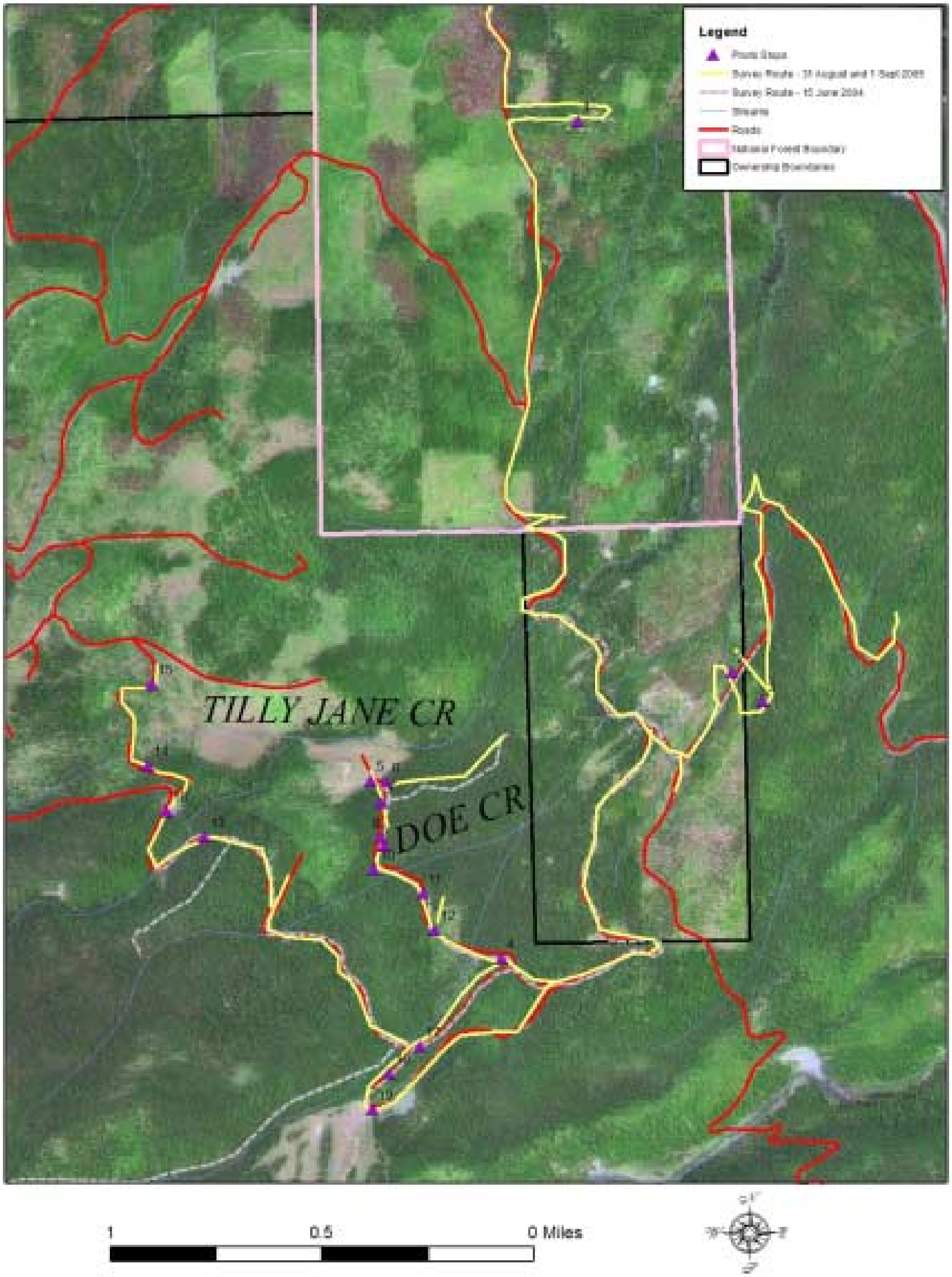


Figure 3b. Photo stop locations from August 31 – September 1, 2005.

Peter Morrison briefly surveyed many of the residences in the Cooper Planning Area. Nearly all the homes in the project area have serious deficiencies with regard to fire safety. Many are textbook examples of homes that in great risk of burning during a wildfire. Examples of some of the homes are illustrated below (Figures 4-10).

Figure 4. The home in this photo is shrouded with young coniferous forest. It has a shake roof and wood siding. This house would ignite immediately during a wildfire.

Figures 5 and 6.
More examples of homes in the planning area at serious risk of burning in a wildfire are presented at the left and following pages.

Figures 7 and 8.

Figures 9 and 10.

Finney and Cohen describe a *home ignition zone* of 30 meters surrounding structures. They state that activities confined to this zone to reduce the potential for wildfire destruction of a structure can address the necessary factors that determine ignitions and can be done sufficiently to reduce the likelihood of ignition. "Given a wildfire, wildland fuel management alone (outside of the home ignition zone) is not sufficient nor does it substitute for mitigations within the home ignition zone" (Finney and Cohen 2003).

Reduction of wildfire risk to homes and communities is an achievable goal if well established guidelines are followed. Jack Cohen, a US Forest Service research scientist who specializes in wildfire risks to communities and structures, emphasizes that the most important element of risk reduction is in building construction and maintenance followed by the maintenance of a relatively fuel-free perimeter around structures (Finney and Cohen 2002, Cohen 2000a, Cohen 2000b, Cohen 2000c, Cohen 2000d, Cohen 1999, Cohen and Butler 1998, Cohen and Saveland 1997). If the goal is community and structure protection, then it is unnecessary to engage in fuel reduction activities that are a substantial distance from the areas targeted for protection (Finney and Cohen 2002).

The homes and surrounding area in the Cooper Planning Area all need to be carefully reviewed for fire safety. In almost every case vegetation needs to be removed or modified within the 30-meter home ignition zone. Many houses have cedar shake roofs. These are not suitable for a forest environment where wildfire is a frequent event. Likewise, exterior wood siding on some homes may be inappropriate for a forest environment. There are many open wood decks which pose a significant fire risk. Debris and firewood storage next to some homes poses a significant risk. *The current state of homes in the planning area is a disaster waiting to happen*.

It is important to emphasize that clearing trees and other vegetation away from structures is not in itself sufficient in preventing them from burning in a wildfire. There are innumerable cases where homes burned in a wildfire with a very sparse tree cover surrounding them. This happens when burning embers ignite flammable materials around the home or flammable parts of the building (roofs, walls, decks). In the Virginia Lakes Fire (Morrison et al 2001), several homes burned where there was little surrounding forest because of home construction and maintenance issues (Figure 11).

Figure 11. Home burned in the Virginia Lake Fire with little surrounding vegetation and only a few ponderosa pine trees that were over 50 feet from the house. Photo by Peter Morrison.

Forest Service fire scientist Jack Cohen has documented numerous similar instances where homes have burned to the ground in areas with sparse forest cover. A good example from the Hayman Fire (Cohen in Graham 2003) is illustrated below (Figure 12).

Figure 12. The destroyed remains of the Horse Creek Cafe and Saloon on State Highway 67, southeast of Deckers, Colorado. Note the surrounding unburned vegetation. (Photo by R. Moraga)

Vegetation and fuel clearance along roads in the Cooper Planning Area is often not adequate to protect firefighters that might respond to a fire. Safe access for firefighters along roads leading into the area and around homes should be a high priority.

In summary, the cumulative effect of the numerous residential-area fire hazards creates a situation where homes in the area would be unlikely to survive even a moderate intensity wildfire. Fire fighters would also be exposed to high personal risk.

Forest Condition

Fire management should be based on a clear understanding of the historic fire regime of the target landscape. Information on the fire regimes of relevant Pacific Northwest forests is readily available (Wright and Agee 2005, Agee 1993, Morrison and Swanson 1990, Morrison 1984, Swanson et al 1977). The forest types within the planning area range from mixed conifer forests dominated by grand fir (Abies grandis) at lower elevations to Pacific silver fir (Abies amabalis) forests at upper elevations. The lower elevation mixed conifer forests usually experience a mixed severity fire regime with a combination of low-severity surface fire and mid to high severity surface and crown fire. Natural fire return intervals at the lower elevations are in the range of 20 to 100 years, depending on the site. The upper elevations in the planning area have a fire regime that supports stand replacement fire events with a 100 to 200 year return interval (Agee 1993). Most areas at upper elevations of the planning area have burned during the last 150 years; therefore these forests are not out of their normal range of variation in fire disturbance events. The lower elevation forests may have missed one or more fire cycles at this time. A map of general forest types and fire regimes was developed from GIS data from the Mt. Hood National Forest (Figure 13).

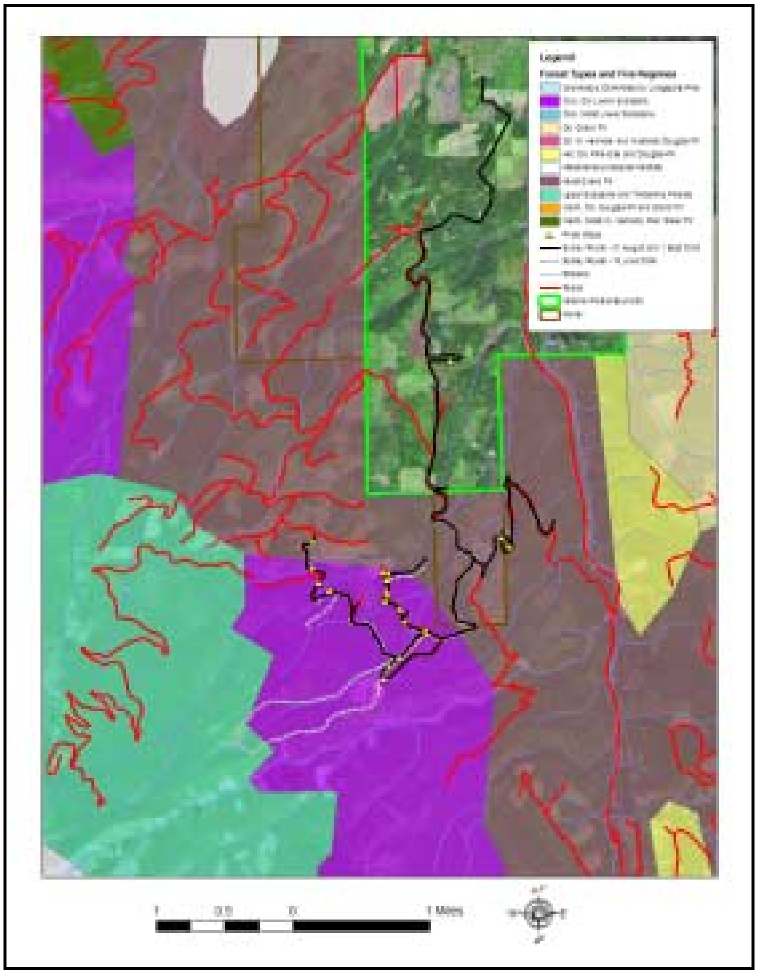


Figure 13. General Forest Types and Fire Regimes from GIS data from the Mt. Hood National Forest

Forest condition within Old and Mature Forests in the Cooper Planning Area

The planning area consists of a patchwork of older forest and other areas that have been logged in the last century and are now covered by young plantations or naturally regenerated stands. The older forests generally have a mixture of age classes present, representing the consequences of past wildfires that burned through the area and natural successional processes (Figures 14 and 15).

Figure 14. Large fire-scarred western red cedar in eastern part of Cooper Planning area exhibiting evidence of past wildfires. Photo stop 3.

Figure 15. Multi-aged older forest in eastern part of planning area near boundary between National Forest and private land. Photo stop 3.

Many stands in the project area have developed at least some old-growth characteristics. Much of the planning area has been mapped by the US Forest Service as containing old growth forests that meets the Region 6 old-growth definition (Figure 16). Most of these stands are in fairly good "health" for their age and successional stages of development.

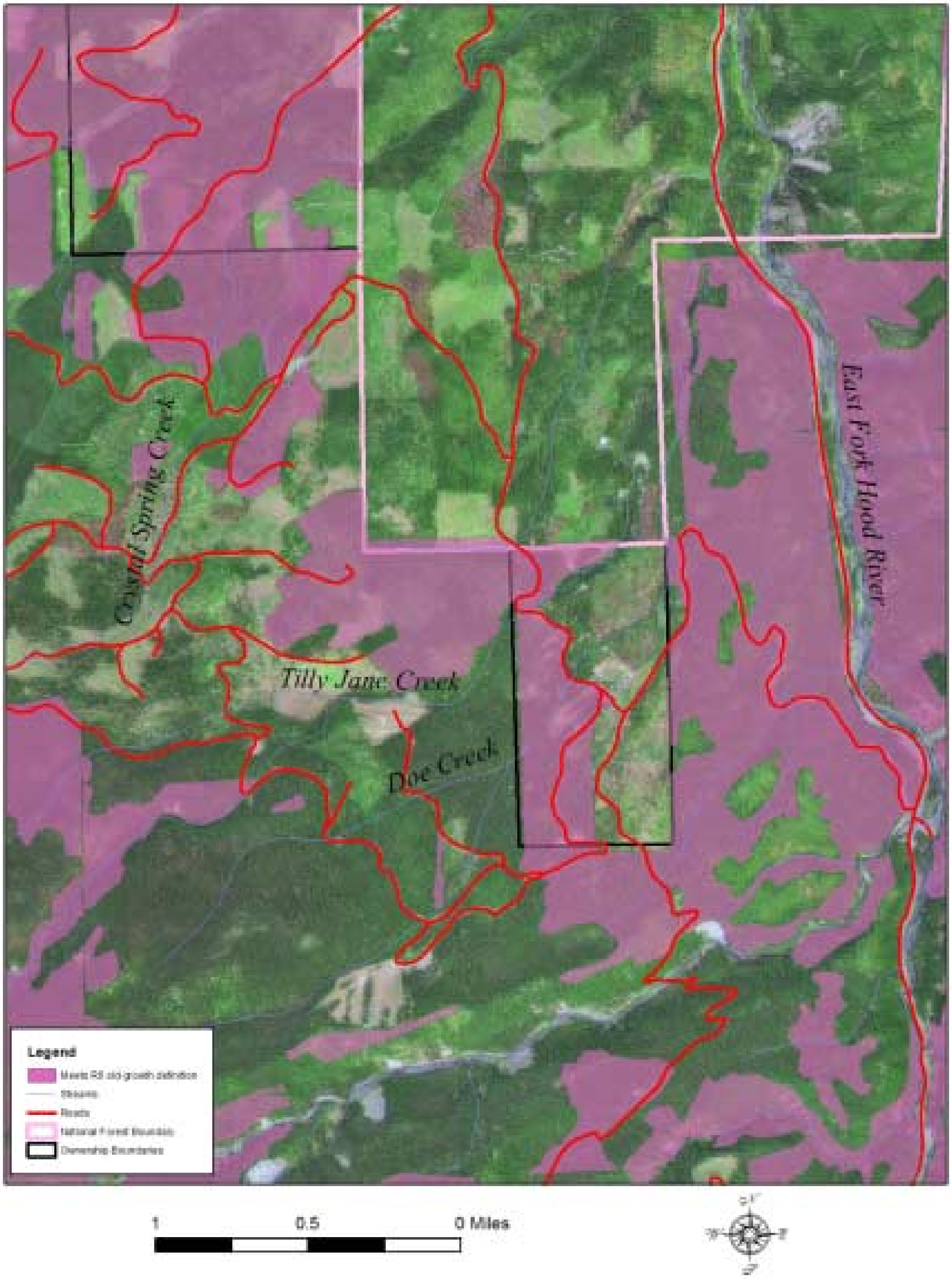


Figure 16. Map of forests in the Planning Area that meet the Region 6 old-growth forest definition (pink shaded areas). Note: Some private lands were not mapped by USFS though old-growth conditions may exist there.

Forest conditions within plantations in the Cooper Planning Area

There are many clearcuts in the Planning Area at various stages of regeneration and stand development (Figures 17-22). Many of the plantations that we examined have a high density of small conifers and often have considerable amounts of remaining logging slash. The fuel conditions represented in many plantations represent a considerable fire risk to the surrounding landscape. These plantations are apt to burn intensely during a wildfire, killing nearly all the young trees in the plantation and some older trees in the surrounding forests.

Many of these stands have dense natural regeneration of lodgepole pine. This is an early successional species and consideration should be given to thinning most of this species out of the young plantations to reduce stand densities and the potential for a crown fire.

Figure 17. Photo stop 4, dense young plantation and natural regeneration after clearcut.

Figure 18. Photo Stop 4, dense young plantation and natural regeneration after clearcut. Note the accumulation of untreated logging slash.

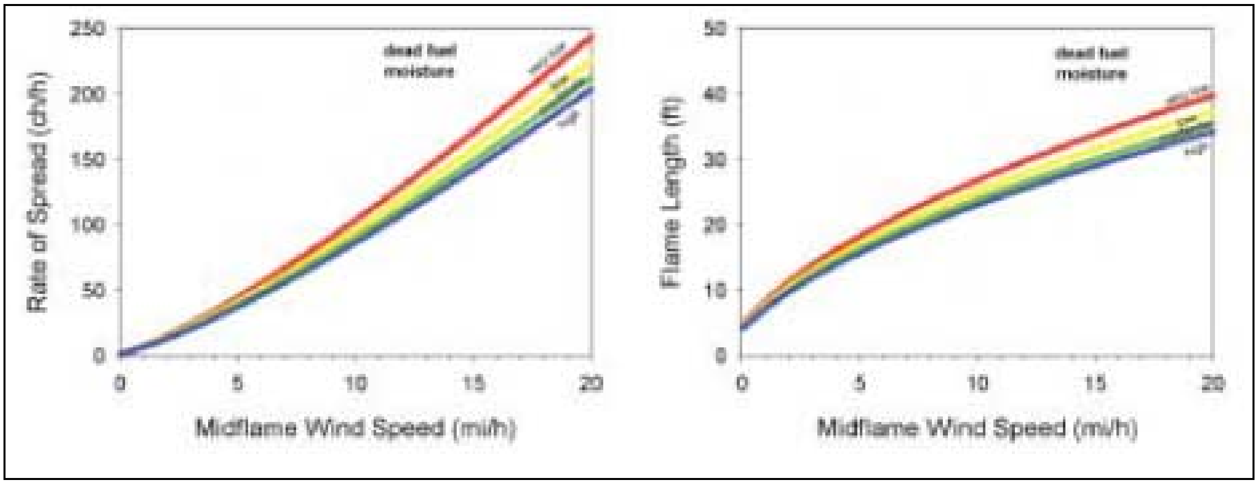
Figures 19 and 20. Photos of dense young stand on private land. Photo Stop 2

Figure 21. A dense young plantation on National Forest land. Photo Stop 12 (left and below)

Figure 22. Forests like these are very likely to burn intensely in a severe crown/surface fire, should a wildfire move through the area. This photo is along a road and illustrates the dense fuel matrix of many young plantation stands. Many wildfires have started in places like this. The presence of many stands like this, which are adjacent to roads, contributes to an enhanced risk that the planning area will experience a wildfire.

These plantation conditions relate best to the very high load humid climate shrub fuel model from USFS General Technical Report-153 (Scott and Burgan 2005). This fuel model is described as having a high spread rate and a very high flame length (Figures 23 and 24).

Figure 23. From Scott and Burgan (2005).



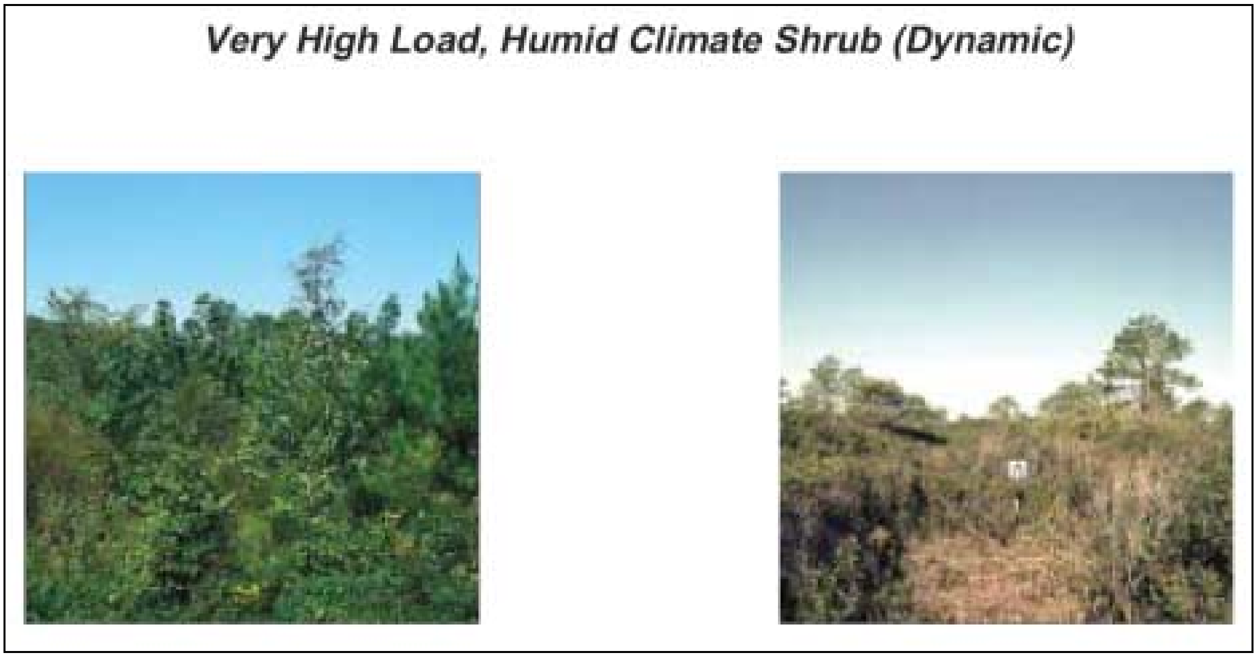


Figure 24. From Scott and Burgan (2005).

Outside of the home ignition zone, the young plantation forests pose the highest threat to wildfire spread and severity in the planning area.

Insect Infestations and Insect Damage to Forest Stands in Planning Area

Aerial surveys conducted by the US Forest Service have identified areas where insect infestations are active or have caused damage to forest stands in the project area. The main forest insect that is active in the area is the mountain pine beetle, which has attacked lodgepole pine trees interspersed in the mixed conifer forests of the area. Fir engraver beetle is present in some areas, but has not caused significant mortality or damage.

Peter Morrison conducted field examinations of the forest stands in the area. These examinations indicate that mountain pine beetle was indeed present and that some lodgepole pines were killed (Figure 25). However, lodgepole pine is usually just a minor component of these forest stands and is an early successional species in this area. Most of the stands in the area do not show substantial insect damage. There are isolated pockets where mortality from mountain pine beetle is higher, but these are quite limited in extent in the context of the larger landscape (Figures 26a and 26b).

Figure 25. Dead lodgepole pine above a healthy understory of other conifer species. This photo was taken of a forest stand east of the Cooper Spur Ski area.

Figures 26a and 26b. Landscape view of forests in Cooper Planning Area north of Cooper Spur Ski Area.

In many forest stands within the planning area most of the trees are unaffected by insects and only scattered infestations and associated mortality exists among the lodgepole pine (Figures 27 and 28). The level of insect infestation and mortality is relatively low in the planning area compared to many areas in eastern Oregon and Washington. The forests of the planning area are generally not “unhealthy” and they represent various stages of natural succession and natural diversity.

Figure 27. Patches of mountain pine beetle mortality in lodgepole pine in older forest below road leading to ski area.

Figure 28. Forest canopy showing live trees and a few dead ones in area mapped by the Forest Service as having high insect damage and mortality. Photo stop 6.

It is expected and normal to see lodgepole pine drop out of the stand at about this time in forest development (Pfister and Cole, 1985). Also, the population levels and outbreak characteristics of the mountain pine beetle are subsiding and should no longer be an issue in the area. Mt. Hood National Forest personnel have stated that the recent outbreak affecting lodgepole pine is over and that the occurrence was a natural process with self-correcting mechanisms (Kim Smolt, Forest Service District Silviculturalist, September 9, 2005 Cooper Area Fuels Reduction Collaboration Group meeting). Forest treatments to suppress mountain pine beetle outbreaks in the area would not be appropriate at this time.

In a few areas, such as the stand immediately east of the Cooper Spur Ski Area (Figure 29), logging of dead lodgepole pine may be warranted to improve the aesthetics of the area for skiers. But only a very limited area needs to be treated to accomplish this objective.

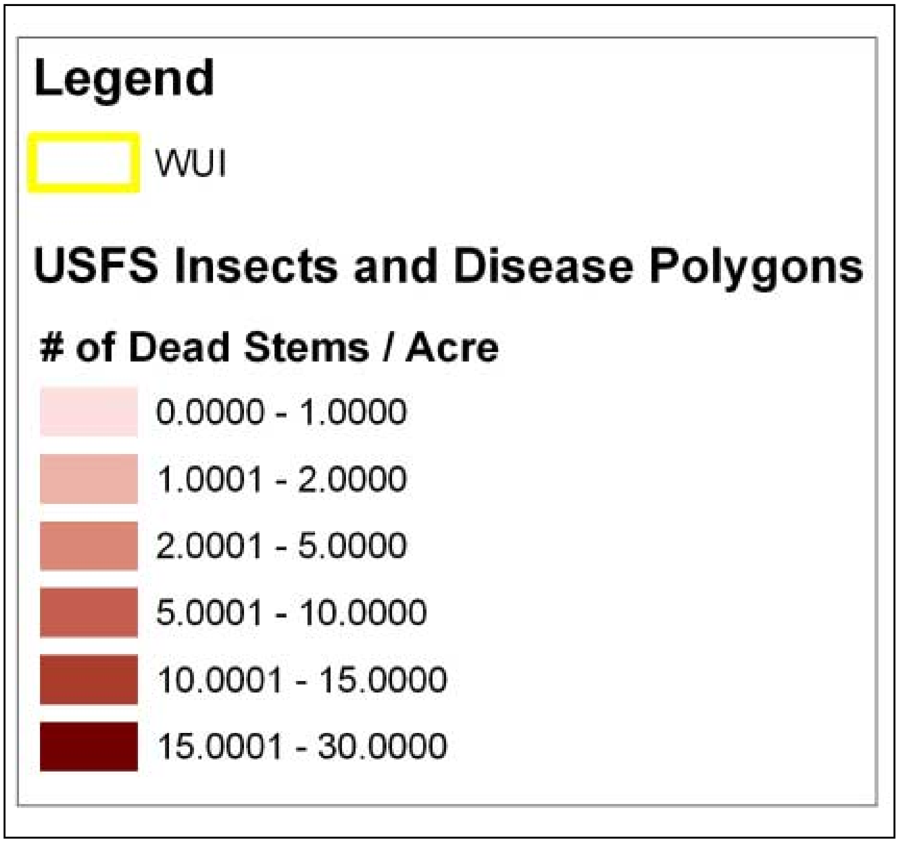
Figure 29. Stand immediately east of Cooper Spur ski area with dead lodgepole pine.

USFS Insect and Disease Polygons within the Planning Area

The Forest Service keeps track of stand mortality caused annually by forest insects and disease across National Forest lands in Washington and Oregon through annual aerial surveys. This Forest Service data is presented in polygon form, which outlines areas on the landscape where new tree mortality each year is seen during aerial surveys and remote sensing analyses. Mortality estimates and principle mortality agents are described in the associated data tables related to each polygon.

It is important to note that viewing insect and disease polygons can be misleading since the polygons themselves seem to indicate an insect outbreak is killing huge portions of the forest, while typically many of the polygons are actually illustrating normal levels of insect and disease caused mortality. Peter Morrison examined many of the areas mapped in the aerial surveys and in many cases found no significant evidence of insect damage.

The legend we've provided is important to keep in mind when viewing the following insect and disease maps because the characteristics and ecological consequences of stand mortality that may be inferred for each polygon vary widely based on the amount of dead trees per acre. A series of maps for each of the last five years is presented below (Figures 30 – 37)



Legend

▭ WUI

USFS Insects and Disease Polygons

# of Dead Stems / Acre

■ 0.0000 - 1.0000
■ 1.0001 - 2.0000
■ 2.0001 - 5.0000
■ 5.0001 - 10.0000
■ 10.0001 - 15.0000
■ 15.0001 - 30.0000

Figure 30. Legend for figures on following pages illustrating data from USFS aerial insect damage surveys.

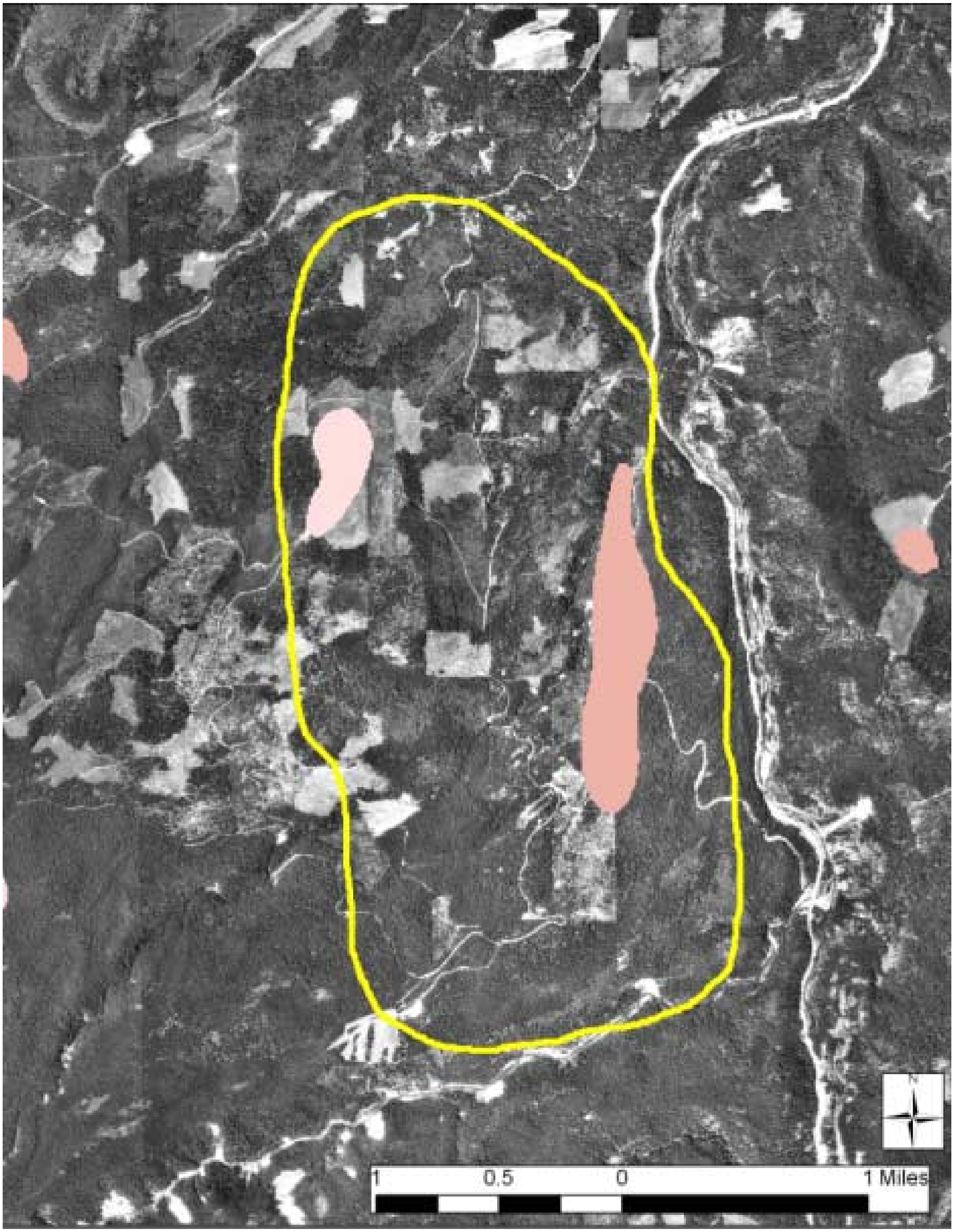


Figure 31. 1999 insect and disease polygons from the USFS. Note that stand mortality due to insects or disease within these polygons does not exceed 2 dead trees per acre. Use legend on previous page. `

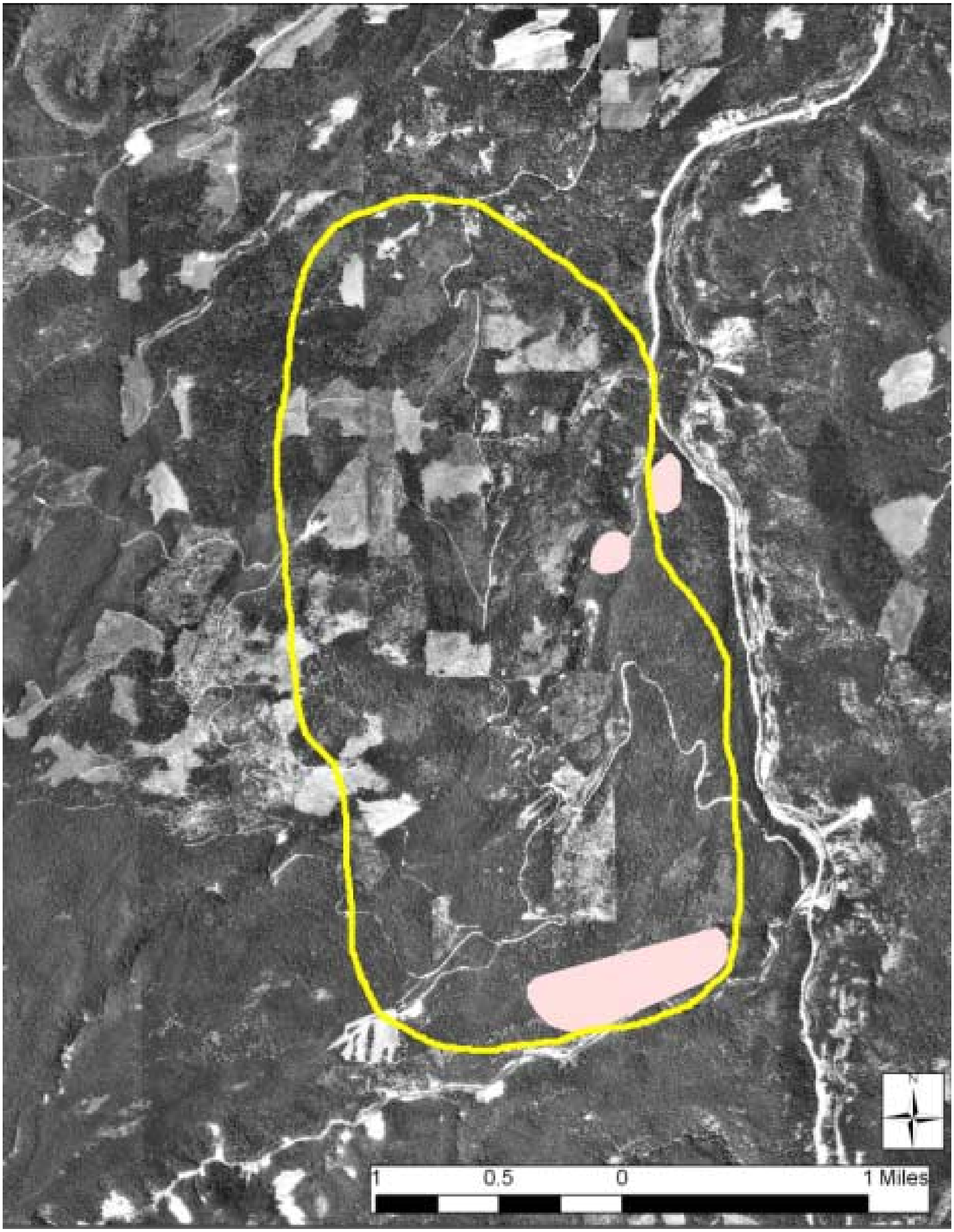


Figure 32. 2000 insect and disease polygons from the USFS. Note that stand mortality due to insects or disease within these polygons does not exceed 1 dead tree per acre.

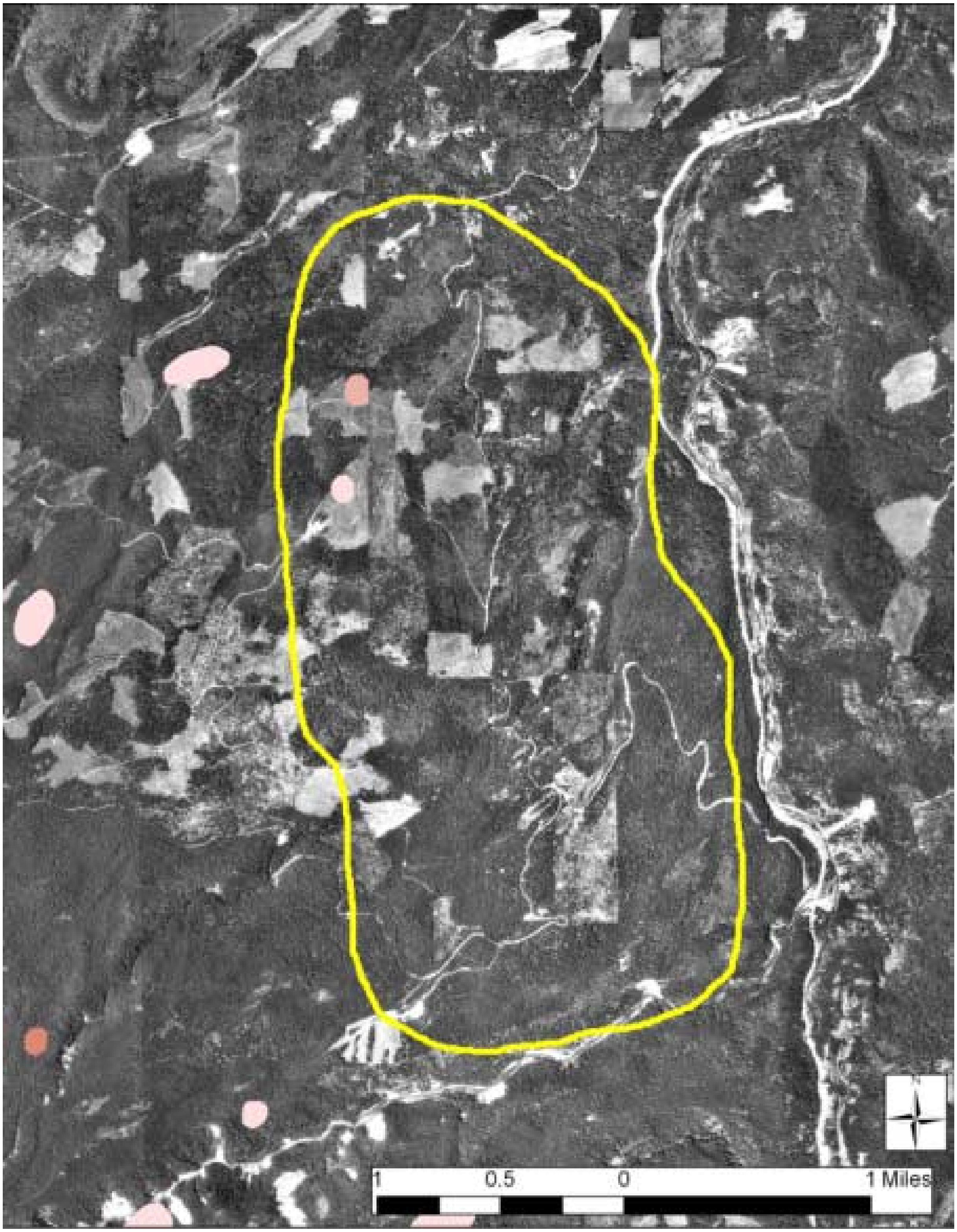


Figure 33. 2001 insect and disease polygons from USFS. Note that stand mortality due to insects or disease within these polygons does not exceed 2 dead trees per acre, except for a small polygon on the lower left which is listed at 3.6 dead trees per acre (polygon is around 5 acres is size).

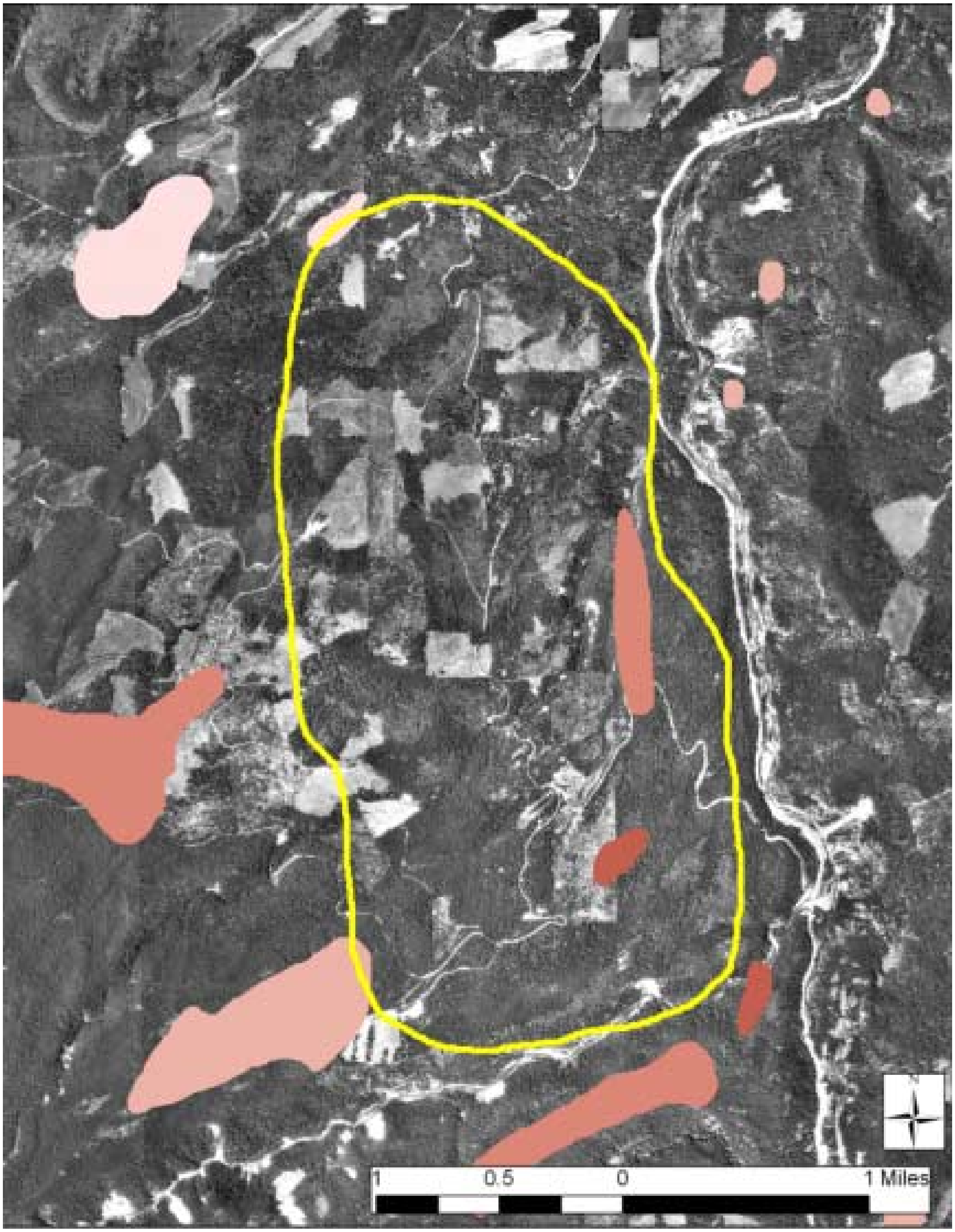


Figure 34. 2002 insect and disease polygons from the USFS. Note that stand mortality due to insects or disease within these polygons does not exceed 6 dead trees per acre.

Figure 35. 2003 insect and disease polygons from the USFS. Note that stand mortality due to insects or disease within these polygons does not exceed 5 dead trees per acre.

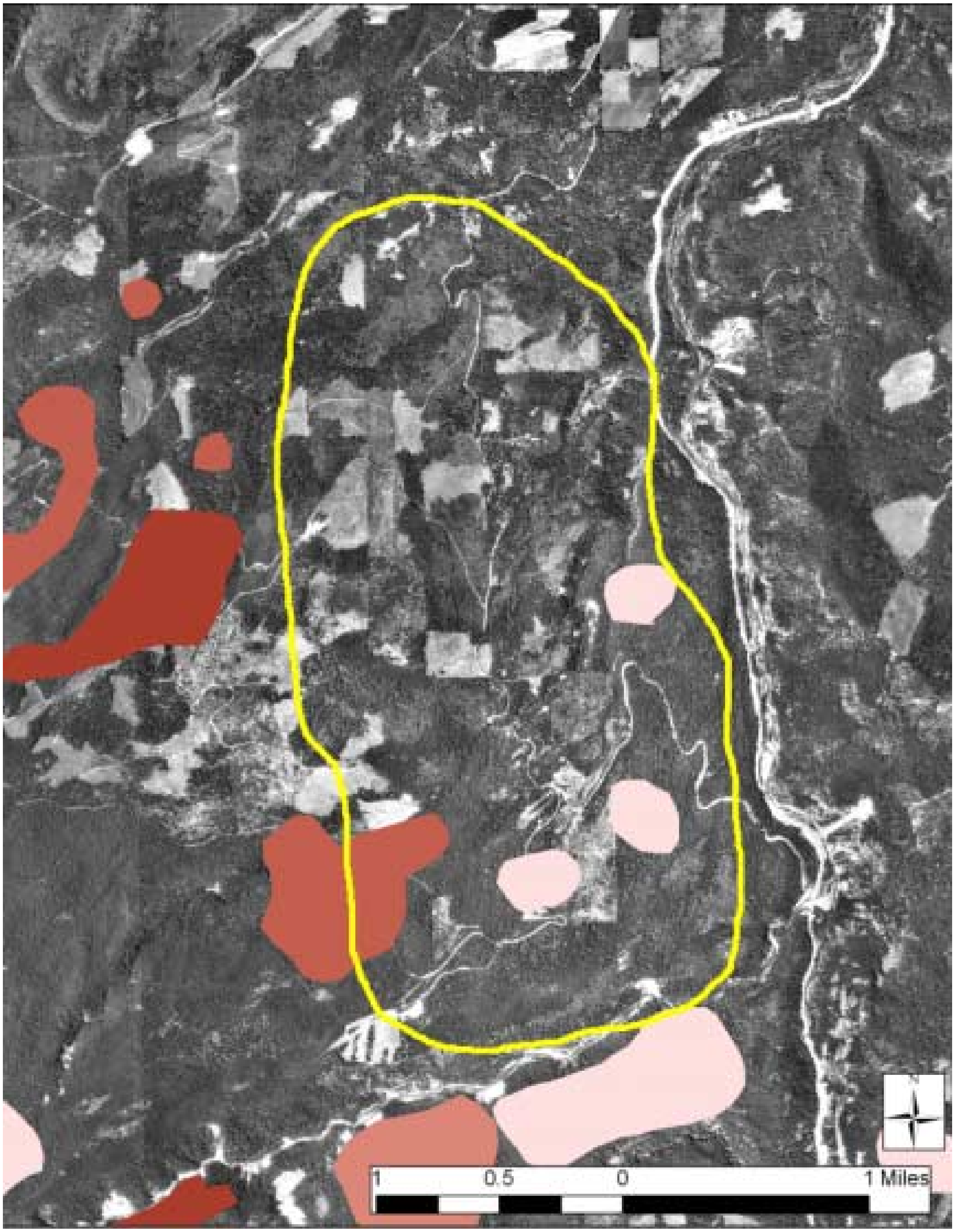


Figure 36. 2004 insect and disease polygons from the USFS. Two polygons on the left side of the map have a stand mortality listed at 15 dead trees per acre, but both these polygons are well outside of the planning area. No polygon within the area has greater than 8.2 dead trees per acre, with most polygons within the area characterizing mortality less than 1 dead tree per acre.

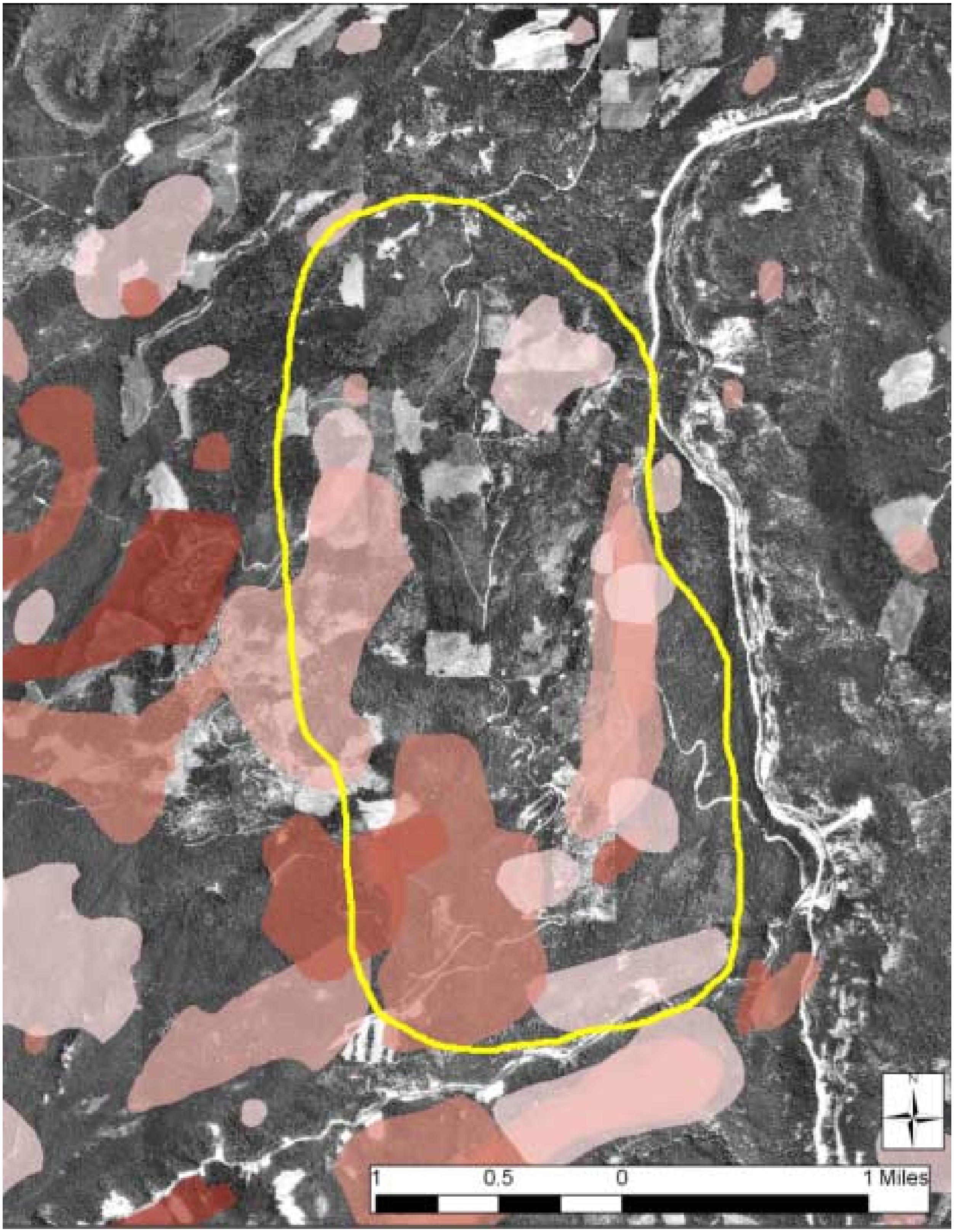


Figure 37. Cumulative overlay of USFS insect and disease polygons from 1999 – 2004. Though much of the planning area is covered by polygons, the relative stand mortality for most polygons is less than 5 dead trees per acre, and in many cases less than 1 dead tree per acre.

Mt Hood National Forest provided us with a true color aerial photograph taken within the southern part of the planning area in 2004 (Figure 38). This photo exhibits the extent and density of tree mortality in the area. We overlaid this photograph with the USFS insect and disease polygons to assess the accuracy of the polygons in representing mortality on the ground. An enlargement of a small example area, which Peter Morrison also examined in the field, is included with comments on his observations (Figure 40).

Figure 38. A 2004 true-color aerial-photograph provided by USFS. The actual date the photo was taken appears in the upper left hand corner. This photo only covers a part of the southern half of the planning area.

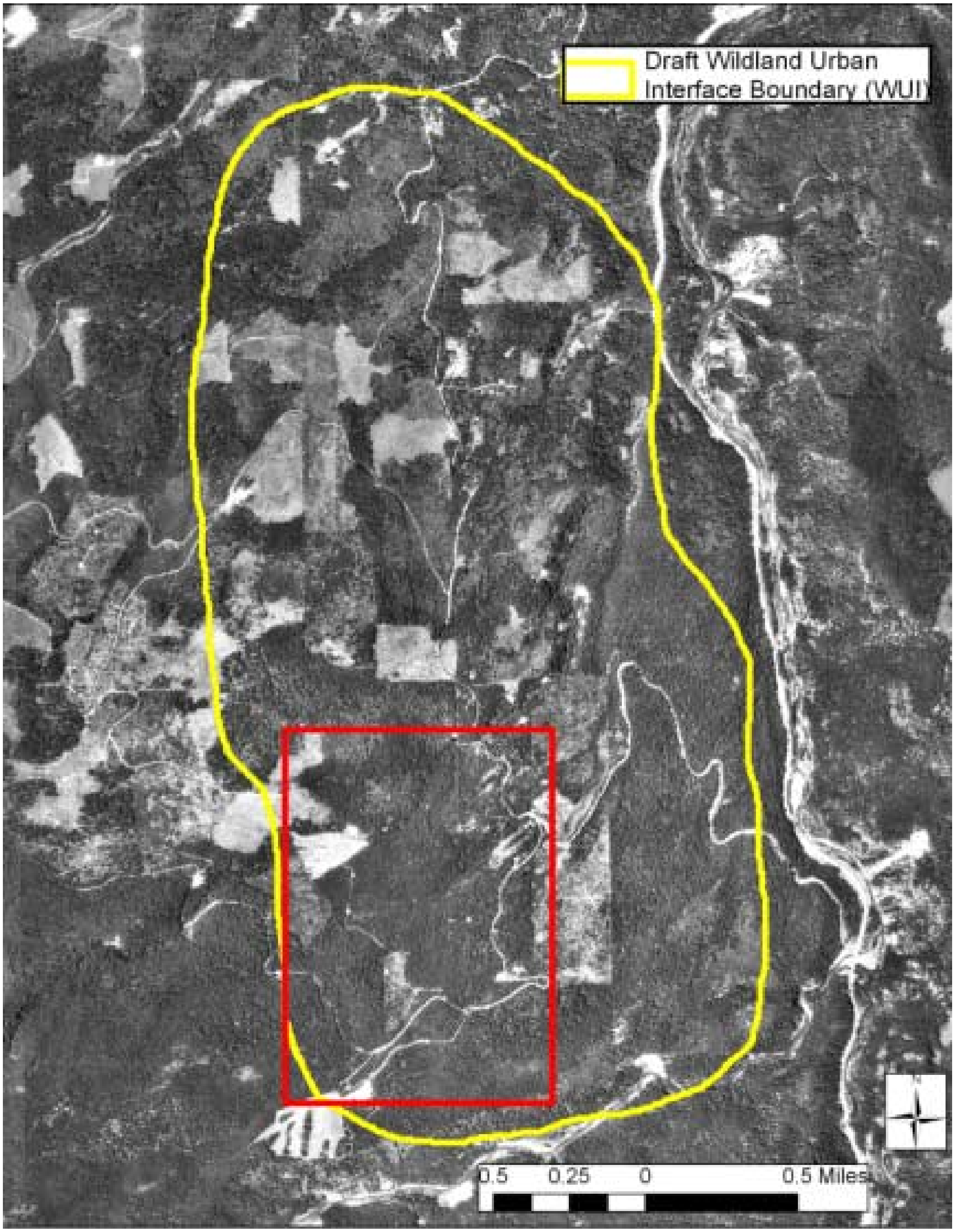


Figure 39. The red box indicated an area we zoomed into on the USFS true color aerial photo to compare insect and disease polygons with perceivable dead trees in the photograph. The area within the red box is displayed on the next page.

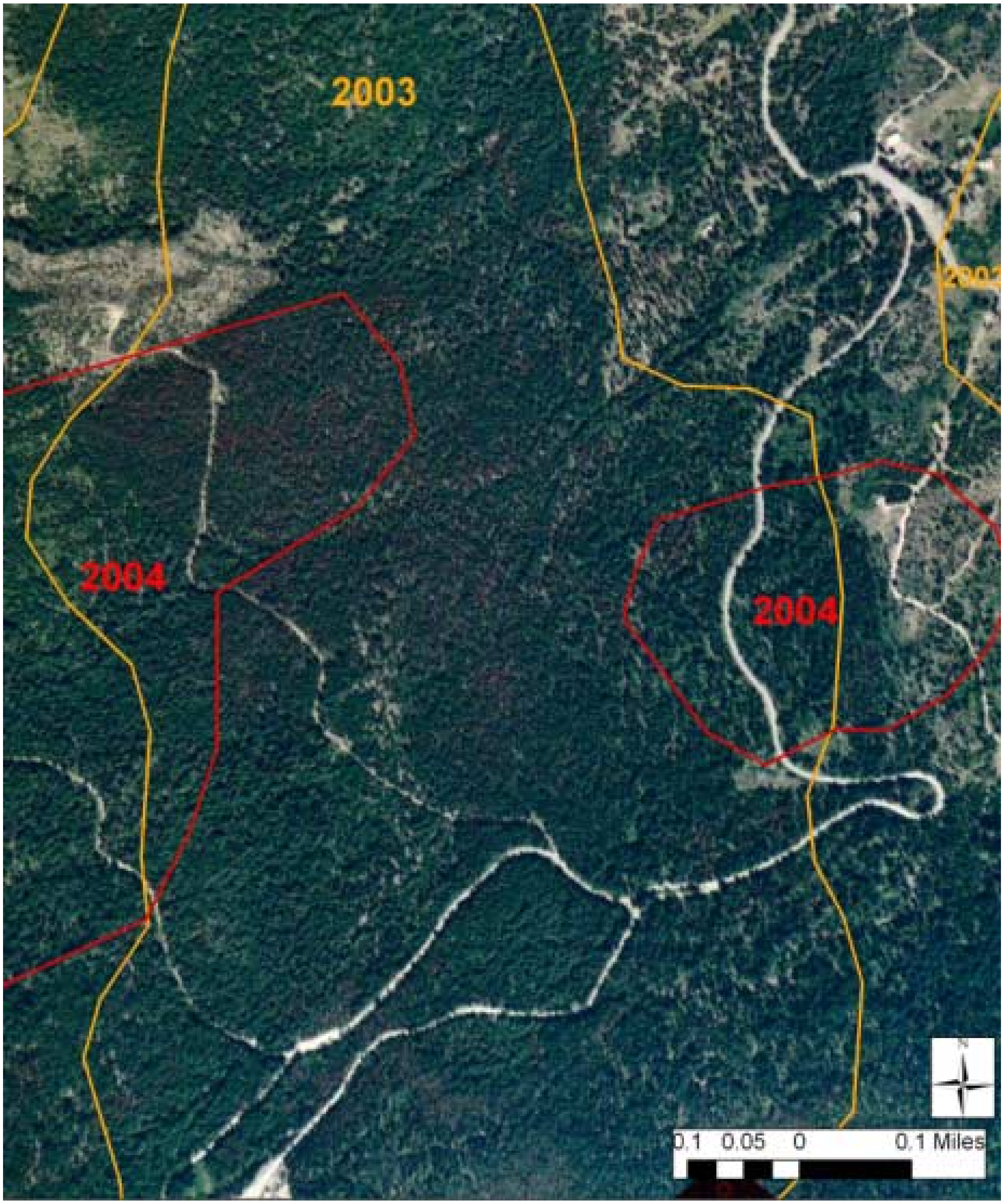


Figure 40. From this area of the photo tree mortality is visible within different forest patches. Within the largest polygon displayed from 2003, there are some areas with dense clusters of dead trees, while in other areas no dead trees are apparent. The USFS labeled this polygon as having 3 dead trees per acre occurring in 2003. Note that the red 2004 polygon on the right side of the photo encompasses multiple stand types: a regenerating clear cut on the right side, a more mature forest in the middle, and a less dense yet more mature forest on the left side. Some tree mortality is visible in the upper left portion of the polygon, but not much is readily visible in the rest. This polygon is listed as having around .24 dead trees per acre. Portions of the polygon labeled 2003 showed moderate to high levels of lodgepole pine mortality during our field visits, but lodgepole

pine is a relatively small component of the stand in most places. Most of the 2003 polygon had little mortality from insects during our field visits. Also, part of the polygon labeled 2004 has moderate to high levels of lodgepole mortality from mountain pine beetle, but other areas have low levels of mortality. Even in cases where lodgepole pine mortality is relatively high, there are several other tree species in the stand that are emerging from the understory or remaining in the overstory.

Coarse Woody Debris and Surface Fires

Coarse woody debris loading is high in some areas as illustrated in the photo below. But coarse woody debris loading is very patchy and many areas within the planning area have low to moderate levels. The areas with the highest coarse woody debris loading are early mature stands (60-80 years old) that are just emerging from the stem-exclusion phase of successional development. High levels of coarse woody debris are common at this stage of stand development.

The climate in the planning area is relatively warm and moist. This will cause relatively rapid decomposition of coarse woody debris by natural decomposition processes.

Figure 41. High levels of coarse woody debris exist in some areas (photo stop 6).

Figure 42a. Lower levels of coarse woody debris exist in other areas (photo stop 3).

Figure 42b. Typical levels of coarse woody debris in mature forests after lodgepole pine dies out of the stand (photo stop 3).

It is relevant to keep in mind the current understanding of the relationships between coarse woody debris and surface fire spread when evaluating wildfire risk and probable behavior in the Cooper Spur Area. A recent report released by the Rocky Mountain Research Station (General Technical Report-153) presents an easy to understand summary of predicted behavior patterns for a comprehensive set of fuel models affecting the flaming front of a fire, many of which fit the surface fuel situation occurring in the project area (Scott and Burgan 2005). In short, the report indicates that heavy loadings of naturally occurring large downed logs (CWD) do not contribute to a substantial increased risk in rates of surface fire spread or increased flame lengths along a flaming front. Also, a surface fuel situation with naturally occurring moderate fine and coarse fuels will maintain low rates of spread and flame length. The driving factor in terms of rates of spread and flame length along a flaming front seem to be fine fuel loadings, with activity slash providing the most suitable conditions for rapid fire spread and high flame lengths.

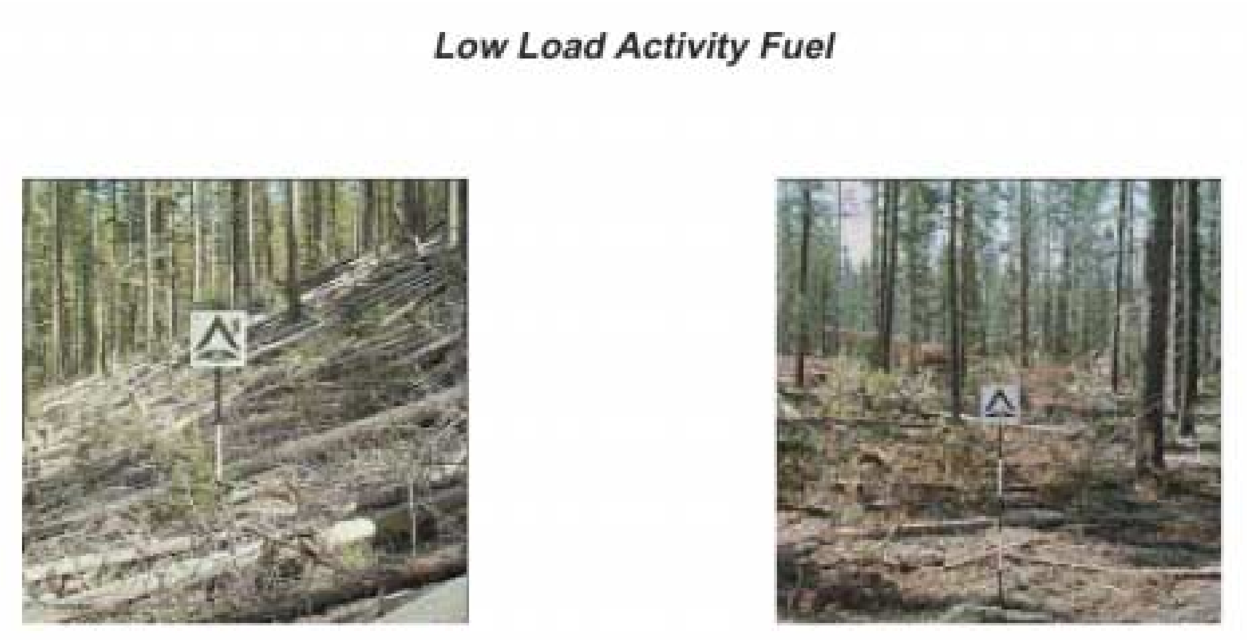


Figure 43. Low load activity fuels photos from Scott and Burgan (2005).

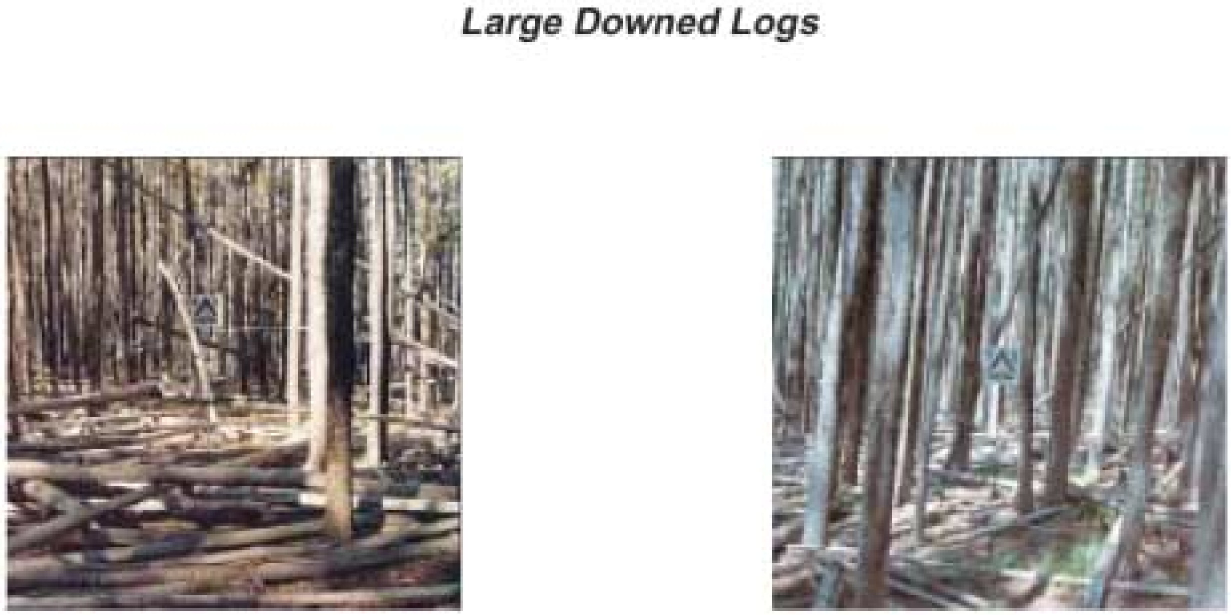


Figure 44. Large downed logs example fuel model photos from Scott and Burgan (2005).

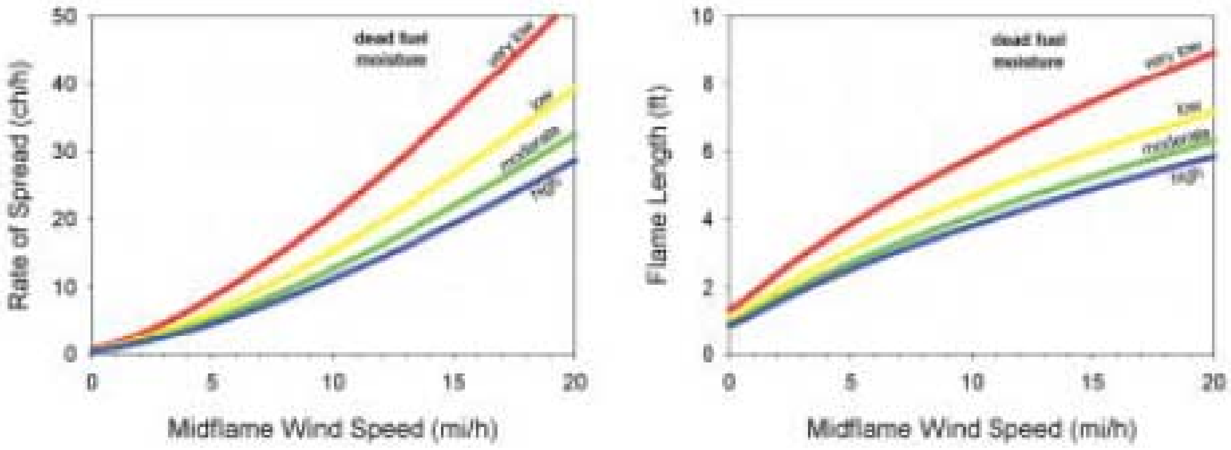


Figure 45. Low load activity fuel model rate of spread and flame length performance under different fuel moisture conditions and wind speeds from Scott and Burgan (2005).

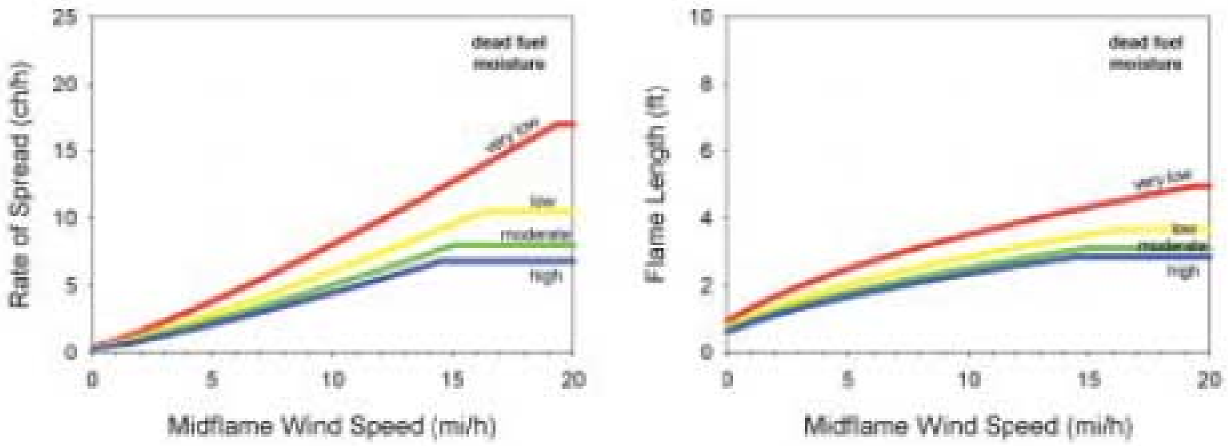


Figure 46. Large downed logs fuel model rate of spread and flame length performance under different fuel moisture conditions and wind speeds. Note: rate of spread Y-axis is ½ that of low load activity fuel model from Scott and Burgan (2005).

Rates of fire spread and flame lengths are dramatically reduced in the large downed logs fuel model compared to low load activity fuel model illustrated above. The large downed logs fuel model is a fitting model for many places within the Cooper Planning Area where naturally occurring surface fuel loadings may seem high because of the presence of coarse woody debris, but these areas are actually far safer in terms of wildfire spread rates and flame lengths than areas where treatment has occurred and light dead and down activity fuel remains on the forest floor.

Fire Condition Class Data From US Forest Service

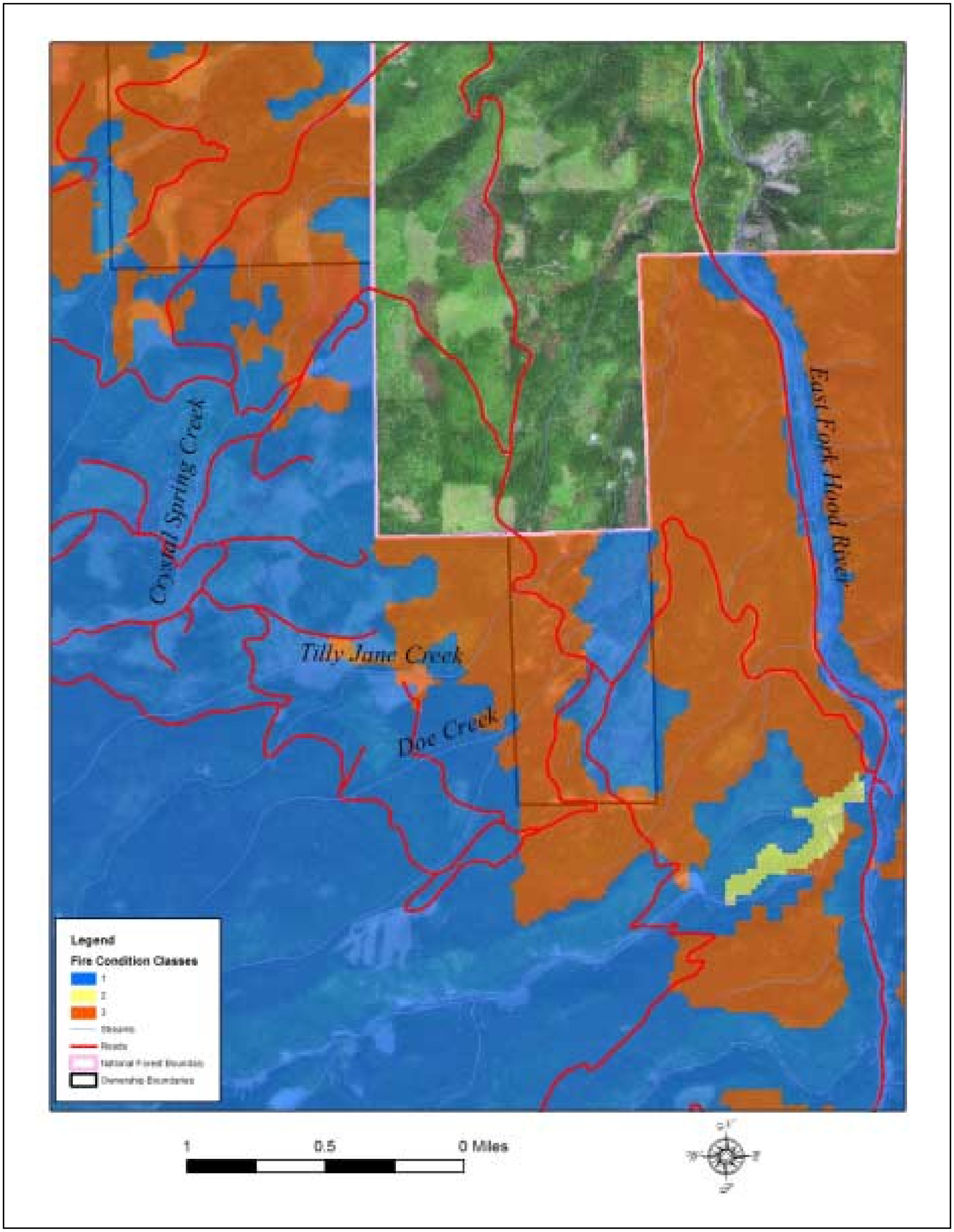


Figure 47. Fire condition class map based on data from Mt. Hood National Forest.

Fire condition classes are an attempt to describe the degree of deviation of a forest stand from the conditions that would be present under presettlement fire regimes. Figure 47 illustrates fire condition class mapping data from the Mt Hood National Forest (April 2005). While some of the areas are mapped to the correct fire regime, many areas are incorrectly mapped. Much more of the planning area should be mapped as Condition Class 2 – the intermediate fire condition class. Too much area is mapped as Condition Class 3 – the most extreme deviation from presettlement conditions. There may also be too much area mapped as Condition Class 1. Considerable revision and refinement of the fire condition class mapping is needed before this is useful in wildfire and fuel reduction planning.

Possible Creation off a Fire Safety Zone around the Planning Area

The most urgent fire safety need is treatment of fuel conditions in the fire ignition zone around homes and modifications and maintenance of homes and other structures to make them fire safe. After this is accomplished another possible activity that may help protect the community from wildfire is the creation of a fire safety zone around the community. The fire safety zone would be based on a 350-foot zone from road centerlines as illustrated in Figure 49. This fire safety zone could be created based on existing roads and previously managed stands – largely on National Forest land (Figure 52). An effective fire safety zone would also involve some treatment of county and private lands (Figure 52). Where roads are not present, a depleted fuel zone can be fairly easily created within existing clearcuts. Some of the proposed fire safety zone would be based on treatment within such areas.

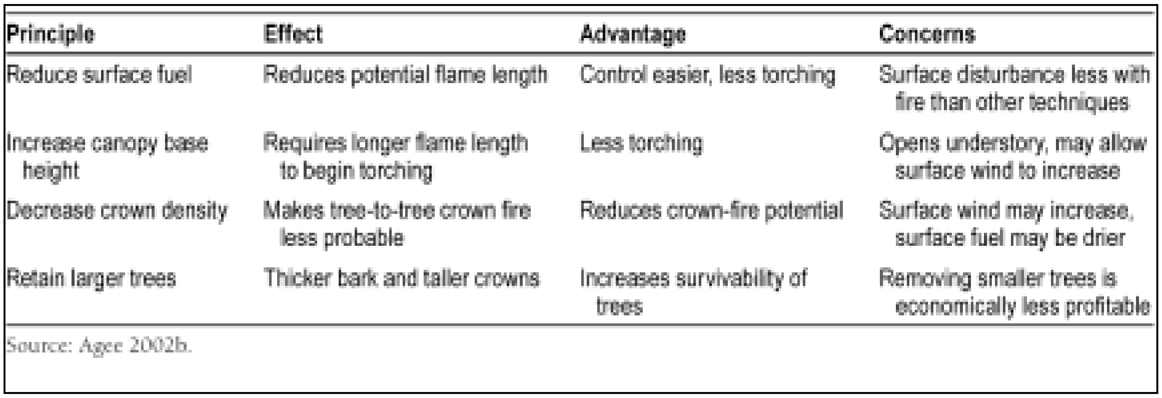
The creation of a perimeter defense zone and fire safety zone where fire fighters can safely operate will enhance protection of the planning area from fires that spread from outside the watershed. This perimeter defense would be centered on the roads or located within previously logged areas around the planning area.

The first zone will be 50 feet from the road centerline on both sides of the road. It includes the road bed and road right-of-way, and it will be treated to eliminate nearly all fuels that can support a surface or crown fire.

The next zone is 100 feet out into the forest from the fuel elimination zone. In this zone, the forest canopy will be dramatically reduced so that there is a complete barrier to the spread of crown fire. Commercial thinning, mechanical treatments and prescribed fire will be used to reduce canopy and dramatically reduce surface fuels.

The exterior fuel reduction zone is 200 feet out into the forest from the severe fuel reduction zone. The goal of this zone is to bring any crown fire down to the ground and to dramatically reduce the intensity of any surface fire. Thinning will not be as severe as in the 100-foot middle zone, but canopy cover reductions will often be more than 50-70% of the current canopy cover.

Scientists have described four principles for creating fire-resilient forests (Agee 2002b, Peterson et al 2005). These principles are listed below and will be used in development of plans for the fire safety zones described in this report (Figure 48).



Principle	Effect	Advantage	Concerns
Reduce surface fuel	Reduces potential flame length	Control easier, less torching	Surface disturbance less with fire than other techniques
Increase canopy base height	Requires longer flame length to begin torching	Less torching	Opens understory, may allow surface wind to increase
Decrease crown density	Makes tree-to-tree crown fire less probable	Reduces crown-fire potential	Surface wind may increase, surface fuel may be drier
Retain larger trees	Thicker bark and taller crowns	Increases survivability of trees	Removing smaller trees is economically less profitable

Source: Agee 2002b.

Figure 48.

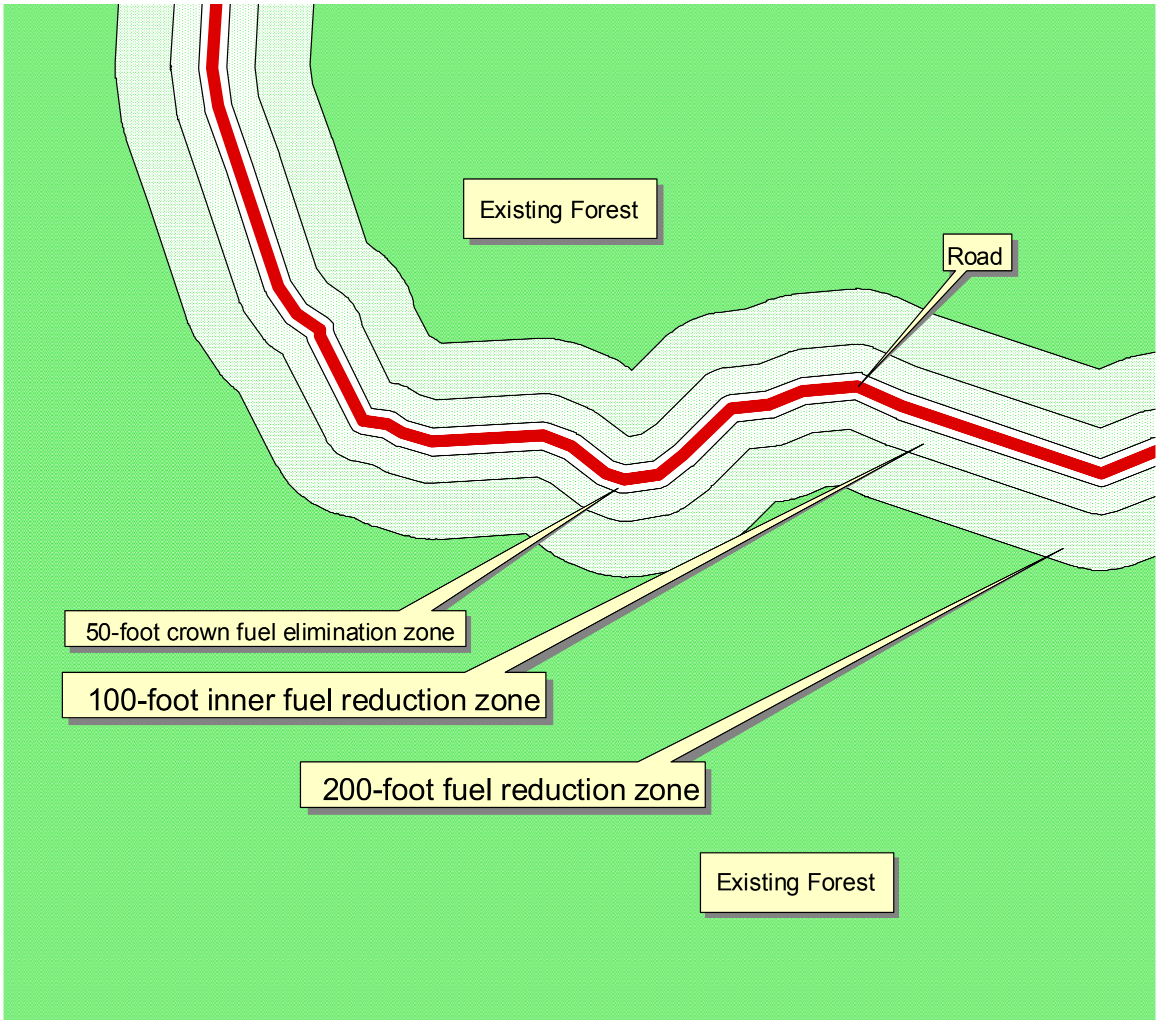


Figure 49. Schematic of a roadway perimeter fire safety zone.

Figures 50 – 51. Dense young forests crowd the sides of most forest roads in the planning area. Often the forest canopy nearly spans the road. Wildfires spread easily across such roads. But the opportunity exists for eliminating the dense forest next to the road and gradually thinning out the forest away from the road. This, plus effective surface fuel reduction measures and regular use of prescribed fire can create a zone where wildfires are either stopped or are greatly reduce in intensity. This can create a zone where firefighters can safely operate to put out the fire.

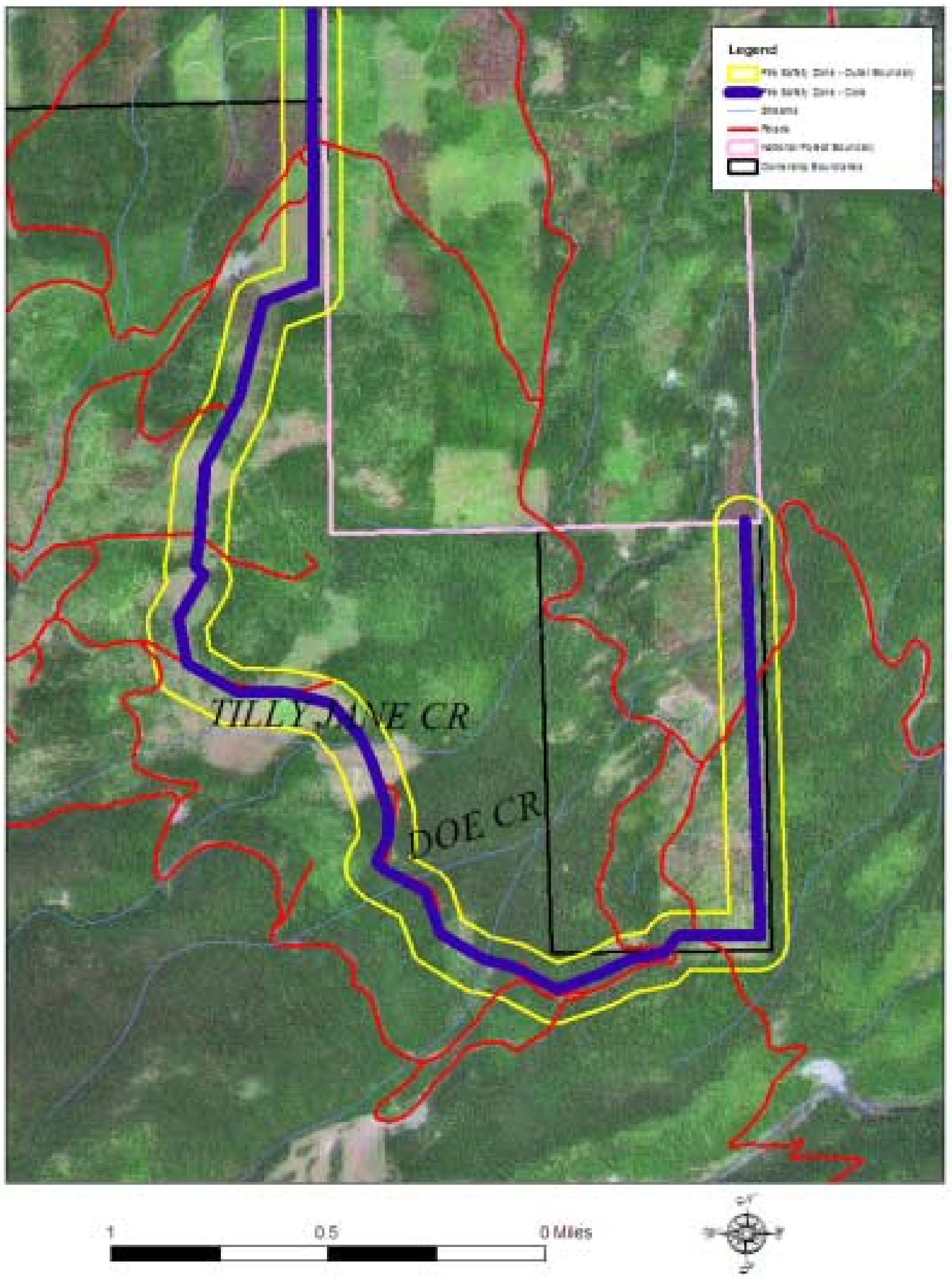


Figure 52. Possible Fire Safety Zone Based on Existing Roads and Treatments to Previously Managed Stands with Aerial Photo Background

Conclusions

Our primary conclusion is that fuel reduction activities in the Cooper Planning Area need to be concentrated around residences and roads near the perimeter of the community. The primary effort to reduce wildfire risk to homes and communities should target the home ignition zone (30-meters from structures) where effective actions can be undertaken. Protection of structures within the planning area can be accomplished with a minimal effort directed toward structure improvements and fuel reduction in the immediate zone surrounding the structures.

Forest treatments outside the home *zone of ignition* will do little to decrease the vulnerability of homes and structures to loss or damage during wildfires unless treatments and proper building techniques/materials are incorporated and maintained within the home *zone of ignition.*

The status quo is a hazardous situation with high fuel loadings within the home *zone of ignition* and flammable construction materials increasing the risk for structure loss or damage given a wildfire of any intensity.

Forest condition and fuel loadings in the portions of the uncut forests of the Cooper Planning Area that Peter Morrison examined appear to be within the normal range of natural variation that can be expected on these sites. There is no "forest health crisis" in this area and no need for dramatic intervention.

Coarse woody debris exists within the older forests, but this is natural and does not contribute to an increased rate of fire spread or increased flame front flame lengths. Fuel treatments within these forests might increase rates of fires spread and flame front flame lengths.

Fuel loadings on some sites that have been partially cut or clearcut are abnormal and should be prioritized for treatment. Pre-commercial thinning of plantations in the area and proper fuel treatment of slash are needed at this time.

Recommendations

- We recommend that the collaborative group devotes the time to better define its goals and planning region boundary.
- Considerable amounts of information and data gathering at the stand level need to be achieved for meaningful management decisions to be made.
- Existing data needs to be assessed in terms of accuracy and usability at the stand level.
- Collaboration between public agencies and private residences should be made a priority to deal with the immediate problems within the home ignition zone.

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