WILDLAND FIRE AND FLOOD ASSESSMENT - FINAL REPORT

LEWIS COUNTY, IDAHO

In 2010, Lewis County received a Federal Emergency Management Agency Pre-Disaster Mitigation Program grant to conduct in-depth risk assessments for the hazards of wildland fire and flood. Wildfire and flooding events occur almost annually in Lewis County; thus, programs and projects that mitigate the impacts of these hazards is a benefit to the local residents, property, infrastructure, and the economy.

This page was intentionally left blank.

WILDLAND FIRE AND FLOOD RISK ASSESSMENT

AND RECOMMENDATIONS FOR HAZARD MITIGATION STRATEGIES

INTRODUCTION

The following narratives document the history of wildland fire and flood events in Lewis County as well as the impacts of these events. Each assessment includes models, research, and professional analysis of causal factors, current environment, and predicted future conditions. In addition, based on the risk assessments, specific mitigation project recommendations are included to provide local decision-makers with information and guidance on feasible solutions for protection of areas in Lewis County exhibiting a high risk of incurring wildland fire or flood damages.

The information contained in this assessment is intended to assist with the development of grant applications by providing a repository of current hazard-related documentation in an easily transferrable format.

PREPARED BY:

NORTHWEST MANAGEMENT, INC.

This page was intentionally left blank.

SIGNATURE OF APPROVAL

This document serves as an addendum and supporting documentation for the existing Lewis County Multi-Hazard Mitigation Plan and Community Wildfire Protection Plan.

This document has been reviewed by and is approved by the Lewis County, Idaho Board of Commissioners as of this 23RD day of JANUARY in 2012.

By: Charles Doty, Commissioner — Date: 1/23/12

By: Carroll Keith, Commissioner — Date: 1/23/12

By: Don Davis, Commissioner — Date: 1/23/12

By: Dave Hasz, Emergency Management — Date: 1-23-12

This page was intentionally left blank.

TABLE OF CONTENTS

INTRODUCTION ..... **III**

SIGNATURE OF APPROVAL ..... **V**

TABLE OF CONTENTS ..... **VII**

TABLE OF TABLES ..... **IX**

TABLE OF FIGURES ..... **X**

WILDLAND FIRE ASSESSMENT **1**

Wildland Fire History **1**

Recent Large Fire Summaries 3
Frequency and Magnitude 5
Impacts of Wildfire 7

Wildfire Characteristics Modeling **8**

Historic Fire Regime Model 8
Fire Regime Condition Class 11
Wildland Urban Interface 12
Fire Behavior Analysis Tool 15

Categorization of High Hazard Areas **15**

Field Assessments 16
Risk Categories 16
Non-native or High Fire Risk Vegetation *16*
High Ignition Potential *18*
High Risk Fire Behavior *18*
Suppression Capabilities *20*
Population Centers and Developing Areas *21*
High Conservation Assets at Risk *21*
Determination of Threat Level 22

Wildfire Mitigation Project Recommendations **23**

Assessment Area 3 - Winchester 23
Olander Project Area *24*
Woodside Project Area *25*
Talmaks Camp Project Area *27*
Assessment Area 3 - Forest 28
Forest Junction Project Area *28*
West Forest Project Area *30*
Assessment Areas 1 and 2 - Kamiah 32
Kamiah Foothills Project Area *32*
Upper Canyon Project Area *33*
Other Types of High Priority Projects 35

FLOOD ASSESSMENT **37**

Flood History **37**

Flood-Prone Watersheds 37
Mission Creek *37*
Lawyer Creek *38*

Flood Characteristics Modeling **40**
Streamstats 40
Previous Studies 40
Mission Creek *41*
Lawyer Creek *41*

Categorization of High Hazard Areas **42**
Field Assessments 43
Risk Categorization 43
Existing Data *43*
Contour Mapping *43*
Historic or Current Flood Damage *43*
Population Centers and Developing Areas *43*
Degradation of Water Quality *43*
Water Retention and Stream Energy Dissipation Potential *44*
Channel Migration Patterns *44*
Frequent Use and/or Safety Concerns *44*
Flood Control Infrastructure *44*
Determination of Threat Level 44
High Risk Areas *44*
Medium Risk Areas *48*
Areas of Concern *52*

Flood Mitigation Project Recommendations **57**
Flying B Homesite Access Road 57
Lawyer Creek Road 57
Tommy Robinson Pond 58
Bountiful Grain & Craig Mountain Railroad Bridge 58
Other Types of Flood Mitigation Projects 59

TABLE OF TABLES

Table 1. Summary of Cause from 1983 to 2009 in Lewis County. 6
Table 2. Historic Fire Regimes in Lewis County. 9
Table 3. Fire Regime Condition Class in Lewis County. 11
Table 4. Estimated Historic High Water Occurrences for Lawyer Creek. 41
Table 5. Mission Creek USGS Streamstats Model Parameters. 41
Table 6. Streamstats Estimated 10, 25, 50, and 100 Year Flow Rates on Mission Creek. 41
Table 7. Lawyer Creek USGS Streamstats Model Parameters. 42
Table 8. Streamstats Estimated 10, 25, 50, and 100 Year Flow Rates on Lawyer Creek. 42
Table 9. Calculated Average Peak Flow Rates for Lawyer Creek. 42

TABLE OF FIGURES

Figure 1. Idaho Statewide Fire Statistics. ... 1
Figure 2. August 7th, 2007 Article in *Clearwater Progress.* ... 2
Figure 3. Wildland Fire Ignition History By Decade from 1983-2009. ... 4
Figure 4. Summary of Ignition and Extent Profile from 1983 to 2009. ... 5
Figure 5. Summary of Ignitions by Landowner from 1983-2009 in Lewis County. ... 6
Figure 6. Historic Fire Regime Map. ... 10
Figure 7. Fire Regime Condition Class Map. ... 12
Figure 8. Wildland Urban Interface Map. ... 15
Figure 9. Map of Designated Assessment Areas. ... 16
Figure 10. Fire Severity Model. ... 17
Figure 11. Wildfire Rate of Spread Model. ... 18
Figure 12. Wildland Fire Intensity Model. ... 20
Figure 13. Rural Fire Protection District Boundaries. ... 21
Figure 14. Relative Threat Level Map. ... 23
Figure 15. Olander Project Area Map. ... 24
Figure 16. Woodside Project Area Map. ... 26
Figure 17. Talmaks Camp Project Area Map. ... 27
Figure 18. Forest Junction Project Area Map. ... 29
Figure 19. West Forest Project Area Map. ... 31
Figure 20. Kamiah Foothills Project Area Map. ... 33
Figure 21. Upper Canyon Project Area Map. ... 34
Figure 22. April 2011 Photos of Mission Creek. ... 38
Figure 23. March 1979 Article Published in the *Clearwater Progress* ... 39
Figure 24. April 2011 Photos of Lawyer Creek. ... 40
Figure 25. Photos of Flying B Homesite. ... 45
Figure 26. High Risk Areas on Lawyer Creek. ... 46
Figure 27. Photos of Tommy Robinson Pond Site. ... 47
Figure 28. Photos of BG&CM Railroad Bridge in February 2011. ... 48
Figure 29. Photos of BG&CM Railroad Bridge in April 2011. ... 48
Figure 30. Medium Risk Areas in Lawyer Creek. ... 49
Figure 31. Photos of Hill Street Bridge in Kamiah. ... 50
Figure 32. Photos of Upper Dike Site. ... 51
Figure 33. Photos of the Lower Dike Site. ... 51
Figure 34. Photos of Mission Creek. ... 53
Figure 35. Identified Areas of Concern on Lawyer Creek. ... 54
Figure 36. Identified Area of Concern on Mission Creek. ... 55
Figure 37. Heightened Threat Level Areas & FEMA-Identified Floodplain Areas. ... 56
Figure 38. Photos of Flying B Homesite Access Road. ... 57
Figure 39. Photos of 2011 Lawyer Creek Road Damage. ... 58
Figure 40. Photos of Tommy Robinson Pond Emergency Diversion Dam. ... 58

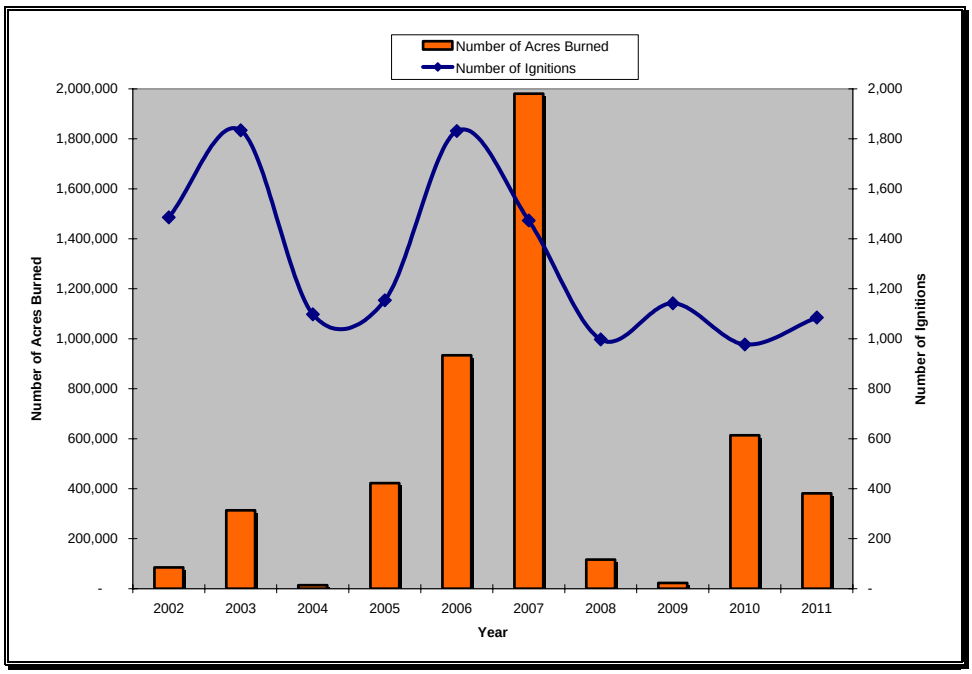
WILDLAND FIRE ASSESSMENT

The purpose of this in-depth wildland fire assessment for Lewis County is to update the technical elements of the existing Lewis County Community Wildfire Protection Plan and provide guidance on the continuation of hazardous fuels reduction projects in Lewis County. Additionally, this assessment serves as an update and supplement to the wildland fire annex of the 2011 Lewis County Multi-Hazard Mitigation Plan.

Wildland Fire History

In the 1930s, wildfires consumed an average of 40 to 50 million acres per year in the contiguous United States, according to US Forest Service estimates. By the 1970s, the average acreage burned had been reduced to about 5 million acres per year. Over this time period, fire suppression efforts were dramatically increased and firefighting tactics and equipment became more sophisticated and effective. For the 11 western states, the average acreage burned per year since 1970 has remained relatively constant at about 3.5 million acres per year.[1] In Idaho, the ten-year average for the total number of ignitions and acres burned statewide is 1,308 and 488,396, respectively. Although not conclusive due to the lack of historical information, there does seem to be a slight downward trend in the number of ignitions per year, but a slight upward trend in number of acres burned annually in Idaho since 2002.[2]

Figure 1. Idaho Statewide Fire Statistics.

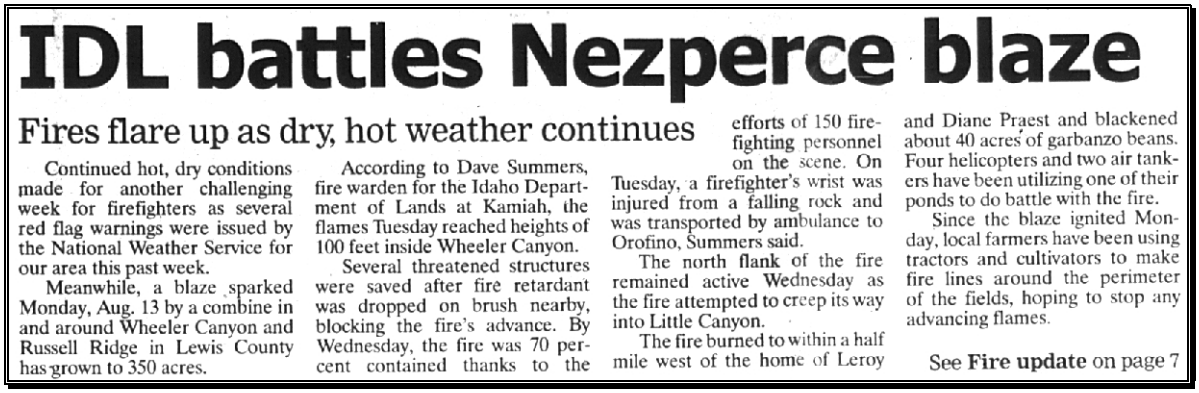


[1] *Managing the Impact of Wildfires on Communities and the Environment, A Report to the President in Response to the Wildfires of 2000*. September 2000. Council on Environmental Quality.

[2] National Interagency Fire Center. "Statistics." Boise, Idaho. Available online at http://www.nifc.gov/fireInfo/fireInfo_statistics.html. December 2011.

The severity of a fire season can usually be determined in the spring by how much precipitation is received, which in turn determines how much fine fuel growth there is and how long it takes this growth to dry. These factors, combined with annual wind events can drastically increase the chance a fire start will grow and resist suppression activities. Furthermore, harvest operations and recreational activities are typically occurring throughout the months of June, July, August, and September. Occasionally, these types of human activities cause an ignition that could spread into populated areas and timberlands.

Figure 2. August 7th, 2007 Article in *Clearwater Progress.*



IDL battles Nezperce blaze

Fires flare up as dry, hot weather continues

Continued hot, dry conditions made for another challenging week for firefighters as several red flag warnings were issued by the National Weather Service for our area this past week.

Meanwhile, a blaze sparked Monday, Aug. 13 by a combine in and around Wheeler Canyon and Russell Ridge in Lewis County has grown to 350 acres.

According to Dave Summers, fire warden for the Idaho Department of Lands at Kamiah, the flames Tuesday reached heights of 100 feet inside Wheeler Canyon.

Several threatened structures were saved after fire retardant was dropped on brush nearby, blocking the fire's advance. By Wednesday, the fire was 70 percent contained thanks to the efforts of 150 firefighting personnel on the scene. On Tuesday, a firefighter's wrist was injured from a falling rock and was transported by ambulance to Orofino, Summers said.

The north flank of the fire remained active Wednesday as the fire attempted to creep its way into Little Canyon.

The fire burned to within a half mile west of the home of Leroy and Diane Praest and blackened about 40 acres of garbanzo beans. Four helicopters and two air tankers have been utilizing one of their ponds to do battle with the fire.

Since the blaze ignited Monday, local farmers have been using tractors and cultivators to make fire lines around the perimeter of the fields, hoping to stop any advancing flames.

See **Fire update** on page 7

Fire was once an integral function within the majority of ecosystems in Idaho. The seasonal cycling of fire across the landscape was as regular as the July, August, and September lightning storms on the Camas Prairie. Depending on the plant community composition, structural configuration, and buildup of plant biomass, fire resulted from ignitions with varying intensities and extent across the landscape. Shorter return intervals between fire events (1 to 47 years[3]) often resulted in less dramatic changes in plant composition.[4] With infrequent return intervals, plant communities tended to burn more severely and be replaced by vegetation different in composition, structure, and age.[5] Native plant communities in this region developed under the influence of fire and adaptations to fire are evident at the species, community, and ecosystem levels. Fire history data (from fire scars and charcoal deposits) suggest fire has played an important role in shaping the vegetation throughout Lewis County.

---

[3] Barrett, J.W. 1979. Silviculture of ponderosa pine in the Pacific Northwest: the state of our knowledge. USDA Forest Service, General Technical Report PNW-97. Pacific Northwest Forest and Range Experiment Station, Portland, OR. 106 p.

[4] Johnson, C.G. 1998. Vegetation Response after Wildfires in National Forests of Northeastern Oregon. 128 pp.

[5] Johnson, C.G.; Clausnitzer, R.R.; Mehringer, P.J.; Oliver, C.D. 1994. Biotic and Abiotic Processes of Eastside Ecosytems: the Effects of Management on Plant and Community Ecology, and on Stand and Landscape Vegetation Dynamics. Gen. Tech. Report PNW-GTR-322. USDA-Forest Service. PNW Research Station. Portland, Oregon. 722pp.

RECENT LARGE FIRE SUMMARIES

2003 Milepost 59 Fire

The Milepost 59 fire was started on August 14, 2003 by a catalytic converter on a disabled vehicle. The vehicle ran out of gas and pulled onto the shoulder of US highway 12 approximately 7 miles northwest of Kamiah, Idaho. The fire was located on the west side of U.S. Highway 12 at the base of a steep slope with a northeast aspect. The fire was reported at 9:05 and the first engine arrived on-scene at 9:20. At that point, the fire was estimated to be several acres in size and was expanding rapidly. Although an attempt was made with crews, engines, and 2 dozers to provide initial attack on the fire, suppression efforts were unsuccessful due to extended drought conditions, steep terrain, rock bluffs, and the inability to mobilize air resources at night. Poor visibility created by smoke and an inversion limited effective air support. Dozers and hand crews attempted to hold the fire at 150 acres with fire lines and burn out operations.

By mid-morning the next day, the inversion lifted and the wind picked up. The fire blew up to approximately 2,000 acres, and made an upriver run of about 2 miles. The fire, managed as a Type 3 incident, was divided into 2 divisions with over 100 people, 3 dozers, 3 engines, and an assortment of volunteer and rural equipment. A decision was made to request a Type 2 incident management team. By August 16th, the fire had doubled to over 4,700 acres and was threatening residences. The fire was essentially being attacked from 2 locations. The Idaho Department of Lands was spearheading the attack on both the upriver and downriver flanks on Highway 12 and the Nezperce Rural Fire Department and local farmers were working from the agriculture lands on the west side of the fire. Suppression forces had also doubled in size with more than 200 people assigned to the fire, not including volunteers. Two residences within the fire were saved by burn-out operations and air support. A number of other residences ahead of the fire were prepped. A decision to close Highway 12 to all but emergency vehicles was made. By nightfall on Sunday, August 17th, the fire was contained at an estimated size of 5,500 acres and a Florida Type 2 team arrived. The final shift was completed on Friday, August 29th, 15 days after ignition. The final size of the fire was 8,142 acres, and the total cost was approximately $2.6 million.

2000 Maloney Creek Fire

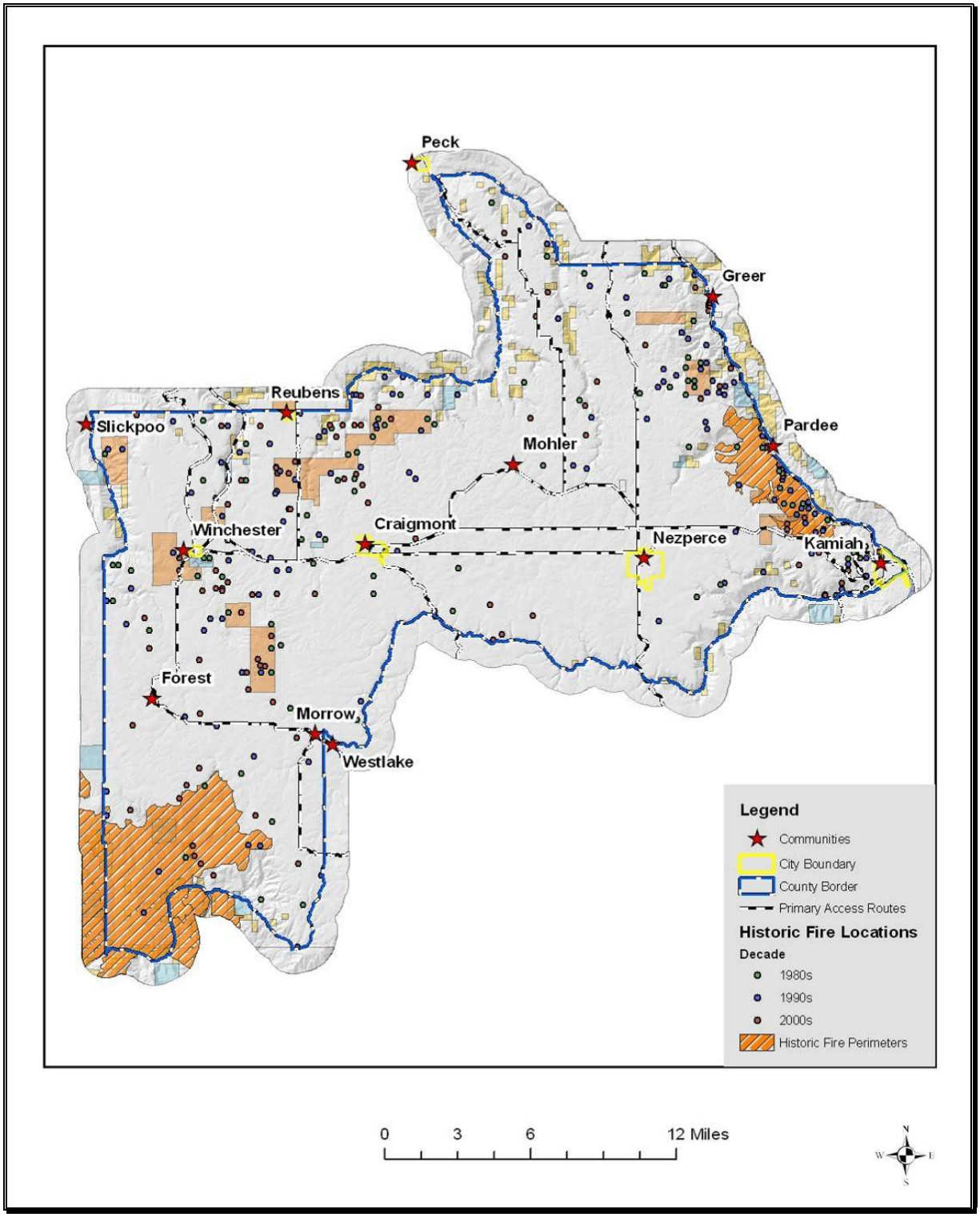
The 2000 Maloney Creek Fire started during a dry lightning storm near the confluence of Maloney Creek and the Salmon River. This fire burned approximately 74,500 acres and cost an estimated $5 million. The majority of the burn was on the Idaho Department of Fish and Game's Craig Mountain Wildlife Management Area. The fire was mostly in the steep grasslands and exposed basalt rock cliffs that characterize this area. US Forest Service ownership burned by the fire was limited to a narrow corridor bordering the Snake River that consists of non-forest land cover types. The Maloney Creek Fire burned in an area that has a very

"Initial efforts to alert area fire crews [of the house fire] reportedly were unsuccessful because the remote location [near Peck] is not within any agency's official jurisdiction."

-- Clearwater Progress article from October 2nd, 1993.

active fire history. Although the Maloney Creek Fire was by far the largest fire on the Idaho Department of Lands' Craig Mountain Supervisory Area, it was only one of 42 fires reported by the Area in 2000. There was a total of 308 fires reported statewide by the Idaho Department of Lands in 2000.

Figure 3. Wildland Fire Ignition History By Decade from 1983-2009.



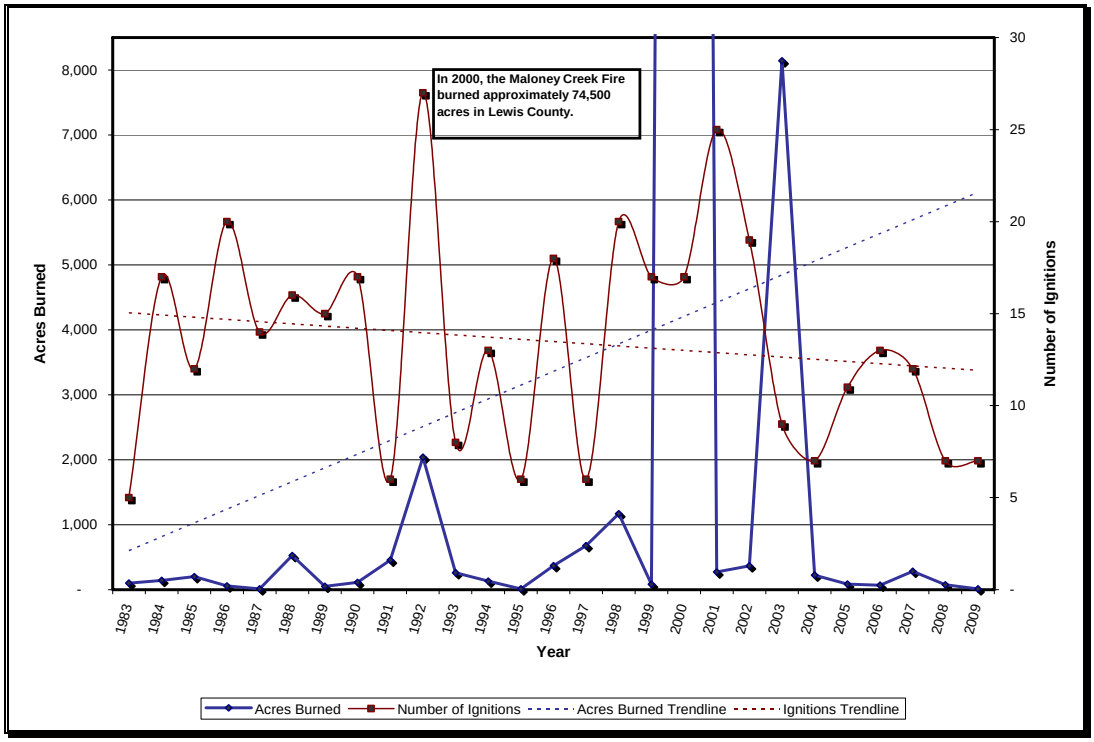
FREQUENCY AND MAGNITUDE

Detailed records of wildfire ignitions and extents from the US Forest Service (USFS), Bureau of Land Management (BLM), Idaho Department of Lands (IDL), and Bureau of Indian Affairs (BIA) have been analyzed for Lewis County. In interpreting these data, it is important to keep in mind that the information represents only the lands protected by the agency specified and may not include all fires in areas covered only by local fire departments or other agencies.

The combined datasets used in this analysis include ignition and extent data from 1983 through 2009 within each agency's jurisdiction. During this period, the agencies recorded an average of 13 wildfire ignitions per year resulting in an average total burned area of 3,359 acres per year.

The highest number of ignitions in Lewis County was witnessed in 1992 with 27 separate ignitions. However, the greatest number of acres burned in a single year occurred when the Maloney Creek Fire scorched approximately 74,500 acres between August 10th and October 30th, 2000. The top 4 largest fires in Lewis County history were the Maloney Creek Fire, the 2003 Milepost 59 Fire (8,142 acres), the 1992 Milepost 62 Fire (1,654 acres) and the 1998 Mission Creek Fire (1,000 acres).

Figure 4. Summary of Ignition and Extent Profile from 1983 to 2009.



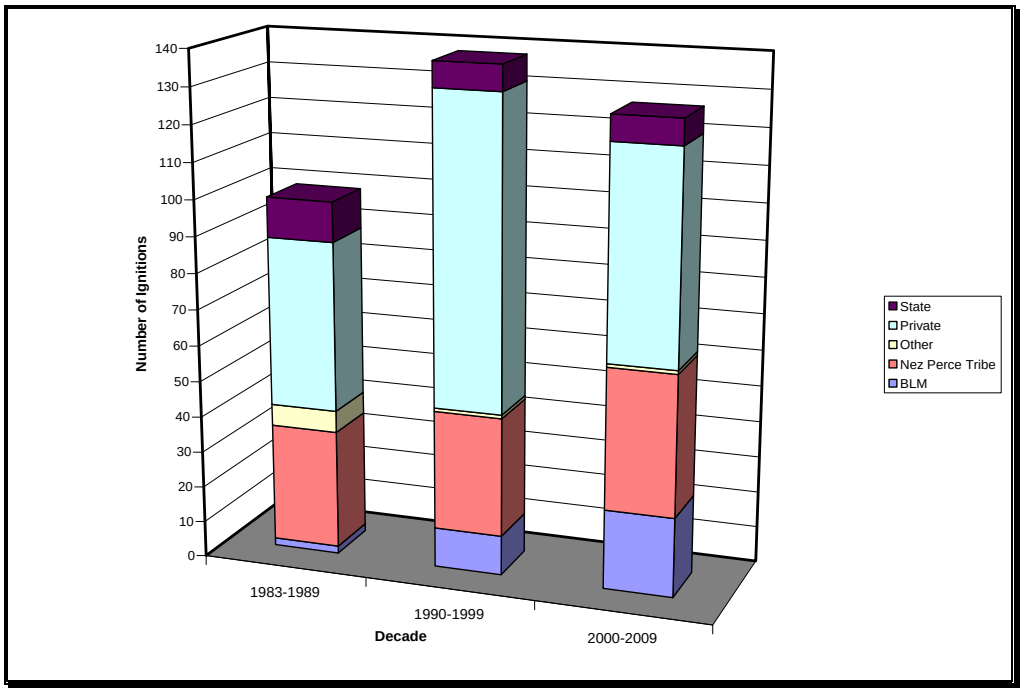
Based on the agencies' combined datasets specific to Lewis County, there is a slight downward trend in the number of ignitions since 1983, but a steep upward trend in the total acres burned since that year, primarily due to the Maloney Creek Fire event. Nevertheless, if the Maloney Creek Fire outlier is not included in the analysis, there is still a slight upward trend in the number of acres burned each year. The average number of acres burned per ignition, not including the Maloney Creek Fire, is approximately 45 acres.

According to the data, the vast majority of ignitions occurring in Lewis County are human caused; however, naturally ignited fires result in a greater percentage of acres burned. This may be due in part to the time lapse between a natural ignition and an initial attack response.

Table 1. Summary of Cause from 1983 to 2009 in Lewis County.				
General Cause	**Number of Ignitions**	**Percent of Total Ignitions**	**Acres Burned**	**Percent of Total Acres**
Human-Caused	213	59%	13,494	15%
Natural Ignition	144	40%	77,127	85%
Unknown	7	2%	62	<1%
Total	**364**	**100%**	**90,683**	**100%**

The data reviewed above provides a general picture regarding the level of wildland-urban interface fire risk within Lewis County. There are several reasons why the fire risk may be even higher than suggested above, especially in developing wildland-urban interface areas.

Figure 5. Summary of Ignitions by Landowner from 1983-2009 in Lewis County.



1) Large fires such as the Maloney Creek Fire and Milepost 59 Fire occur infrequently. Large fires drastically affect this type of statistic. Thus, 28 years of historical data may be too short of a timeline to capture enough large, infrequent wildland fire events to establish an accurate frequency interval.

2) The level of fire hazard depends profoundly on weather patterns. A several year drought period would substantially increase the probability of large wildland fires in Lewis County. In areas dominated by primarily grass and brush vegetation, a much shorter drought period of a few months or less may substantially increase the fire hazard. Crop failure due to drought or other causes resulting in unharvested fields or expansion of the Crop Reserve Program (CRP) could also increase the wildland fire risk and/or extend the fire season.

3) The potential losses in wildland urban interface areas is significantly higher than for wildland areas as a whole due to the greater risk to life and property. The probability of fires starting in interface areas is much higher than in wildland areas because of the higher population density

and increased activities. Many fires in the wildland urban interface are not recorded in agency datasets because the local fire department responded and successfully suppressed the ignition without mutual aid assistance from a state or federal agency.

IMPACTS OF WILDFIRE

Wildland fires, big and small, are dangerous to both Lewis County residents and emergency response personnel. Wildland fire suppression activities have a very high frequency of injuries, such as heat exhaustion and smoke inhalation, and have caused numerous deaths nationwide. Fire events in Lewis County typically result in a multi-department (volunteer), tribal, and agency (state and federal) response effort; thus, coordinating activities and ensuring everyone's safety is paramount.

Local residents with property in the path of wildland fire will likely suffer the greatest impacts through loss of structures and/or the value of any timber or agricultural crops on their land. Many fires require an evacuation of nearby residences in order to ensure the safety of citizens. Evacuation procedures require the coordination of law enforcement and fire service organizations and may involve temporary sheltering.

Lewis County, like most areas, has sensitive populations, such as elderly residents and children, who may be affected by air quality during a wildland fire. Smoke and particulates can severely degrade air quality, triggering health problems. In areas heavily impacted by smoke, people with breathing problems might need additional services.

Commerce in Lewis County and the rest of the region may also be interrupted by wildland fires. Transportation corridors will likely be temporarily closed or slowed due to a fire burning in the area. Heavy smoke from a wildfire several miles away could be dense enough to make travel unsafe on roadways. Additionally, railroad corridors, particularly wood trestles, are also at risk to wildfire. In 2011, the 74-acre "Culdesac Fire", consumed one of the historic trestles on the Bountiful Grain & Craig Mountain Railroad route from Spalding to the Camas Prairie (formerly known as the Camas Prairie Railroad).[6] This line was not currently active, but the loss of the trestle may hinder plans to reopen the line, which would be an economic boon to Lewis and surrounding counties.

"Culdesac Fire" consuming historic BG&CM trestle in 2011.

The environmental impacts from a fire are dependent on the vegetation present and the intensity of the fire.

Most of the rangeland and forest ecosystems present in Lewis County are adapted to periodic fire events and are actually benefitted by occasional, low intensity burns that maintain a lower level of fuel build up. On the other hand, overcrowded or unhealthy forest conditions where fire has been excluded will likely burn much more intensely than those that occurred historically. These types of fires tend to result in a high rate of mortality in the vegetation and often adversely impact soil conditions. High intensity fires are also much more dangerous and difficult to suppress.

[6] Barker, Eric. *"Trestle may be history".* Lewiston Morning Tribune. September 7, 2011.

Lewis County is actively pursuing funds to help with wildland fire mitigation projects and public education programs. While mitigation efforts will significantly improve the probability of a structure's survivability, no amount of mitigation will guarantee survival.

Wildfire Characteristics Modeling

Lewis County was analyzed using a variety of models managed on a Geographic Information System (GIS) system. Physical features of the region including roads, streams, soils, elevation, and remotely sensed images were represented by data layers. Field visits were conducted by specialists from Northwest Management, Inc. Discussions with area residents and local fire suppression professionals augmented field visits and provided insights into forest health issues and treatment options. This information was analyzed and combined to develop an objective assessment of wildland fire risk in the region.

HISTORIC FIRE REGIME MODEL

Historical variability in fire regime is a conservative indicator of ecosystem sustainability, and thus, understanding the natural role of fire in ecosystems is necessary for proper fire management. Fire is one of the dominant processes in terrestrial systems that constrain vegetation patterns, habitats, and ultimately, species composition. Land managers need to understand historical fire regimes, the fire return interval (frequency) and fire severity prior to settlement by Euro-Americans, to be able to define ecologically appropriate goals and objectives for an area. Moreover, managers need spatially explicit knowledge of how historical fire regimes vary across the landscape.

Many ecological assessments are enhanced by the characterization of the historical range of variability which helps managers understand: (1) how the driving ecosystem processes vary from site to site; (2) how these processes affected ecosystems in the past; and (3) how these processes might affect the ecosystems of today and the future. Historical fire regimes are a critical component of characterizing the historical range of variability in fire-adapted ecosystems. Furthermore, understanding ecosystem departures provides the necessary context for managing sustainable ecosystems. Land managers need to understand how ecosystem processes and functions have changed prior to developing strategies to maintain or restore sustainable systems. In addition, the concept of departure is a key factor for assessing risks to ecosystem components. For example, the departure from historical fire regimes may serve as a useful proxy for the potential of severe fire effects from an ecological perspective.

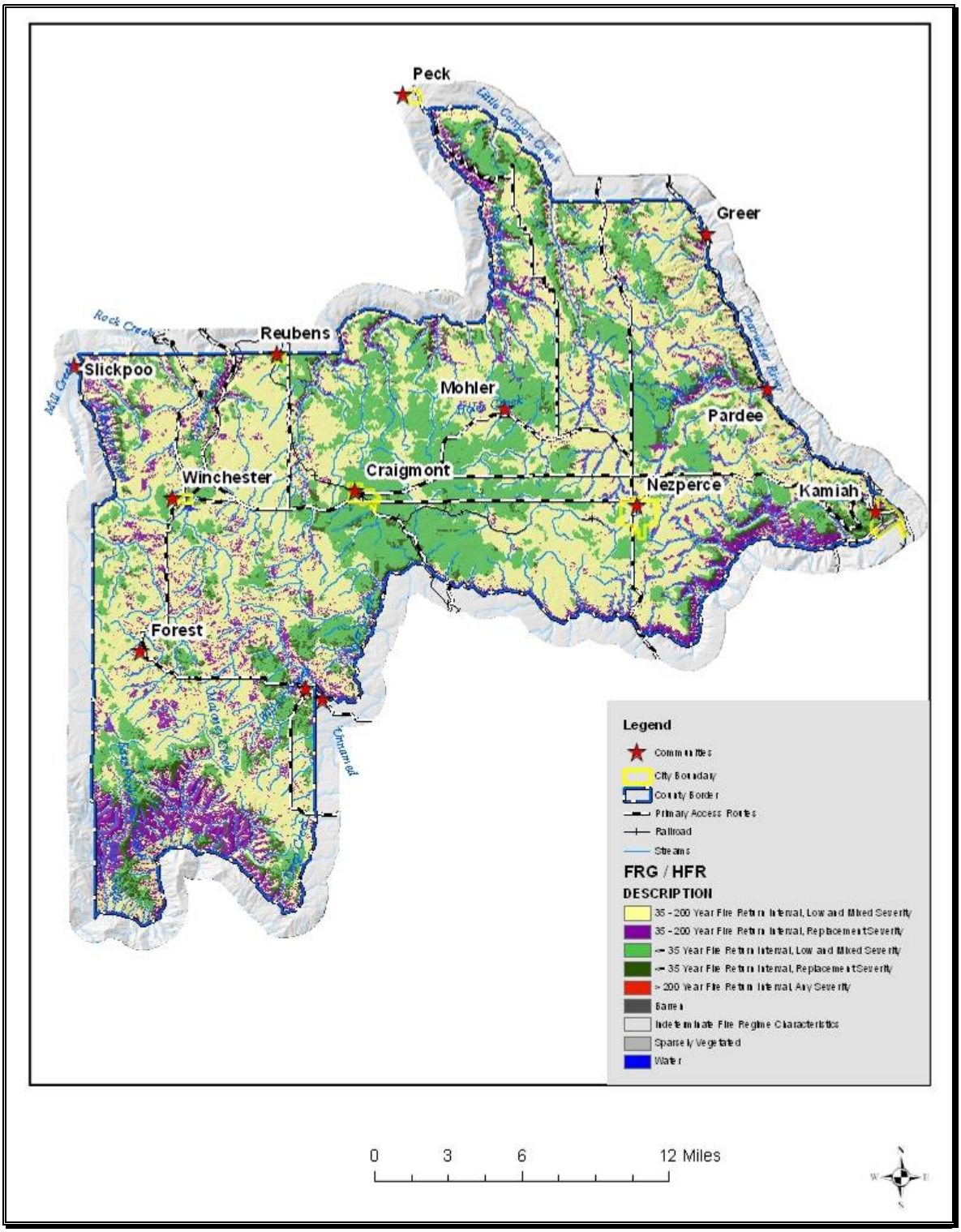
Table 2. Historic Fire Regimes in Lewis County.			
Historic Fire Regime	**Description**	**Acres**	**Percent of Total**
Fire Regime Group I	<= 35 Year Fire Return Interval, Low and Mixed Severity	76,324	25%
Fire Regime Group II	<= 35 Year Fire Return Interval, Replacement Severity	13,556	4%
Fire Regime Group III	35 - 200 Year Fire Return Interval, Low and Mixed Severity	174,452	57%
Fire Regime Group IV	35 - 200 Year Fire Return Interval, Replacement Severity	39,967	13%
Fire Regime Group V	> 200 Year Fire Return Interval, Any Severity	673	<1%
Water	Water	554	<1%
Barren	Barren	81	<1%
Sparsely Vegetated	Sparsely Vegetated	0	<1%
Indeterminate Fire Regime Characteristics	Indeterminate Fire Regime Characteristics	1,234	<1%
	Total	**306,842**	**100%**

The Historic Fire Regime model suggests that fires in western Lewis County historically burned with low to mixed severity on a longer return interval. The Salmon River breaks as well as small scattered pockets around Forest and Winchester experienced replacement severity fires. Since much of the Salmon River canyon is a grassy, south aspect slope, complete mortality (replacement) of the vegetation after a fire does not necessarily indicate a high intensity fire that resulted in changes to soil properties and caused secondary impacts such as erosion and high rainwater runoff. Replacement severity fires in timbered areas do; however, suggest that crown fires may have occurred in small patches.

While most of central and eastern Lewis County historically burned with low to mixed severities, the central part of the County surrounding Craigmont and Mohler and the Central Ridge area likely experienced more frequent fire return intervals (less than 35 years). The fire frequency south of Nezperce and along the Clearwater River canyon was generally longer (35 to 200 years).

The south aspect slope on the north side of Lawyer's Canyon historically experienced replacement severity fires with 35 to 200 year return intervals. Again, due to the primarily grassland vegetation in this area, a replacement severity fire does not necessarily indicate a high intensity fire.

Figure 6. Historic Fire Regime Map.



FIRE REGIME CONDITION CLASS

A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but including the influence of aboriginal burning.[7, 8] Coarse scale definitions for historic fire regimes have been developed by Hardy et al[9] and Schmidt et al[10] and interpreted for fire and fuels management by Hann and Bunnell.

A fire regime condition class (FRCC) is a classification of the amount of departure from the historic regime.[11] The three classes are based on low (FRCC I), moderate (FRCC II), and high (FRCC III) departure from the central tendency of the natural (historical) regime.[12,13] The central tendency is a composite estimate of vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated natural disturbances. Low departure is considered to be within the natural (historical) range of variability, while moderate and high departures are outside.

An analysis of Fire Regime Condition Classes in Lewis County shows that the majority of non-agricultural land in the county has a high departure (25%) from its historic fire regime and associated vegetation and fuel characteristics. Approximately 3% is moderately departed from historic regimes and 21% has a low departure.

Table 3. Fire Regime Condition Class in Lewis County.

Fire Regime Condition Class	Description	Acres	Percent of Total
Fire Regime Condition Class I	Low Vegetation Departure	65,024	21%
Fire Regime Condition Class II	Moderate Vegetation Departure	9,915	3%
Fire Regime Condition Class III	High Vegetation Departure	76,188	25%
	Agriculture/No Departure	155,715	51%
	Total	306,842	100%

The current Fire Regime Condition Class model shows that much of central and eastern Lewis County is dominated by agricultural development and is therefore not included in the model. The majority of lands in Condition Class III are located in the southwestern arm of the County near Forest and

[7] Agee, J. K. Fire Ecology of the Pacific Northwest forests. Oregon: Island Press. 1993.

[8] Brown. J. K. "Fire regimes and their relevance to ecosystem management." *Proceedings of Society of American Foresters National Convention*. Society of American Foresters. Washington, D.C. 1995. Pp 171-178.

[9] Hardy, C. C., et al. *"Spatial data for national fire planning and fuel management."* International Journal of Wildland Fire. 2001. Pp 353-372.

[10] Schmidt, K. M., et al. *"Development of coarse scale spatial data for wildland fire and fuel management."* General Technical Report, RMRS-GTR-87. U.S. Department of Agriculture, Forest Service. Rocky Mountain Research Station. Fort Collins, Colorado. 2002.

[11] Hann, W. J. and D. L. Bunnell. "Fire and land management planning and implementation across multiple scales." International Journal of Wildland Fire. 2001. Pp 389-403.

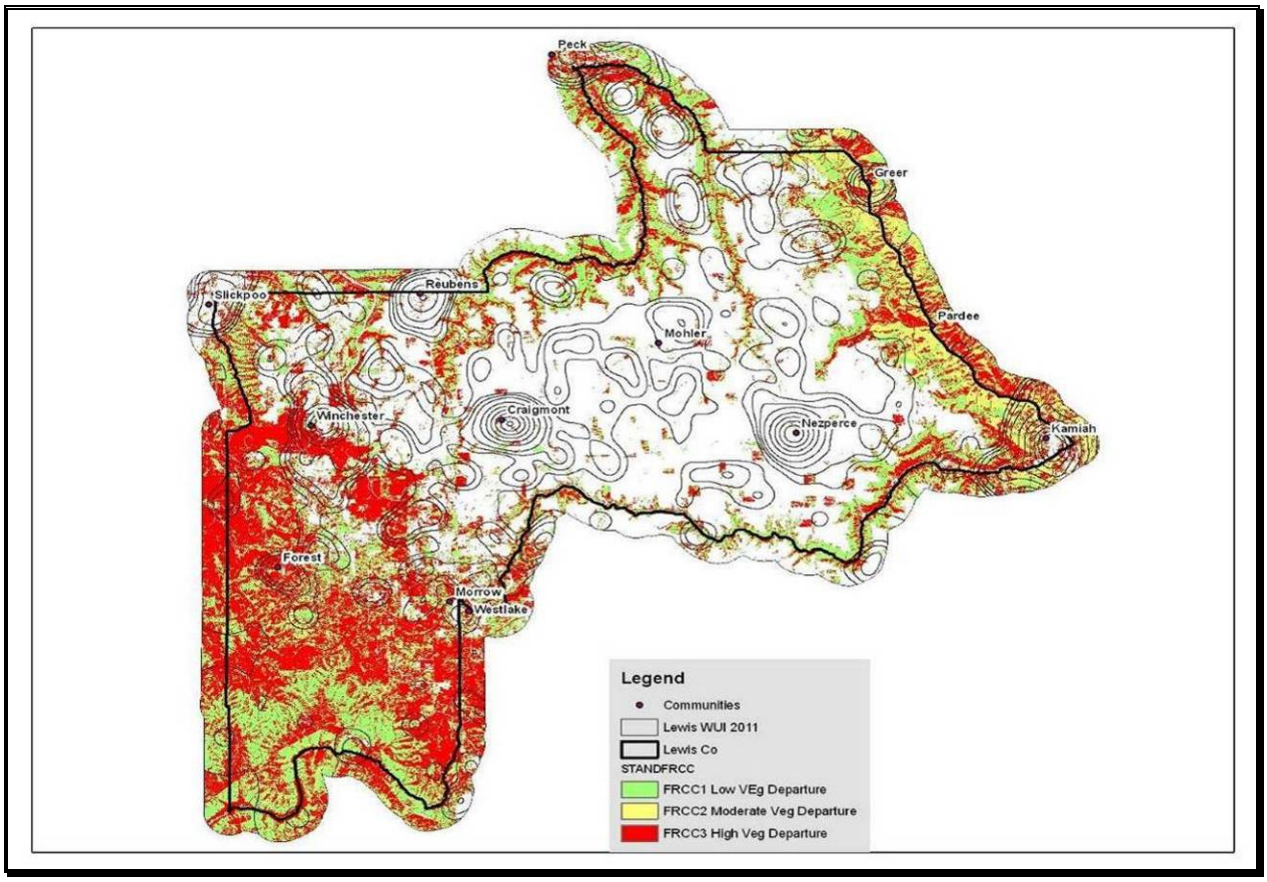
[12] Hardy, C. C., et al. *"Spatial data for national fire planning and fuel management."* International Journal of Wildland Fire. 2001. Pp 353-372.

[13] Schmidt, K. M., et al. *"Development of coarse scale spatial data for wildland fire and fuel management."* General Technical Report, RMRS-GTR-87. U.S. Department of Agriculture, Forest Service. Rocky Mountain Research Station. Fort Collins, Colorado. 2002.

Winchester. The historical biophysical setting in this area was primarily classified as “Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest” (Douglas-fir and ponderosa pine). The current vegetation type is still a dry, mixed conifer forest; however, there is a larger component of lodgepole pine and grand fir, particularly in the understory. The current fire severity model suggests that a higher severity fire than historical norms would be expected in this area.

Condition Class III is also represented on certain aspects in Big Canyon and Little Canyon. Although it appears that many of the southerly aspects in these canyons are Condition Class III, this is not entirely true. Much of the Salmon River breaks are shown as a mix of Condition Class I and III and the Clearwater River canyon is a mix of Condition Class I, II, and III.

Figure 7. Fire Regime Condition Class Map.



WILDLAND URBAN INTERFACE

The wildland-urban interface (WUI) has gained attention through efforts targeted at wildfire mitigation; however, this analysis technique is also useful when considering other hazards because the concept looks at where people and structures are concentrated in any particular region.

A key component in meeting the underlying need for protection of people and structures is the treatment of hazards in the wildland-urban interface. The wildland-urban interface refers to areas where wildland vegetation meets urban developments or where forest fuels meet urban fuels such as houses. The WUI encompasses not only the interface (areas immediately adjacent to urban development), but also the surrounding vegetation and topography. Reducing the hazard in the wildland-urban interface

requires the efforts of federal, state, tribal, and local agencies and private individuals.[14] The role of most federal agencies in the wildland-urban interface includes wildland firefighting, hazardous fuels reduction, cooperative prevention and education, and technical experience. Structural fire protection during a wildfire in the wildland-urban interface is largely the responsibility of local governments. Property owners share a responsibility to protect their residences and businesses and minimize danger by creating defensible/survivable space around them and by taking other measures to minimize the risks.[15] Fuel treatments in the WUI can provide firefighters a defensible area from which to suppress wildland fires or defend communities. [16]

By reducing hazardous fuel loads, ladder fuels, and tree densities as well as creating defensible space, landowners can protect the wildland urban interface, the biological resources of the management area, and adjacent property owners by:

- minimizing the potential of high-severity ground or crown fires entering or leaving the area;
- reducing the potential for firebrands (embers carried by the wind in front of the wildfire) impacting the WUI. Research indicates that flying sparks and embers (firebrands) from a crown fire can ignite additional wildfires as far as 1¼ miles away during periods of extreme fire weather and fire behavior;[17] and
- improving defensible space in the immediate areas for suppression efforts in the event of wildland fire.

Three wildland-urban interface conditions have been identified (Federal Register 66(3), January 4, 2001) for use in wildfire control efforts. These include the Interface Condition, Intermix Condition, and Occluded Condition. Descriptions of each are as follows:

- **Interface Condition** – a situation where structures abut wildland fuels. There is a clear line of demarcation between the structures and the wildland fuels along roads or back fences. The development density for an interface condition is usually 3+ structures per acre;
- **Intermix Condition** – a situation where structures are scattered throughout a wildland area. There is no clear line of demarcation; the wildland fuels are continuous outside of and within the developed area. The development density in the intermix ranges from structures very close together to one structure per 40 acres; and
- **Occluded Condition** – a situation, normally within a city, where structures abut an island of wildland fuels (park or open space). There is a clear line of demarcation between the structures and the wildland fuels along roads and fences. The development density for an occluded condition is usually similar to that found in the interface condition and the occluded area is usually less than 1,000 acres in size.

---

[14] Norton, P. Bear Valley National Wildlife Refuge Fire Hazard Reduction Project: Final Environmental Assessment. Fish and Wildlife Services, Bear Valley Wildlife Refuge. June 20, 2002.

[15] USFS. 2001. United States Department of Agriculture, Forest Service. Wildland Urban Interface. Web page. Date accessed: 25 September 2001. Accessed at: http://www.fs.fed.us/r3/sfe/fire/urbanint.html

[16] Norton, P. Bear Valley National Wildlife Refuge Fire Hazard Reduction Project: Final Environmental Assessment. Fish and Wildlife Services, Bear Valley Wildlife Refuge. June 20, 2002.

[17] McCoy, L. K., et all. Cerro Grand Fire Behavior Narrative. 2001.

In addition to these classifications detailed in the Federal Register, four additional classifications of population density have been included to augment these categories:

- **Rural Condition** – a situation where the scattered small clusters of structures (ranches, farms, resorts, or summer cabins) are exposed to wildland fuels. There may be miles between these clusters. The condition of the WUI connects these clusters into a relatively homogenous area.

- **High Density Urban Areas** – those areas generally identified by the population density consistent with the location of larger incorporated cities, however, the boundary is not necessarily set by the location of city boundaries: it is set by very high population densities (more than 7-10 structures per acre or more).

- **Non-WUI Condition** - a situation where the above definitions do not apply because of a lack of structures in an area or the absence of critical infrastructure crossing these unpopulated regions. This classification is not WUI.

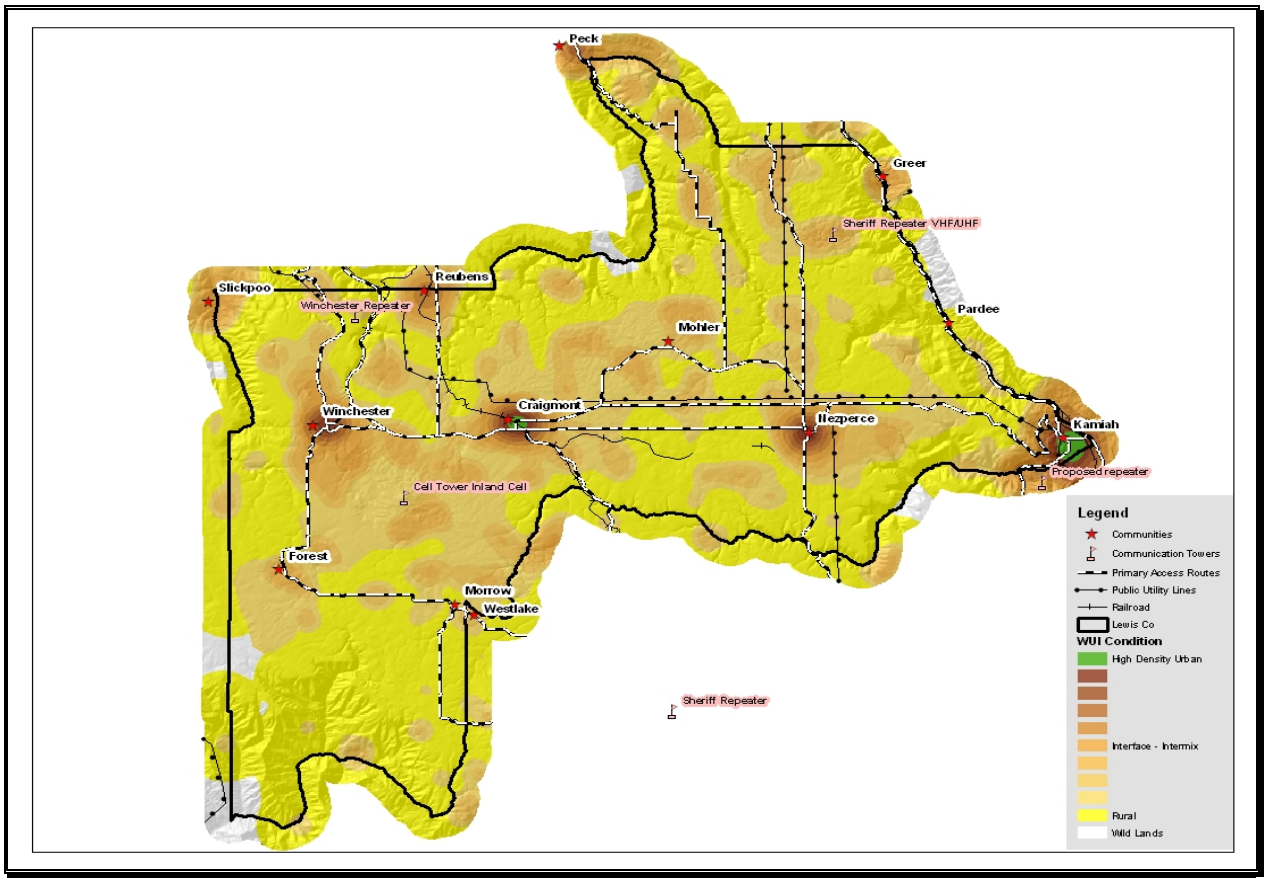
Lewis County's wildland-urban interface is based on population density. Relative population density across the county was estimated using a GIS-based kernel density population model that uses object locations to produce, through statistical analysis, concentric rings or areas of consistent density. To graphically identify relative population density across the county, structure locations are used as an estimate of population density. Aerial photography was used to identify structure locations. The resulting output identified the extent and level of population density throughout the county.

By evaluating structure density in this way, WUI areas can be identified on maps by using mathematical formulae and population density indexes. The resulting population density indexes create concentric circles showing high density areas, interface, and intermix condition WUI, as well as rural condition WUI (as defined above). This portion of the analysis allows us to "see" where the highest concentrations of structures are located in reference to relatively high risk landscapes, limiting infrastructure, and other points of concern.

The WUI, as defined here, is unbiased and consistent, allows for edge matching with other counties, and most importantly – it addresses all of the county, not just federally identified communities at risk. It is a planning tool showing where homes and businesses are located and the density of those structures leading to identified WUI categories. It can be determined again in the future, using the same criteria, to show how the WUI has changed in response to increasing population densities. It uses a repeatable and reliable analysis process that is unbiased.

The Healthy Forests Restoration Act makes a clear designation that the location of the WUI is at the determination of the county or reservation when a formal and adopted Wildfire Mitigation Plan is in place. It further states that the federal agencies are obligated to use this WUI designation for all Healthy Forests Restoration Act purposes. In addition to a formal WUI map for use with the federal agencies, it is hoped that it will serve as a planning tool for the county, the Idaho Department of Lands, and local fire districts.

Figure 8. Wildland Urban Interface Map.



FIRE BEHAVIOR ANALYSIS TOOL

The Fire Behavior Analysis Tool (FBAT) is a fire behavior mapping and analysis program that computes potential fire behavior characteristics in an ArcMap platform while producing many of the same fire behavior outputs as the FlamMap tool.

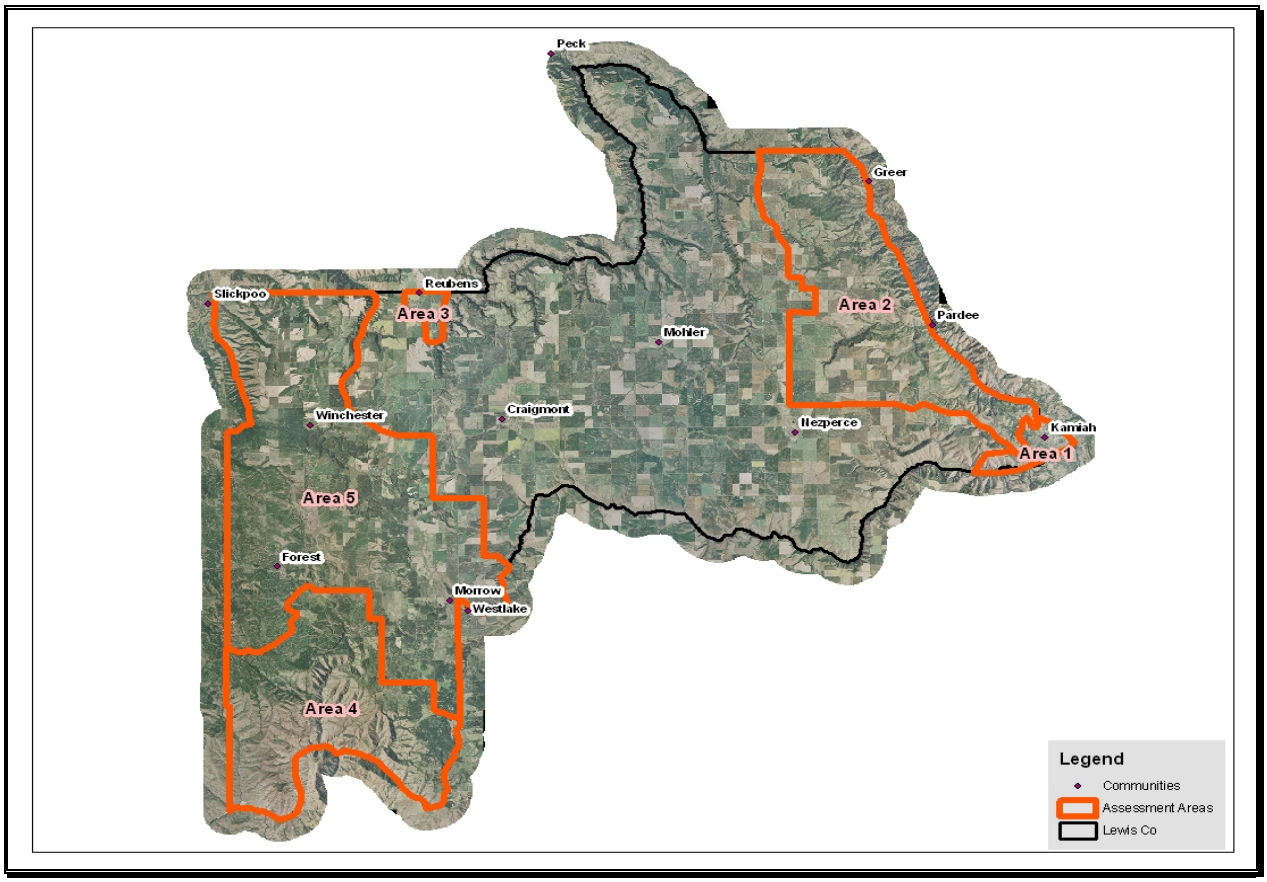
FBAT can be used to assist managers in prioritizing fuel treatments on the basis of fire behavior and in assessing the effectiveness of fuel treatment proposals. This model can also be used to support the analysis of prescribed and wildland fires.

Categorization of High Hazard Areas

Lewis County recognizes that certain regions of the County have unique risk factors that increase their vulnerability to wildland fire. In order to refine the assessment process, Lewis County designated the Salmon River breaks, the Clearwater River corridor, and the communities of Forest, Winchester, Reubens, and Kamiah as having factors contributing to high fire danger. These Assessment Areas were the focus of the field assessments and risk category determinations.

The purpose of this exercise was to develop a “Threat Level” map based on unique local conditions such as fuel type, suppression capability, expected fire behavior, existence of structural fire protection, and other factors.

Figure 9. Map of Designated Assessment Areas.



FIELD ASSESSMENTS

Fire control and mitigation specialists conducted a thorough field assessment to evaluate the accuracy of the models and other data, assess the extent of risk and hazardous fuels, and develop specific hazardous fuels treatment project plans. Additionally, local experts from the Nez Perce Tribe, the Idaho Department of Lands, and Lewis County were interviewed in order to address specific areas of concern and document local wildfire suppression operational tactics.

RISK CATEGORIES

Based on analysis of the various modeling tools, existing historical information, local knowledge, and the field assessments, each Assessment Area was further evaluated on its level of risk from a set of categories developed by Lewis County. These risk categories are defined as follows.

Non-native or High Fire Risk Vegetation

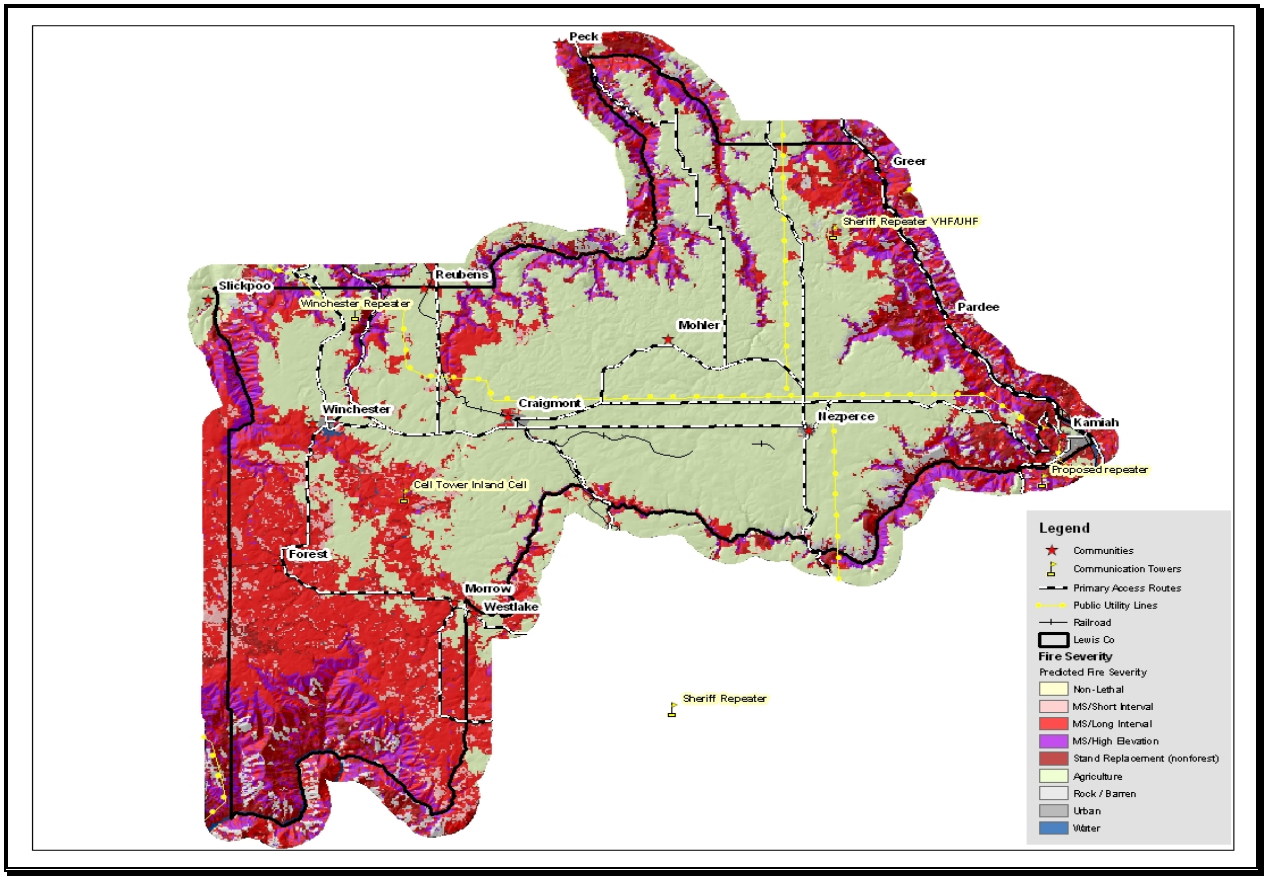
Fuel type, or vegetation, plays an important role in determining wildland fire danger. All fuel types can and will burn under the right conditions; however, some fuel types pose more danger than others due to the intensity at which they burn, the horizontal and vertical continuity of burnable material, and firefighters' ability to modify the fuel complex in front of an approaching wildfire. While rangeland or grass fires often spread rapidly, they burn quickly and at a lower intensity than forest fires. Additionally, local farmers and firefighters can often construct fuel breaks with dozers and other equipment relatively quickly. These tactics are not as effective in forested areas or on steep terrain.

The forestlands surrounding Winchester and Forest have a high wildland fire risk due to the forest structure in many areas. Historically, this area was characterized by dry, open pine stands with relatively frequent fire intervals. Successful fire suppression and differing forest management objectives over the past 100 years have resulted in a denser, mixed conifer forest type. The encroachment of more shade tolerant species creates additional regeneration as well as more dead and down material in the understory. These forest conditions are conducive to infrequent, but intense wildland fires often with crowning and torching due to the ladder fuels.

Cheatgrass often occurs as a significant component of foothills rangeland vegetation and has invaded disturbed and undisturbed grassland communities in Lewis County to become the dominant species in many lower-elevation areas. Cheatgrass is notorious for its ability to thrive in disturbed areas such as construction sites, post-wildfire and flooded areas, poorly managed grazing allotments, and where intense recreation activities take place. As this invasive species begins to dominate an area, it alters native plant communities and displaces native species thus impacting wildlife. Additional negative impacts include changes in soil properties, a decline in agricultural production, and altered fire frequencies. Cheatgrass is highly flammable and densely growing populations provide ample, fine-textured fuels that increase fire intensity and often decrease the intervals between fires.

Vegetation types that lead to increased wildfire intensity or severity were given a higher threat level rating.

Figure 10. Fire Severity Model.



High Ignition Potential

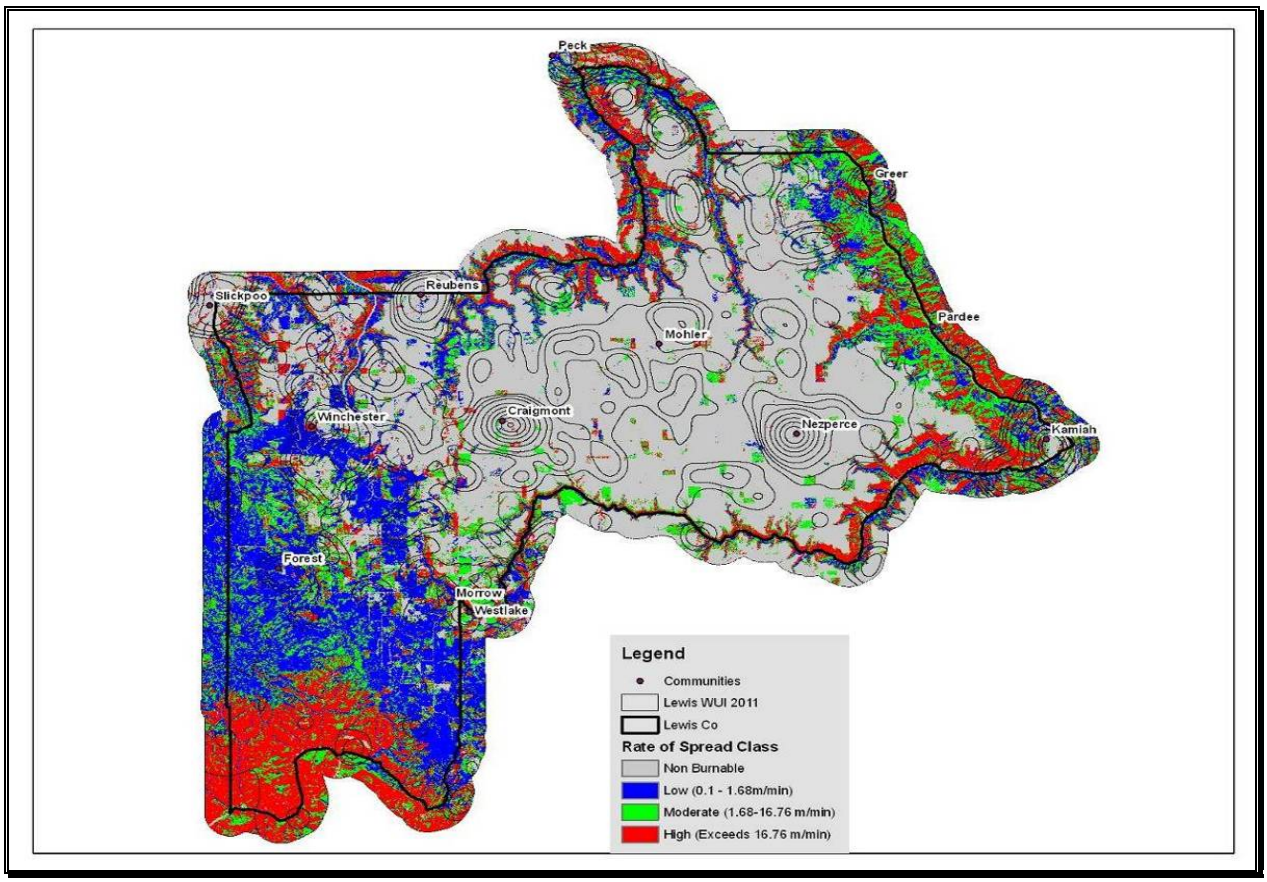
Lewis County is prone to both natural and human-caused ignitions. Lightning strikes are most common along the breaks of both the Salmon and Clearwater River canyons, but can occur anywhere. Human-caused ignitions generally result from vehicle use along U.S. Highways 12 and 95 and other roads, recreational vehicles (ATVs, motorcycles, etc.), unattended campfires, agricultural equipment, and stubble or debris burning. Since the 1980s, the majority of ignitions have occurred near Kamiah and along the Highway 12 corridor. There have also been numerous ignitions in the mixed conifer forest and agricultural area northwest of Craigmont, southeast of Reubens, and southeast of Winchester. This is likely due to a mix of agriculture-related ignitions, recreational activities, and scattered residential housing. In the last decade, there has been an increasing number of ignitions south of Forest along the Salmon River breaks. This is likely due to the increased recreational and other human activity in the area.

Areas considered to have a higher potential for fire ignitions such as recreational hotspots were given a higher threat level rating.

High Risk Fire Behavior

Due to the steep topography as well as the fuel type, fires in the Salmon and Clearwater River canyon lands have the potential to develop extreme fire behavior characteristics. These areas are typically dry grasslands with ponderosa pine and Douglas-fir forest types in the draws and on north aspects. The rapid rate of spread, particularly under the influence of wind, makes suppression operations difficult and often dangerous.

Figure 11. Wildfire Rate of Spread Model.



One of the factors contributing to potentially dangerous fire behavior is the preheating of fuels on steep slopes ahead of the actual flame front. Typically, fires spread very rapidly uphill, particularly in grass fuel types. Hot gases rise in front of the fire along the slope face preheating the upslope vegetation and moving a grass fire up to four times faster with flames twice as long as a fire on level ground. This preheating of fuels, or radiant heat, is capable of igniting combustible materials from distances of 100 feet or more.[18]

Another factor contributing to fire behavior concerns is the topography in the canyonlands. When you are planning a fire attack, the direction of canyon and slope winds should be carefully considered. Air currents flow up a canyon and upslope during the day and down during the night. Wind movement can be critical in the chutes or steep v-drainages common in the Salmon and Clearwater River drainages. These terrain features create a chimney effect, causing a forced draft, as in a stove chimney. Fires in these chutes or drainages spread quickly and are very dangerous. Gusty winds are also very hazardous to firefighters because they change speed and direction rapidly.

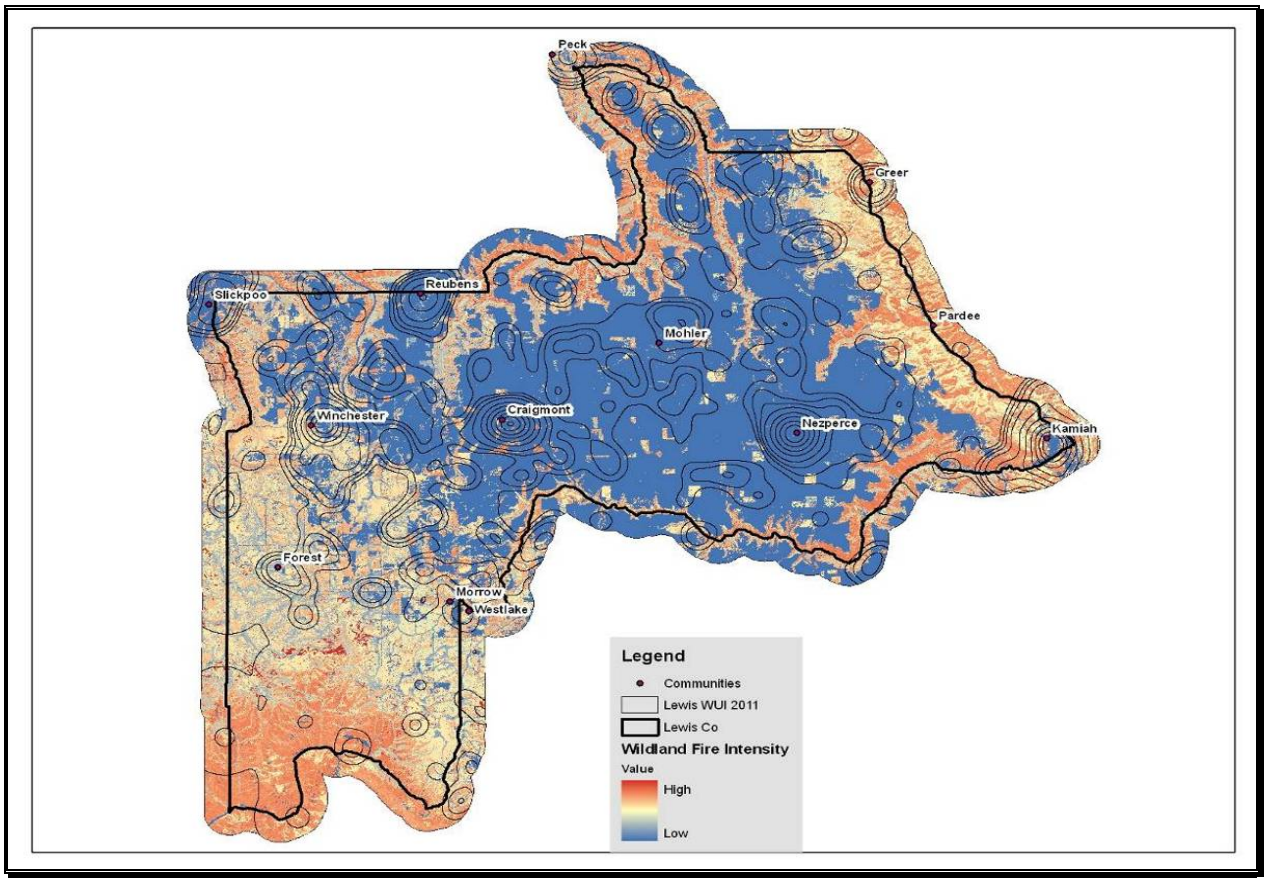
Farmers and firefighters working together to construct a fireline during the August 1992 Milepost #62 Fire.

Another characteristic of extreme fire behavior is the formation of crown fires, which has a dramatic effect on suppression capabilities and ultimately the severity of the fire. Crown fires are defined as fires that advance through canopy fuels more or less independently of surface fires. Crown fires are extremely dangerous, very difficult to fight, and often require the use of indirect suppression methods. Crown fires are generally grouped into three broad classes: dependent, active, and independent based on the degree of dependence on the surface fire. Dependent crown fires are initiated and maintained by the heat produced by the consumption of surface fuels and may consume individual tree crowns or small clumps of trees. They do not spread from crown to crown except for adjacent trees in a clump. An active crown fire runs through both the surface and aerial strata at the same time, while an independent crown fire burns through crowns independent of the surface fire. While dependent crown fires are a significant concern in some forested areas of Lewis County, active and independent crown fires are uncommon primarily due to the patchy nature of the forest fuel types and structure. General exceptions to this pattern might occur in fires with extreme fire behavior caused by low moisture levels, erratic winds, or high fuel loadings. Ideal conditions for the development of crown fires include dry fuel, low humidity with high temperatures, heavy accumulations of dead and downed litter, conifer regeneration and other ladder fuels, steep slopes, strong winds, unstable atmosphere, and a continuous cover of coniferous trees.[19]

[18] "Wildfires and Schools". 2008. National Clearinghouse for Educational Facilities. National Institute of Building Sciences. Available online at http://www.ncef.org/pubs/wildfires.pdf.

[19] Forest Encyclopedia Network. 2011. USDA Forest Service Southern Research Station and Southern Regional Extension Forestry. Available online at http://www.forestencyclopedia.net/p/p481.

Figure 12. Wildland Fire Intensity Model.



Areas with a high potential for extreme fire behavior based on FBAT modeling and local knowledge were given a higher threat level rating.

Suppression Capabilities

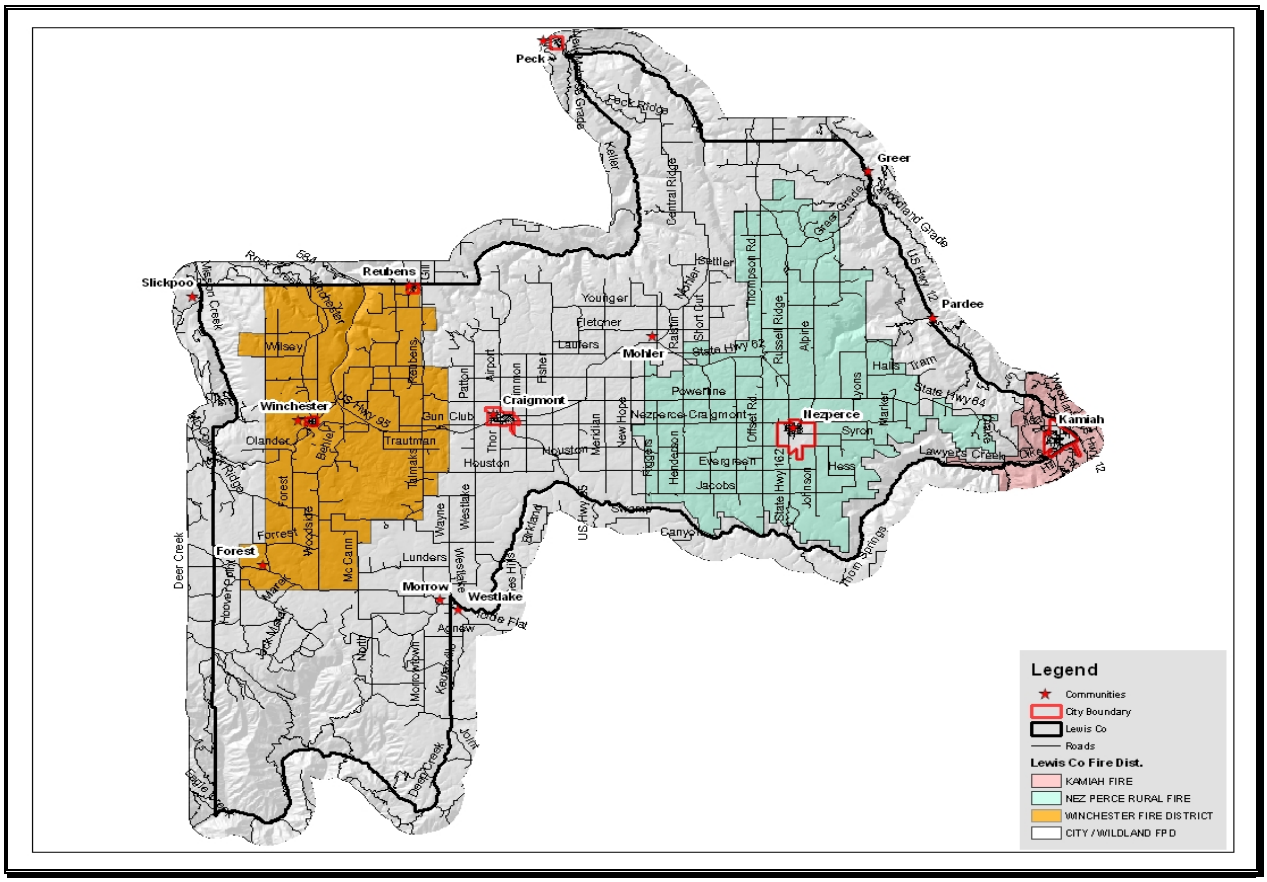
Since the original Community Wildfire Protection Plan was written in 2005, Lewis County has been working on improving the structural fire protection coverage by either annexing additional lands into existing rural fire districts or by creating new districts. The Winchester Rural Fire District was established in 2010 and has a large coverage area that includes the majority of structures surrounding Forest, Winchester, and Reubens. Lewis County is actively working on establishing rural fire districts in the Central Ridge and Mohler areas as well.

The Idaho Department of Lands and the Nez Perce Tribe provide wildland fire protection services throughout Lewis County; however, these agencies are not equipped or trained to provide structural fire protection. Thus, areas not currently covered by a city or rural structural fire protection district have an elevated risk from wildland fire. A large portion of Lewis County (approximately 33%) does not have structural fire suppression coverage.

Additionally, fire suppression in the Salmon River and Clearwater River canyons in Lewis County is extremely challenging due to very limited access, steep topography, and the potential for dangerous fire behavior.

Areas outside of a formal rural fire district or areas with severe access limitations for fire suppression were given a higher threat level rating.

Figure 13. Rural Fire Protection District Boundaries.



Population Centers and Developing Areas

Due to the increased human activity within and surrounding Lewis County communities, these areas are inherently at a higher risk of ignitions. Growth in Lewis County has been slow (approximately 2% since 2000)[20], but steady over the past two decades. There have been numerous small developments near Winchester, Forest, and in the foothills west of Kamiah. Larger parcels are often subdivided into 5 to 10 acre lots with little concern for providing adequate road systems, water supply, or hazardous fuels reduction.

The perimeter and outskirts of population centers and known developing areas were given a higher threat level rating.

High Conservation Assets at Risk

There are several areas in Lewis County that constitute protection due to their high conservation value such as tribal and other culturally or historically significant sites, recreational areas, and high value timber or other natural resource. The forestlands surrounding the community of Forest, particularly to the west towards Soldiers Meadows, are intensely used for recreational purposes such as 4-wheeling, motorcycle riding, camping, and hiking. There are also several areas near Winchester and Forest that are significant cultural and timber resource sites for the Nez Perce Tribe. Members of the Tribe often

[20] U.S. Census Bureau. "State and County QuickFacts." Available online at http://quickfacts.census.gov/qfd/states/16/16061.html. December 2011.

visit these areas for management, spiritual, and recreational purposes. Currently, approximately 15% of Lewis County is owned by the Nez Perce Tribe. Much of the private lands surrounding Winchester and Forest are also valuable due to their timber asset and/or development potential.

Recreational areas and culturally or historically significant sites were given a higher threat level rating.

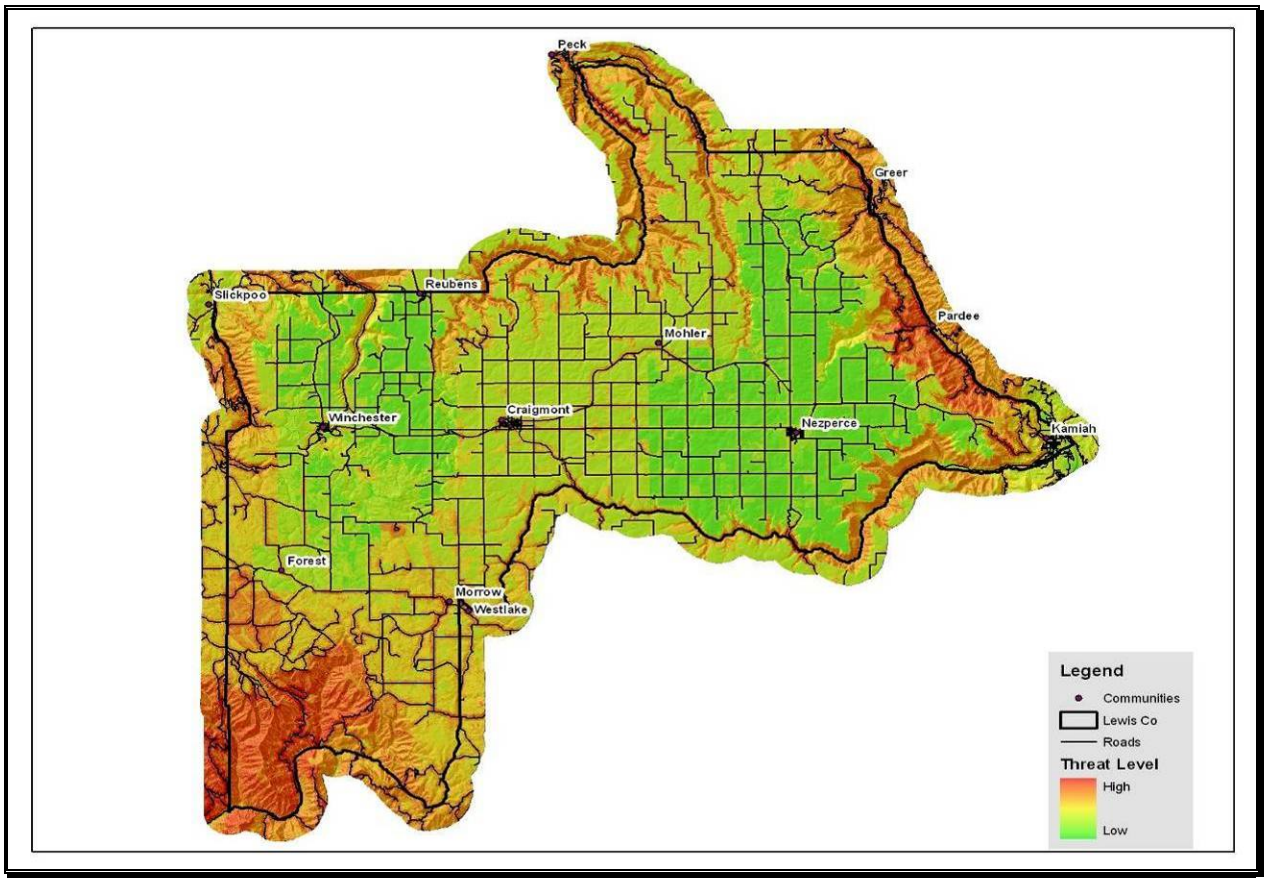
DETERMINATION OF THREAT LEVEL

Development of the Threat Level model involved locating and ranking the various risk category areas. Risk categories included in the analysis were structural fire protection boundaries, vegetation cover type, topography, ignition potential, fire behavior characteristics, populated and developing areas, and areas of high conservation value. The various categories, or layers, were ranked based on their significance pertaining to causal factors of high wildland fire risk conditions or protection significance. The ranked layers were then analyzed in a geographical information system to produce a cumulative effects map based on the ranking. Following is a brief explanation of the various categories used in the analysis and the general ranking scheme used for each.

- Structural Protection – areas within a rural or city structural fire protection district were given a lower threat ranking than areas outside of a district.
- Vegetation Cover Types – certain vegetation types are known to carry and produce more intense fires than other fuel types. Conifer and hardwood forest types as well as certain shrubland types were given a higher ranking where as grass communities and riparian areas were given a moderate ranking. Sparsely vegetated, developed, and non vegetated areas were given the lowest ranking.
- Ignition Potential - areas where the probability of an ignition occurring is high such as road and highway corridors, populated areas, recreation areas, and areas with identified high wildfire frequencies were given the highest ranking.
- Fire Behavior – areas identified by fire behavior modeling as having high rate of spread potential, crown fire potential, and certain types of topographic features were given a higher threat level.
- Populated and Developing Areas – these areas were ranked higher due to the presence of human populations, structures, and infrastructure requiring protection from fire. This risk category includes areas identified as having future development potential.
- High Conservation Value – areas that cannot be replaced such as cultural or historic sites, have scenic or other natural values, or have important economic or recreational value were given a higher ranking.

Each data layer was developed, ranked, and converted to a raster format using ArcGIS 9.3. The data layers were then analyzed in ArcGIS using the Spatial Analyst extension to calculate the cumulative effects of the various threats. This process sums the ranked overlaid values geographically to produce the final map layer. The ranked values were then color coded to show areas of highest threat (red) to lowest threat (green).

Figure 14. Relative Threat Level Map.



Wildfire Mitigation Project Recommendations

Lewis County has an active hazardous fuels reduction program and is currently partnering with other organizations and agencies to fund and implement high priority mitigation projects throughout the County. The following Project Areas were identified during the field assessments and interviews as potentially having several factors contributing to high wildfire risk. The Threat Level modeling verified this risk; thus, specific prescriptions for hazardous fuels reduction projects as well as other types of mitigation recommendations were developed.

The Project Areas were identified without regard for landownership boundaries; thus, site-specific prescriptions will require coordination and approval by the various landowners. The following descriptions provide as much detail as possible regarding the objectives, prescription, and unique nature of each Project; however, exact acreages and site plans will be determined after consultation with the affected landowners.

ASSESSMENT AREA 3 - WINCHESTER

There are numerous homes around Winchester, the majority of which are relatively safe from wildfire due to the agriculture fields surrounding the town. Winchester Lake State Park is located just south of Winchester and is used heavily for recreational purposes. The ignition potential within and surrounding the Park is increased due to the intensity of human activity.

Projects proposed near Winchester will help protect individual properties as well as critical transportation routes. This area holds a significant amount of timber, recreational, and cultural value for

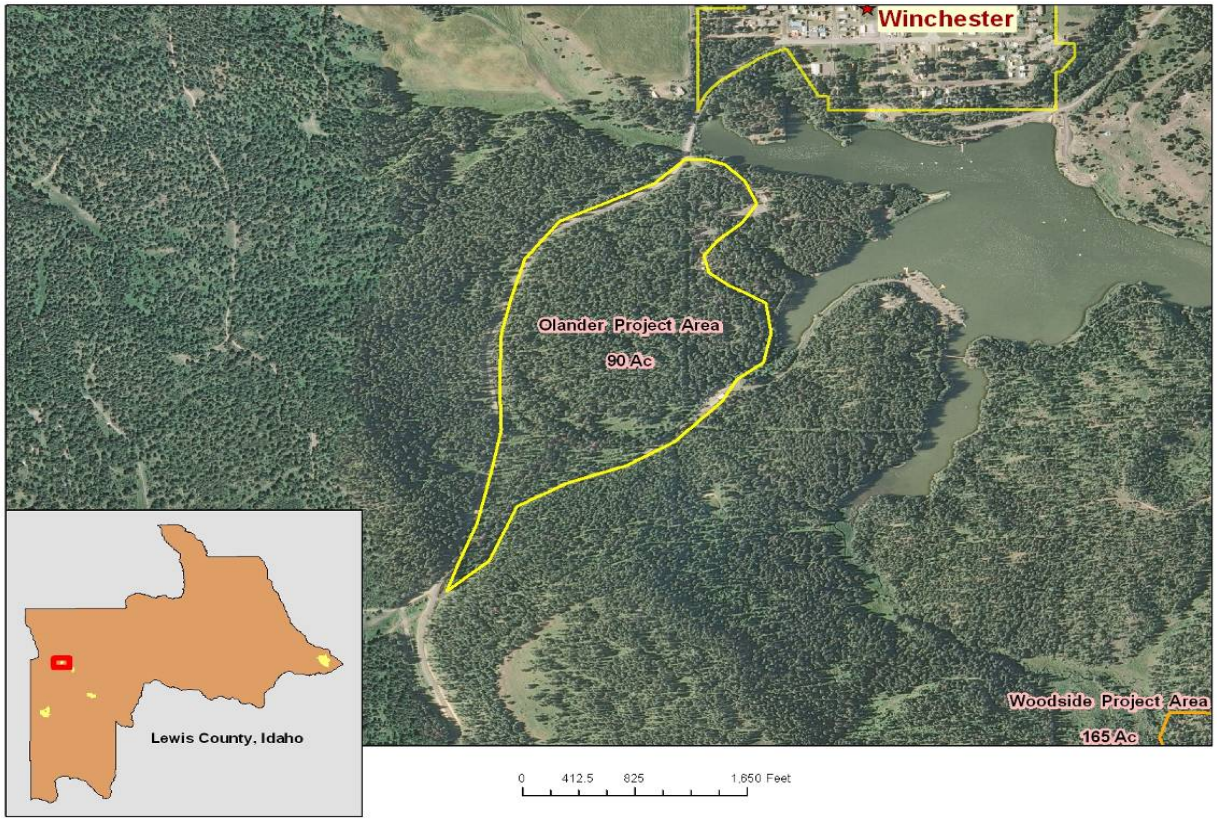
Lewis County, the Nez Perce Tribe, and local communities. The intent is to turn high risk areas of concern into areas that can be protected from wildland fire with minimal effort and resources.

Olander Project Area

Olander Road is a well-traveled route heading southward out of Winchester on the west end of the Winchester Lake State Park. Olander Road connects Forest Road, the primary route to the community of Forest, to services in Winchester. After crossing the dam forming Lapwai Lake (Winchester Lake), Olander Road travels through a densely forested area before opening up into agricultural fields. This area is characterized by semi-overcrowded ponderosa pine and Douglas-fir with dense clumps of saplings. Ladder fuels, which may lead to higher intensity crown fires, are a significant concern in this area. Additionally, a few small pockets of dead and dying trees were noted on the south end of the project area. This could be an indication of an insect attack or other forest health issues.

The Olander Project Area is bounded by Olander Road to the west and one of the State Park access routes to east. A small portion of the Park consisting of some of the camping areas and nature trails is included in the Project Area.

Figure 15. Olander Project Area Map.



Project Prescription

In order to protect structures and other State Park assets, defensible space techniques according to the Firewise program standards[21] should be created and maintained near camping areas and within the immediate vicinity of nature trails.

The creation of shaded fuel breaks within at least 30 feet on each side of Olander Road (approximately .82 miles) and the Park's access road (approximately 1.12 miles) would help improve safe ingress and egress, particularly during an evacuation. Shaded fuel breaks typically require the removal of brush and other understory components as well as thinning the overstory to provide spacing between crowns. Pruning remaining trees will also disrupt the continuity of available fuels.

The improvement of forest health conditions and resiliency to wildfire should also be a priority in order to protect Olander Road as well as the scenic quality of the State Park. Both commercial and precommercial thinning would help reduce ladder fuels and improve forest productivity. The removal of dead and dying trees will also help reduce fuel loading.

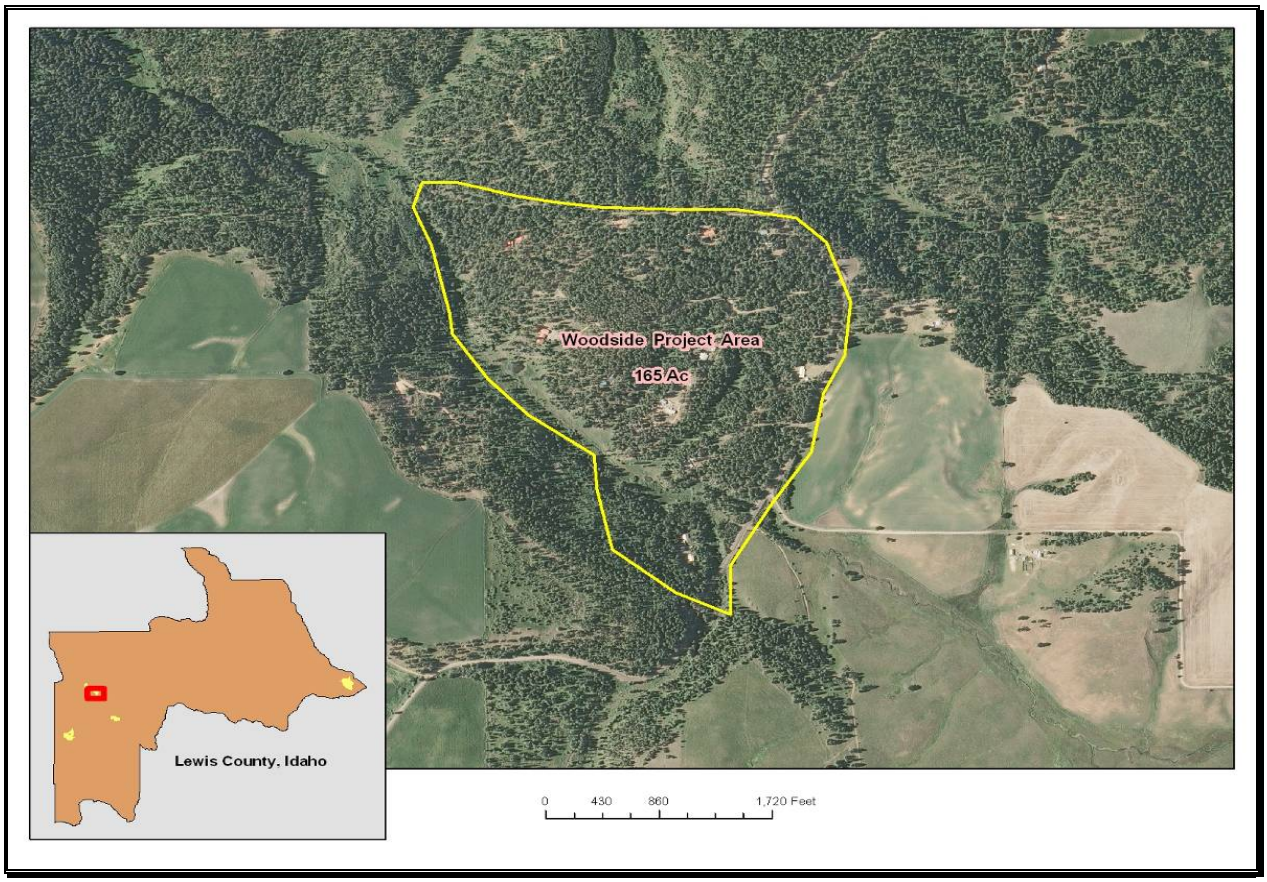
Woodside Project Area

The Woodside Project Area is located southwest of Winchester and Winchester Lake State Park. A small drainage feeding the Lake provides the southern border of the Project as well as a natural fuel break. Woodside Road is the eastern boundary and Granite Road is the northern border. There are 15-20 homesites surrounded by overcrowded ponderosa pine and Douglas-fir forestlands. The understory is variable, but dense clumps of ponderosa pine and Douglas-fir saplings are typical in openings.

The majority of structures are located on the southwest aspect bordering the main drainage. There are two small draws dissecting the Project Area that could act as chimneys for heat and smoke in the event of a fire. Residences are typically located on top of the finger ridges or on short driveways off of Woodside or Granite Road.

[21] FIREWISE Communities. National Fire Protection Association. Available online at http://www.firewise.org/. December 2011.

Figure 16. Woodside Project Area Map.



Project Prescription

In order to protect structures and other assets, property owners in this Project Area should implement homesite defensible space techniques according to Firewise program standards.[22] Since most structures are located on ridgetops, increasing the defensible space downslope will provide additional protection and safety for firefighters.

The creation of shaded fuel breaks within at least 30 feet on each side of Woodside Road extending past the Project Area (approximately 1.73 miles total) and Granite Road (approximately .3 miles) would help improve safe ingress and egress, particularly during an evacuation. This technique should also be implemented on private driveways. Shaded fuel breaks typically require the removal of brush and other understory components as well as thinning the overstory to provide spacing between crowns. Pruning remaining trees will also disrupt the continuity of available fuels.

Additionally, forest management options should also be considered by the property owners in this area to reduce fuel loading and improve forest health conditions. The prescription for this type of work would be site specific, but would likely include both commercial and precommercial thinning. Healthy forest stands are generally more resistant to the development of extreme fire behavior characteristics and are more resilient to the after-effects of wildland fire.

[22] FIREWISE Communities. National Fire Protection Association. Available online at http://www.firewise.org/. December 2011.

Although the creek bottom is wet and free of most high risk fuels, this area is not necessarily appropriate for use as a safety zone for residents in the Woodside Project Area due to concentrated smoke and hot gases. The agricultural fields upstream towards the southeastern corner of the Project Area could be used as a designated safety zone for residents and firefighters.

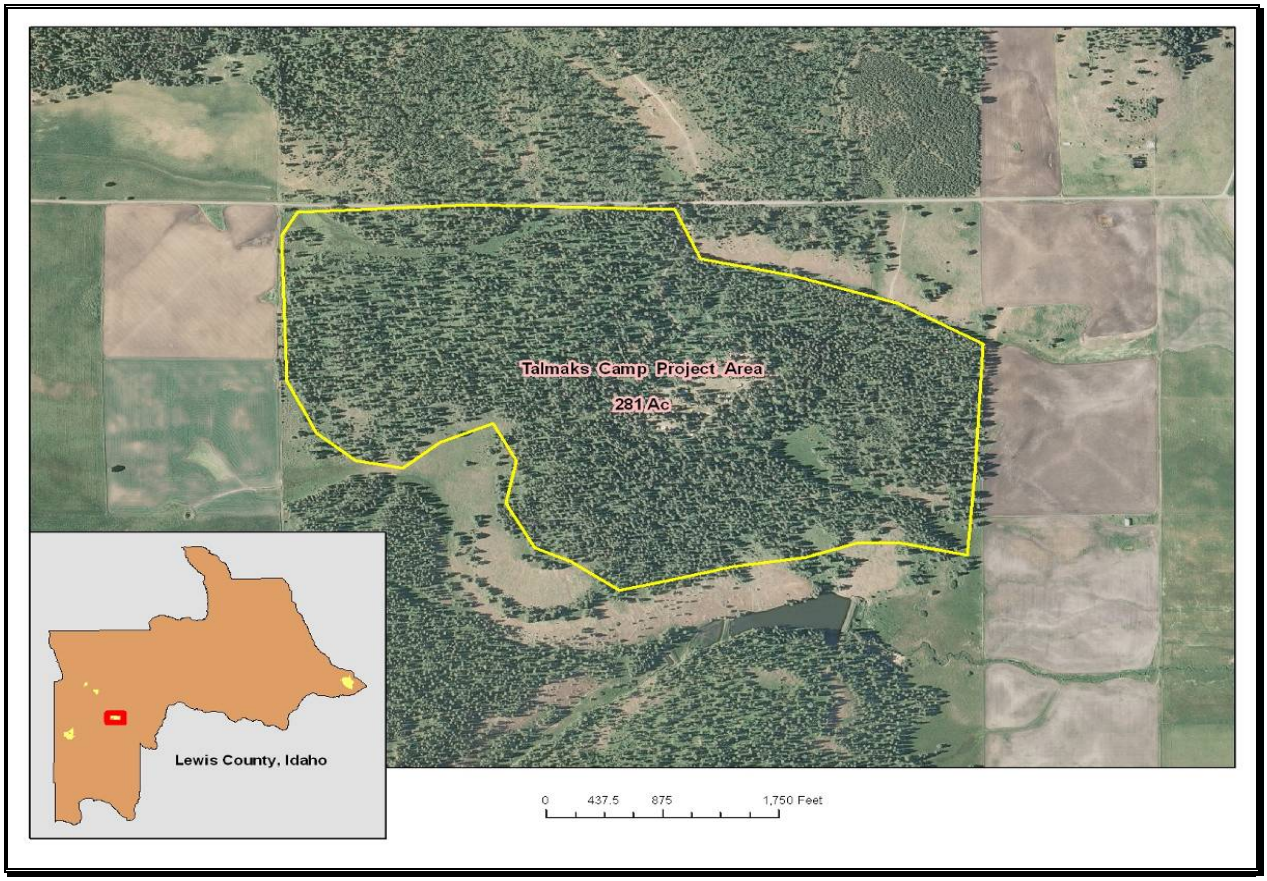
Talmaks Camp Project Area

The Nez Perce Tribe's Talmaks Camp is both historically and culturally significant as a gathering place for Presbyterian churches on the Nez Perce Reservation since 1910. The Camp currently consists of several religious and other public gathering facilities as well as cabins and developed campsites.

Talmaks Camp is located in a forested area south of Mason Butte. Agricultural development is the primary land use within approximately ½ mile to the east and west of the Camp. The immediate vicinity of the Camp facilities has been cleared of hazardous vegetation and is well maintained. The forestland surrounding the Camp and to the north and south is primarily ponderosa pine with dense saplings in the understory. Much of this area has been managed for timber production, thus, patches of younger forests are evident, particularly on the north side of Talmaks Road.

The potential for a fire ignition originating at Talmaks Camp is high due to campfires, fireworks, and cooking during Camp activities. Additionally, a wildfire started by harvesting or stubble burning in nearby agricultural fields spreading to Talmaks Camp is also a potential threat.

Figure 17. Talmaks Camp Project Area Map.



Project Prescription

In conjunction with continued maintenance of the Talmaks Camp site, precommercial thinning the forestlands surrounding the Camp will reduce the risk of wildland fire as well as improve the productivity of the forest stand.

In addition, the creation of shaded fuel breaks 30 feet from each shoulder of Talmaks Camp Road (approximately .3 miles) would help improve safe ingress and egress, particularly during an evacuation. Shaded fuel breaks typically require the removal of brush and other understory components as well as thinning the overstory to provide spacing between crowns. Pruning remaining trees will also disrupt the continuity of available fuels. Improving Talmaks Camp Road and maintaining Talmaks Road is critical for a safe evacuation of the Camp in the event of a wildland fire.

There is a man-made pond approximately ¼ miles south of Talmaks Camp that may be used as a draft site for water resupply; however, access to the pond with large equipment may be difficult. Development of this area as a formal water supply for wildland fire suppression would help improve the turnaround time for fire crews. Talmaks Camp is outside of the Winchester Rural Fire District; thus, the Camp currently does not have any formal structural fire protection.

This area has been identified by Lewis County as culturally and historically significant; thus, it is a priority for protection measures.

ASSESSMENT AREA 3 - FOREST

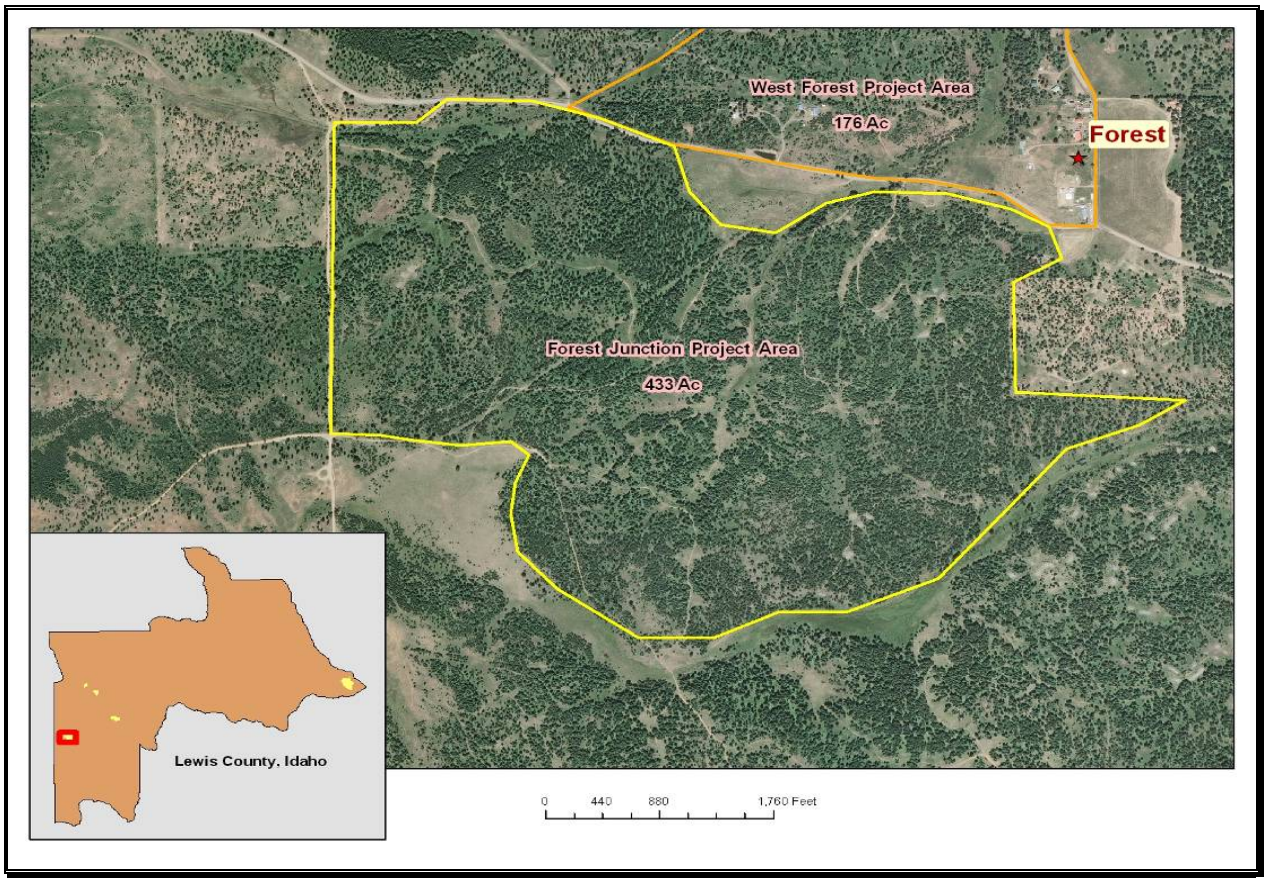
The community of Forest is situated among the most contiguous timber in all of Lewis County. The Salmon River canyon lies to the south of Forest with numerous draws and finger ridges. Besides being steep with little access, these canyons can act as chimneys, which contribute to extreme fire behavior.

There are large patches of managed timberlands directly to the south of Forest as well as further to the west near the County boundary. The overstory trees on these properties are well spaced and would not likely support a crown fire. Suppression efforts would be aided by the low fuel loading and relatively flat topography in this area. The implementation of the following projects would create an effective fuel break along the entire length of Soldiers Meadow Road in Lewis County. A fuel break in this location would help protect the community of Forest, scattered structures, timber assets, and significant historical and cultural sites in the area from a wildland fire. The most significant fire risk comes from ignitions in the Salmon River canyon or recreational activities in the Hoover Point area pushed by prevailing southwesterly winds. These hazardous fuels reduction projects would provide firefighters with a safe area to execute suppression techniques and stop a fire from continuing northward.

Forest Junction Project Area

The forested area southwest of Forest is a mature stand containing ponderosa pine, Douglas-fir, and western larch components. The understory consists of lodgepole pine and grand fir with a grass and short shrub component. Due to the density of stems and horizontal and vertical fuel continuity, a very intense surface fire or a crown fire would be expected in this area likely resulting in stand replacement. During the summer months, the prevailing winds typically originate from the southwest; thus, a fire in the Salmon River canyon could be pushed towards the community of Forest.

Figure 18. Forest Junction Project Area Map.



There is managed forest lands due south of Forest on the east border as well as on the western border (near junction of Soldiers Meadow Road and Hoover Point Road) of the Project Area. A small drainage with a relatively wide floodplain consisting of open meadow and riparian area grasses and short shrub species create the southern border of the Project Area.

In addition to high risk fuels, this area near Forest is bordered on the north by Soldiers Meadow Road. This is a well-maintained gravel road that receives a considerable amount of vehicle and recreational vehicle traffic during the warmer months. The surrounding forestlands are a popular recreational area for local residents. Camping, 4-wheeling, motorcycle and horseback riding, and hunting are common, particularly to the west towards Soldiers Meadows Reservoir and where access is available in the Salmon River canyon to the south. There is also a power line corridor crossing the project area from near the Hoover Point Road in the southwest corner traveling in a northeasterly direction to Forest.

There are several homes and other structures in the Forest community as well as scattered homes along the north side of Soldiers Meadows Road bordering the project area. Residents as well as the timber and recreational assets in this area have a very high risk of experiencing a wildfire.

Project Prescription

A 100 foot shaded fuel break along Soldiers Meadow Road between the Hoover Point Road junction and the Forest Road junction would help protect the Forest community and scattered residents in the area from wildland fire. This type of fuels management would also provide a safe control area to stage effective suppression efforts. This project would provide direct protection benefits to approximately 25

existing structures and could help protect thousands of timbered acres if Soldiers Meadows Road was used as a strategic fire line during suppression operations. The shaded fuel break would include approximately 15 acres of brush clearing, thinning to a spacing of about 20 feet between trees, pruning remaining overstory trees, and piling and burning of slash.

Additionally, forest management options should also be considered by the property owners in this area to reduce fuel loading and improve forest health conditions. The prescription for this type of work would be site specific, but would likely include both commercial and precommercial thinning. Healthy forest stands are generally more resistant to the development of extreme fire behavior characteristics and are more resilient to the after-effects of wildland fire.

Due to the ignition potential, the power line corridor within the project area should be inspected to ensure that the right-of-way is clear of hazardous fuels. This will require coordination with the Avista Corporation.

This area has been identified by Lewis County as a developing area for residential and recreational construction. Property owners with existing structures as well as any new construction should implement homesite defensible space techniques according to the Firewise program standards.[23]

There is a relatively large agricultural field directly west of the Forest townsite that could be used as a safety zone for residents and fire crews if necessary.

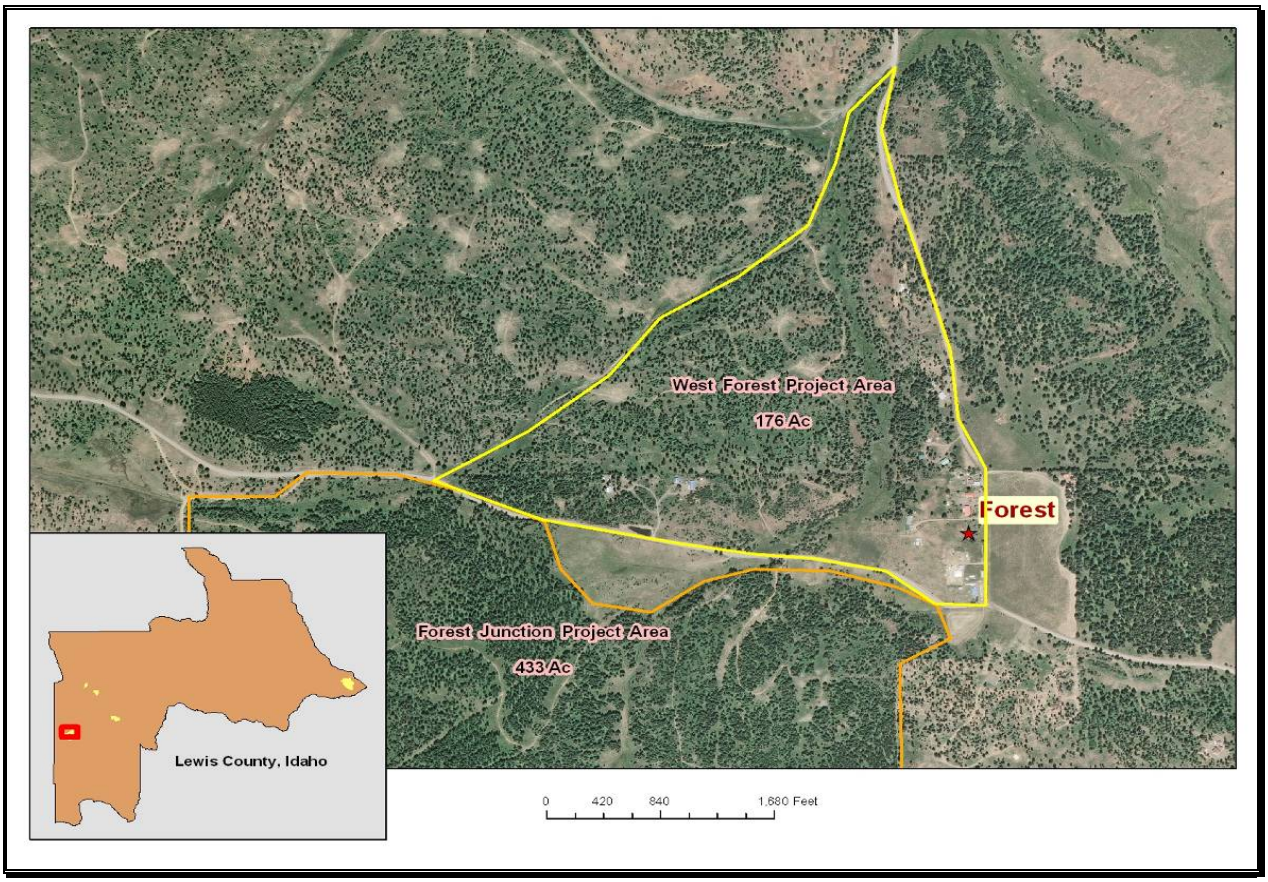
West Forest Project Area

The forested area bounded by Forest Road to the east, Soldiers Meadow Road to the south, and a secondary dirt road to the northwest has a high fire risk primarily due to the abundance of structures and human activity in the immediate vicinity. The community of Forest lies in the southeast corner and there are numerous structures along both Forest Road and Soldiers Meadow Road. This area will likely see additional residential and recreational development in the next decade.

The fuels in this project area consist of dense, small diameter lodgepole pine with a mixed grass and short shrub understory.

[23] FIREWISE Communities. National Fire Protection Association. Available online at http://www.firewise.org/. December 2011.

Figure 19. West Forest Project Area Map.



Project Prescription

In order to protect structures and other assets, property owners in this Project Area should implement homesite defensible space techniques according to the Firewise program standards.[24] Due to the distance from Winchester or an easily accessible drafting site, the construction of a permanent water supply at Forest would help reduce the turnaround time for fire suppression vehicles in the event of a structure or wildland fire in the area.

The density of the lodgepole pine stems within the project area will likely promote the development of a very intense wildland fire and possibly a crown fire. Forest management options should be considered by the property owners in this area to reduce fuel loading and improve forest health conditions overall. The prescription for this type of work would be site specific, but would likely include both commercial and precommercial thinning to create space between crowns and promote fewer, but larger diameter trees. Creating openings and planting more fire-resistant species such as ponderosa pine may be beneficial for long-term management objectives. Healthy forest stands are generally more resistant to the development of extreme fire behavior characteristics and are more resilient to the after-effects of wildland fire.

[24] FIREWISE Communities. National Fire Protection Association. Available online at http://www.firewise.org/. December 2011.

ASSESSMENT AREAS 1 AND 2 - KAMIAH

Kamiah is located in the Clearwater River Canyon at the confluence of Lawyer Creek. The majority of the townsite sits on the flat near the River with structures and other development stretching to the southwest along Lawyer Creek as well as to the northwest along U.S. Highway 12. The slope to the west of town is somewhat mild near the bottom, but becomes steeper mid-slope and is nearly vertical near the top where it breaks onto the Camas Prairie. The lower half of the slope is characterized by several benches and shallow draws where residential development is becoming more and more common. The primary access route into this foothills area is State Route 64, which makes several switchbacks before climbing out of the canyon via the Lawyer Creek drainage.

The Milepost 59 Fire threatened Kamiah when it jumped three separate fire lines built downriver to protect the community. Fire suppression and control efforts are extremely restricted by the steep terrain, lack of access, and fuel loading in the narrow draws.

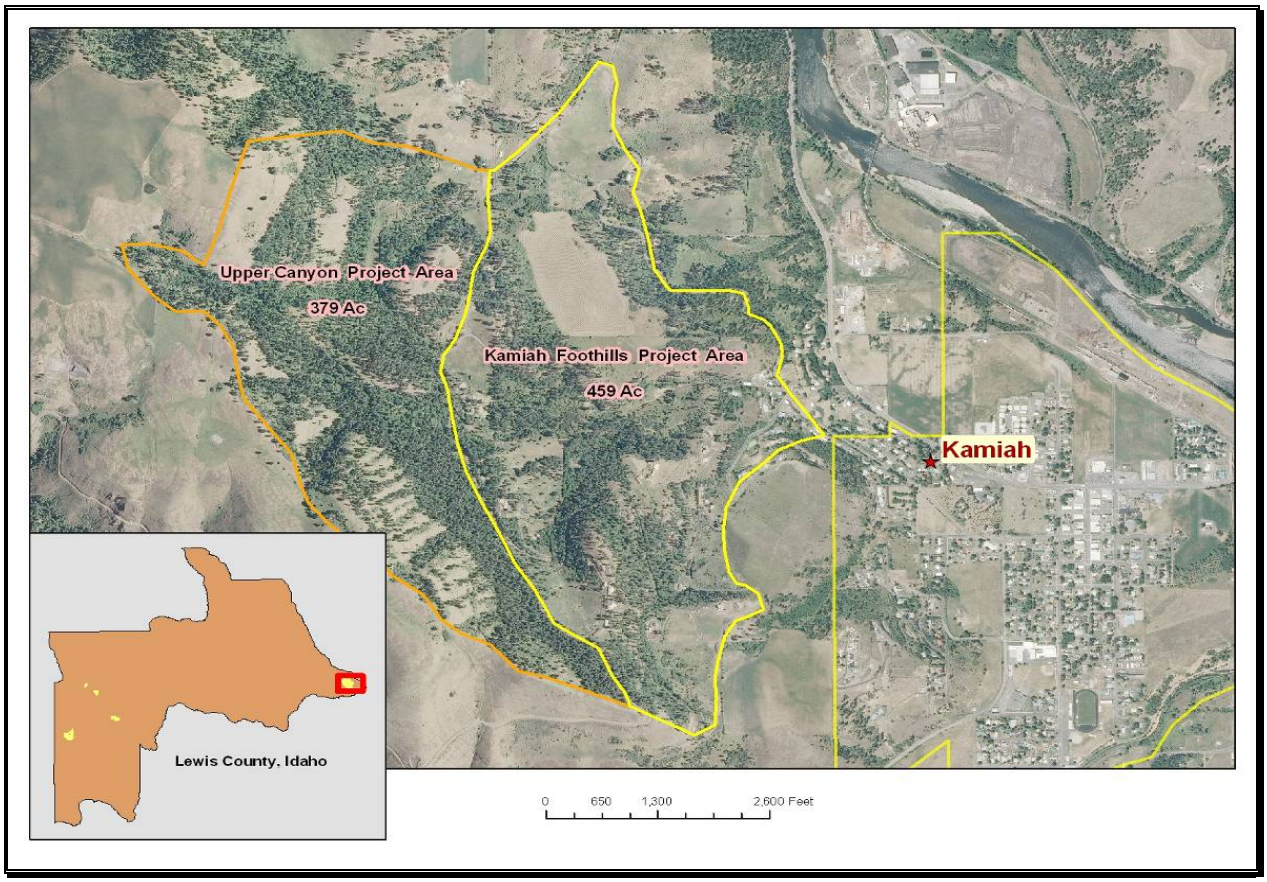
The projects proposed in this section will provide direct wildland fire protection for the community of Kamiah by lessening the potential intensity of fires upslope of the townsite as well as by creating a pre-determined line of defense to stage suppression efforts. These projects will also reduce the potential threat to individual property owners in the foothills area by improving structural survivability with fewer resources and by lessening the loss of property value due to a stand replacing fire. Evacuation routes and access to properties will also be improved by implementing roadside fuels management strategies.

Kamiah Foothills Project Area

The Kamiah Foothills Project Area located upslope and west of the city limits of Kamiah is one of the most rapidly developing areas in Lewis County. This area consists of numerous benches and draws with homes, driveways, and small agricultural development scattered throughout. The area is primarily an east aspect with slopes ranging from fairly flat to extremely steep. Residential development has resulted in some clearing of forestland; however, most of the draws and north aspects are still timbered. The overstory is made up of primarily ponderosa pine and Douglas-fir. The understory is somewhat more variable due to human modifications; however, tall brush and regeneration is predominant in most areas.

State Route 64 provides the primary access route and bounds the project along the west edge. There are also numerous private roads and driveways leading to structures. These are typically well-signed, but are not always built to standards adequate for heavy truck or emergency vehicle travel.

Figure 20. Kamiah Foothills Project Area Map.



Project Prescription

In order to protect structures and other assets, property owners in this Project Area should implement homesite defensible space techniques according to the Firewise program standards.[25] In addition, the creation of shaded fuel breaks within at least 30 feet of State Route 64 (approximately 2.4 miles) as well as private roads and driveways would help improve safe ingress and egress, particularly during an evacuation. Shaded fuel breaks typically require the removal of brush and other understory components as well as thinning the overstory to provide spacing between crowns. Pruning remaining trees will also disrupt the continuity of available fuels.

The improvement of forest health conditions and resiliency to wildfire should also be a priority. Precommercial thinning and removal of dead and dying trees as well as the majority of brush would help reduce ladder fuels and avoid jackpots of fuels.

Available water resources are limited in the Foothills Project Area. Working with landowners to develop ponds or other water storage would improve resupply turnaround times for fire crews.

Upper Canyon Project Area

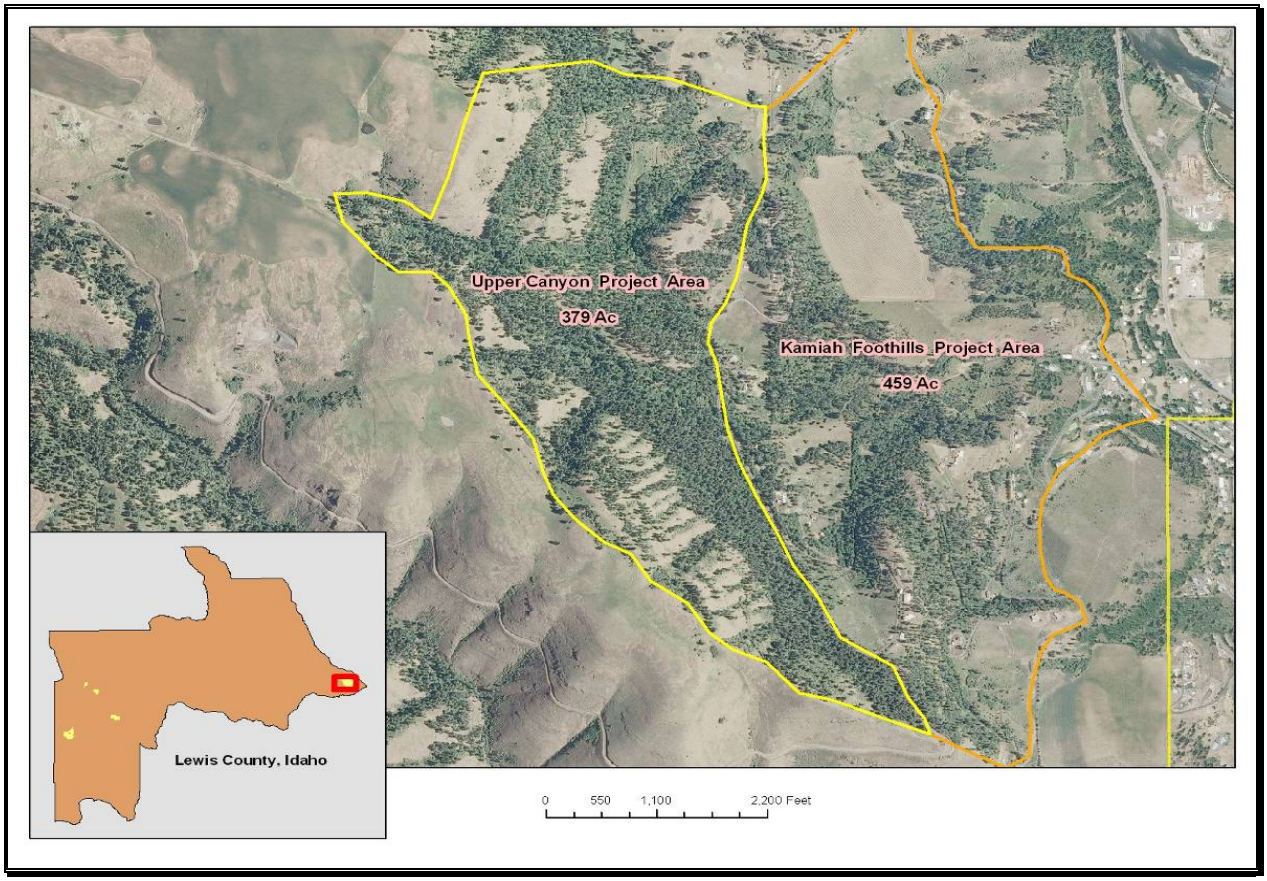
The Upper Canyon Project Area is located on the very steep canyon walls upslope of State Route 64 west of Kamiah. There are no structures in this area; however, the forest health conditions and steep

[25] FIREWISE Communities. National Fire Protection Association. Available online at http://www.firewise.org/. December 2011.

terrain are likely to contribute to extreme fire behavior in the event of a wildfire. In addition, preemptive modification of fuels in the Upper Canyon Project will help protect the residential developments below and the city of Kamiah as a whole.

The Upper Canyon Project Area is a mesic forest type with a primarily ponderosa pine (90%) and Douglas-fir (10%) overstory. An abundance of dead standing and down woody debris was noted during the field assessment. The understory consists of tall shrubs and dense pockets of conifer regeneration. Based on the habitat type and historic fire regime data, the forest within the Project Area historically consisted of relatively open ponderosa pine and Douglas-fir stands with a mostly grass understory due to relatively frequent low to mixed severity fires. Successful fire suppression over the last 100 years has increased fuel loading in the understory. The Threat Level is extremely high in this area due to the steep terrain, lack of access, high ignition potential, and increasing development pressure below the project area. As witnessed in previous occurrences, fire spread upslope will occur very rapidly making control efforts difficult and often dangerous.

Figure 21. Upper Canyon Project Area Map.



Project Prescription

The prescription for reducing the wildfire risk in the Upper Canyon Project Area is focused on improving forest health and resiliency to wildfire as well as constructing a permanent fuel break to help protect the community and provide firefighters with an adequate control point to base suppression efforts.

In order to reduce fuel loading and return the forest to more historic conditions, the entire project area should be intensely thinned with most of the regeneration and brush removed from the understory.

Remaining overstory trees should be well spaced (*at least* 15 feet between stems or clusters of stems). Ideally, slash created by this operation would be piled and burned; however, terrain and access issues in some areas may require that slash is lopped and scattered. Land managers should consider periodic prescribed burning to maintain this condition and limit fuel loading.

In addition, a permanent fuel break should be constructed along the northern boundary of the project area. The fuel break will be approximately 100 feet wide and strategically located on a ridge or other area accessible to dozers. All forest vegetation and brush should be completely removed and the area reseeded to native grasses. In the event of a fire, this area could be mechanically converted to mineral soil very quickly in order to provide a safe line of defense for residents, structures, and infrastructure in and around Kamiah.

OTHER TYPES OF HIGH PRIORITY PROJECTS

There are several other types of mitigation projects that will help reduce the wildland fire risks in Lewis County. These projects typically require additional planning, partnerships with federal and/or tribal agencies, and/or long-term land management modifications.

1. Continue to pursue the development of structural fire protection coverage in populated areas.
2. Continue to enhance regional communication capabilities and comply with narrow band standards.
3. Continue to work on development and new construction policies to reduce exposure to wildland fire hazards.

This page was intentionally left blank.

FLOOD ASSESSMENT

The goal of developing a flood hazard risk assessment for Lewis County is centered on life safety and flood risk reduction to area residents. Participation in the National Flood Insurance Program (NFIP) and subsequent adoption of more stringent building codes makes the residents of Lewis County eligible for flood loss insurance. Additionally, further development of a detailed flood risk assessment identifies potential locations of outdated or threatened infrastructure and areas where continued residential and/or commercial construction could increase damage potential during flood events.

Flood History

Floods have been a serious and costly natural hazard affecting Lewis County for many decades. Floods damage roads, farmlands, and structures often disrupting lives and businesses. Simply put, flooding occurs when water leaves the river channels, lakes, ponds, and other confinements where we expect it to stay. Flood-related disasters occur when human property and lives are impacted by flood waters. Therefore, an understanding of the role of weather, runoff, landscape, and human development in the floodplain is a key to understanding and controlling flood-related disasters.

Presidential disaster declarations related to flooding in Idaho were recorded in 1956, 1957, 1961, 1962, 1963, 1964, 1972, 1974, 1984, 1996, 1997, 2005, 2006, 2008, 2009, 2010, and 2011. Many of these declarations include Lewis County.

FLOOD-PRONE WATERSHEDS

Historically two tributaries to the Clearwater River have been the focus of concern when discussing flood hazards in Lewis County: Mission Creek and Lawyer Creek. A review of the Idaho County Free Press, Clearwater Progress, Lewiston Morning Tribune, United States Geological Survey (USGS) stream gauging data, and Lewis County flood information records have provided some detail on the history of flooding for these streams.

Mission Creek

Mission Creek confluences with Lapwai Creek about ½ mile west of Culdesac, Idaho. The nearest stream gauge is located on Lapwai Creek (No. 13342450) near the town of Lapwai, Idaho. Currently, the USGS does not have a stream gauging station on Mission Creek; therefore, data gathered from the Lapwai Creek stream gauge was used to estimate potential flood occurrences on Mission Creek. These data show that from 1975 to 2010 the average spring flow for Lapwai Creek ranged from 119 to 212 cubic feet per second (CFS). During this same 35 year period, Lapwai Creek's maximum flow exceeded 300 CFS on 24 occasions, exceeded 400 CFS on 11 occasions, and exceeded more than 500 CFS on four occasions. In 1996, the Lapwai Creek gauge recorded 674.7 CFS in February and 540 CFS in April.

Impacts

The most notable high flow impacts on Mission Creek occurred when excessive flow rates caused down-cutting in the stream channel adjacent to the Slickpoo Levee and substrate/large rock movement from lower parts of the Levee in certain areas. During the flooding events of 1996, large amounts of streambed substrate and sediment were flushed down Mission Creek damaging roads and flooding nearby properties. In 2011, similar movement of debris was observed during field visits to the Levee. In January of 2011, the U.S. Army Corps of Engineers (Corps) released the decision report from their 2010 periodic inspection of the Slickpoo Levee. The Corp's overall rating of the Levee was "minimally acceptable". This decision was based on unwanted vegetation on the Levee embankment crown, riverside, and landside slopes; stream down-cutting in at least two locations at the levee toe; riprap

displacement in several locations; and the installation of fencing, a power pole, irrigation piping, and buildings that encroach on the Levee structure.[26] In addition to field visits by Lewis County, an article in the Lewiston Morning Tribune on April 4th 2011 reported that Mission Creek was flooding and causing property damages in the vicinity of McCormick Ridge Road. These damages, combined with similar events on Lapwai Creek and Cottonwood Creek, led the Nez Perce County Commissioners to issue a formal disaster declaration encompassing those locations.

Figure 22. April 2011 Photos of Mission Creek.

Slickpoo Levee Down-cutting Stream Channel

Slickpoo Levee Undermining Streambank

Bridge Wash Downstream of Slickpoo in Nez Perce County

Lawyer Creek

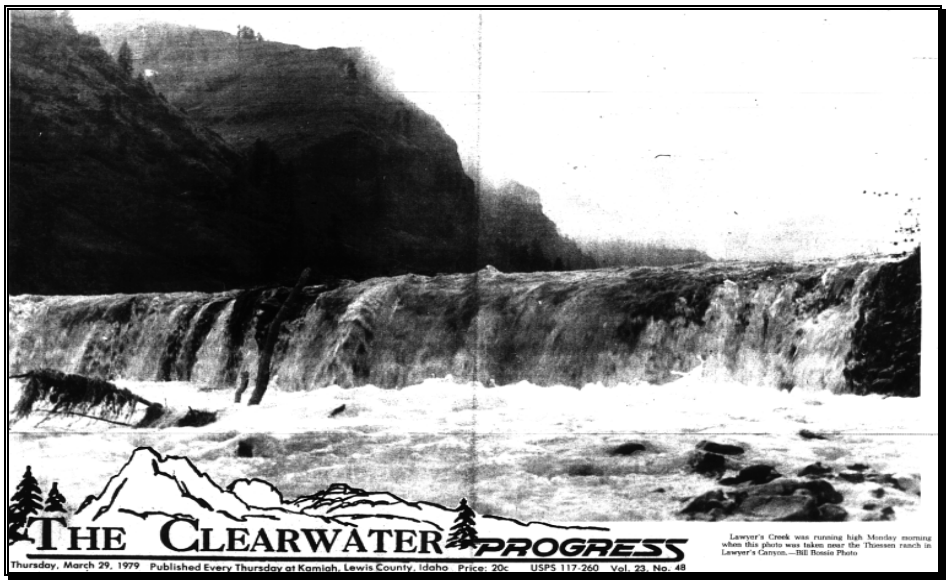
Lawyer Creek drains a large portion of the Camas Prairie above Kamiah with its headwaters beginning at Mason Butte and Cottonwood Butte and flowing northeastward to the Clearwater River. Currently, the USGS does not have a stream gauging station on Lawyer Creek. For the purposes of identifying periods of increased streamflow and flood potential, data from the nearby Lapwai Creek gauging station was used in this assessment. It is noted that the elevation of the Lapwai Creek gauging station and Lawyer Creek, where it confluences with the Clearwater River, differ in elevation by approximately 400 feet. However, snow melt and precipitation are known to affect both Mission Creek and Lawyer Creek similarly producing comparable high stream flow events. This suggests the effects noted at the Lapwai Creek gauging station as a result of high flow rates in Mission Creek are similar in timing to the high flow rates known to occur on Lawyer Creek. The high water events on Lawyer Creek have been a source of flooding damages in Kamiah for many years. Notable flooding occurrences have been documented in the *Clearwater Progress* and other local newspapers as well as by Lewis County Emergency Management.

Impacts

Damages caused by flooding on Lawyer Creek include washed out roads, culverts, and streambanks as well as undermined levees and damaged bridge abutments. Severe flood-related damages in the community of Kamiah were recognized with the availability of federally subsidized flood insurance on April 3rd, 1975. Over the past 35 years, high water events and flooding of Lawyer Creek has caused displacement of residents and damage to local infrastructure every few years. In March 1979, high water levels on Lawyer Creek were seen uprooting small trees and scouring the stream channel near the Thiesen Ranch.

[26] "Periodic Inspection Report: Slickpoo (St. Joseph)". October 2010. US Army Corps of Engineers. Walla Walla District. Walla Walla, Washington.

Figure 23. March 1979 Article Published in the *Clearwater Progress*.



March 1979 caption, "Lawyer's Creek was running high Monday morning when this picture was taken near the Thiesen Ranch in Lawyer Canyon. – Bill Bossie Photograph" The mean stream flow on Lapwai Creek during March 1979 was 417.7 CFS. Flow rates at or above 400 CFS in the month of March have only been reached four times in the last 35 years.

In February 1986, Lawyer Creek flooding disrupted the Kamiah airport and threatened the Bethman Addition.[27] Again, in the February 1996, Lewis County officials estimated $8 - $10 million in damages, much of which was in Lawyer Canyon along Highway 164. The Peck Grade and the Nez Perce-Kamiah Grade (Highway 64) were also damaged in 1996 as well as levees and several roadways in Kamiah. During this time, Governor Phil Batt of Idaho signed an executive order to allocate $5 million in aid for flood restoration and damages in the 10 northern Idaho counties.[28] Even with this assistance, the Corps postponed repairs on the Lawyer Creek Levee citing insufficient funding according to an article published in the Clearwater Progress in April 1997.[29] Local planners noted that the lack of property owner consent, insufficient matching funds, and general irresolution on appropriate projects also affected the Corps's decision to postpone the Levee's repairs. The 1997 article also stated that the damage the Levee had sustained during the 1996 flood events had resulted in continued deterioration.

In November 1998, Kamiah began planning "Project Impact", a program focused on managing flood control efforts, landslides, wildfires, and the city of Kamiah's stormwater system. In September 1999, the first on-the-ground project implemented by Project Impact was announced. The goal of the project was to remove about 6,500 cubic yards of sediment from an area near the mouth of Lawyer Creek in order to reduce the risk of flooding. In September 2002, a flood mitigation and restoration report for Lawyer Creek was completed for Lewis County.

In April 2011, Lawyer Creek crested its banks and flooded a homesite near the Tommy Robinson Pond in Lawyer Canyon and caused damage to Lawyer Creek Road. This event also caused the Tommy

---

[27] "Rains Close Many Highways in Idaho." *Clearwater Progress*. February 1986.

[28] St. Peter, Jeff. "Flood Update: Agencies offer help." *Clearwater Progress*. February 1996.

[29] "Kamiah City Council: Corps puts off repairs to levy." *Clearwater Progress*. April 1997.

Robinson Pond to overflow. Damages were primarily on private property; thus, no estimate of losses is available.

Figure 24. April 2011 Photos of Lawyer Creek.

Lawyer Creek Diversion Dam

Lawyer Creek Road Washout

Lawyer Creek Road Washout Below Tommy Robinson Pond

Flood Characteristics Modeling

When high stream flows and flooding occur, they are commonly referred to as “100 year floods”; however, 25 year, 50 year, and 100 year flood events all have the potential to cause damage in an unhealthy stream environment. The terms "25 year", "50 year", and "100 year" are used to describe the statistical probability of a flood event of a certain size occurring each year. For example: a 25 year flood has a 4% probability of occurring in any given year, a 50 year event has a 2% probability, and a 100 year event has a 1% probability. While unlikely, it is possible to have two 100 year floods within consecutive years or months of each other such as occurred with the 1996 and 1997 flood events in Lewis County.

STREAMSTATS

The USGS’s Streamstats multiple regression model was used to estimate the low flow, peak flow, and annual flow rates for both Mission Creek and Lawyer Creek. This model was selected because it directly pertains to stream reaches in Idaho that have been gauged. Neither Mission Creek or Lawyer Creek have stream gauging stations; therefore, little to no data on flow rates or high water events has been recorded. The Streamstats software evaluates the drainage area, elevation, annual precipitation, topographic relief, and geographical region for computation of the estimated streamflow parameters in a watershed.

PREVIOUS STUDIES

In 1985, FEMA published the “Flood Insurance Study, City of Kamiah, Idaho”[30] and estimated the 100 year flood event flow rate for Lawyer Creek to be 7,300 CFS. In April 2000, the Natural Resource Conservation Service (NRCS) published *“The Lawyer Creek Hydrologic Study”*[31] which estimated the 100 year flood event flow rate for Lawyer Creek to be approximately 8,500 CFS. Furthermore, in 2002, Water Consulting, Inc. published *“The Lawyer Creek Restoration and Flood Mitigation Project”*.[32] This report documented the bankfull flow rate for Lawyer Creek as well as the 10, 25, 50, and 100 year flow rates for flooding using statistical models and comparisons with measured stream flow data from the

[30] “Flood Insurance Study, City of Kamiah, Idaho”. 1985. National Flood Insurance Program. Federal Emergency Management Agency.

[31] “The Lawyer Creek Hydrologic Study”. 2000. Natural Resource Conservation Services. U.S. Department of Agriculture.

[32] Water Consulting Inc. “Lawyer Creek Restoration and Flood Mitigation Project Final Design Report.” Hamilton, Montana. September 2002.

Lapwai Creek and Clearwater River USGS gauging stations. The bankfull flow rate for Lawyer Creek was estimated between 640 – 695 CFS and the 10, 25, 50, and 100 year peak food events were recorded at 2,400; 3,500; 4,200; and 4,600; respectively.

The results for 10, 25, 50, and 100 year high water events from previous studies on Lawyer Creek are presented in Table 2.1. The historic high water event occurrence was estimated using USGS FlowStat modeling, stream survey information from Project Impact, and streamflow data from gauges 13342450 (Lapwai Creek) and 13338500 (Clearwater River at Stites, ID) as indicators of flood event size within similar geographic attributes as well as newspaper articles dating back to the 1945.

Table 4. Estimated Historic High Water Occurrences for Lawyer Creek.

Historic Flood Regime	Estimated Flow Rates	Historic Occurrences
10 Year High Water Event	3700CFS +/-52%error	1976, 1979, 1982, 2003, 2010
25 Year High Water Event	4910CFS +/-49%error	1912, 1995
50 Year High Water Event	5840CFS +/-48%error	1986, 1997
100 Year High Water Event	6840CFS +/-47%error	1964, 1996

Mission Creek

Using Streamstats and the parameters described in Table 2.2, estimates for 10, 25, 50, and 100 year peak flow rates on Mission Creek were calculated. The results of this analysis are presented in Table 2.3.

Table 5. Mission Creek USGS Streamstats Model Parameters.

		Regression Equation Valid Range	
Parameter	**Value**	***Minimum***	***Maximum***
Drainage Area (square miles)	74.3	2	788.7
Mean Basin Elevation (feet)	3,610	1,458.4	4,040.1
Mean Annual Precipitation (inches)	21.2	19.3	30.1
Relief (feet)	3,470	1,442.8	5,098.9

Streamstats' estimated flow rates are presented as calculated by the model without comparison to previous studies because the previous documented rates for Mission Creek are linked to the USGS gauge in Lapwai Creek, not Mission Creek independently.

Table 6. Streamstats Estimated 10, 25, 50, and 100 Year Flow Rates on Mission Creek.

			90% Prediction Interval (CFS)	
Peak Flow Event	**Flow (CFS)**	***Prediction Error (%)***	***Minimum***	***Maximum***
10 year	1,130	44	545	2,340
25 year	1,490	43	729	3,050
50 year	1,790	44	858	3,750
100 year	2,110	46	971	4,580

Lawyer Creek

Using the Streamstats USGS model and the parameters described in Table 2.4, estimates for Lawyer Creek 10, 25, 50, and 100 year peak flow rates were calculated. These estimates were compared to previous studies, where possible, and an average flow rate for each level was calculated.

Table 7. Lawyer Creek USGS Streamstats Model Parameters.			
		Regression Equation Valid Range	
Parameter	**Value**	***Minimum***	***Maximum***
Drainage Area (square miles)	216	4	5,507.9
Mean Basin Elevation (feet)	13.6**	18.7	57.2
Mean Annual Precipitation (inches)	20.4	15.9	65.6
Relief (feet)	3,540	3,528.6	7,461.3
Percent Forest (percent)	13	4.8	93

***Value is below the minimum value range within the model of 18.7 feet.*

Table 2.5. documents recorded and previously documented flow rates on Lawyer Creek.

Table 8. Streamstats Estimated 10, 25, 50, and 100 Year Flow Rates on Lawyer Creek.[33]				
			90% Prediction Interval (CFS)	
Peak Flow Event	**Flow (CFS)**	***Prediction Error (%)***	***Minimum***	***Maximum***
10 year	3,700	52	1,590	8,610
25 year	4,910	49	2,200	11,000
50 year	5,840	48	2,660	12,800
100 year	6,840	47	3,130	14,900

The calculated average flow rate for the flood events in Table 2.6 were used in conjunction with the average bankfull estimate of 667.5 CFS, (640 + 695 / 2 = 667.5 CFS) to estimate the depth of water above the bankfull measurement.

Table 9. Calculated Average Peak Flow Rates for Lawyer Creek.					
Peak Flow Event	**FEMA 1985 (CFS)**	**NRCS 2000 (CFS)**	**WCI 2002 (CFS)**	**Streamstats 2011 (CFS)**	**Average Flow Rate (CFS)**
10yr			2,400	3,700	3,050
25yr			3,500	4910	4,205
50yr			4,200	5,840	5,020
100yr	7,300	8,500	4,600	6,840	6,810

The average peak flow rate estimates were used to help determine the risk categories and subsequent threat levels presented in the following sections.

Categorization of High Hazard Areas

Lewis County recognizes that Mission Creek and Lawyer Creek pose the greatest flood damage potential in the County. Thus, only these watersheds were evaluated as part of this assessment.

The purpose of this exercise was to develop "Threat Levels" and mapped priority areas based on the unique conditions in Mission Creek and Lawyer Creek such as response to snow melt, expected high flow rates, property and infrastructure at risk, flood control mechanisms, and future development in high risk areas.

[33] Water Consulting Inc. "Lawyer Creek Restoration and Flood Mitigation Project Final Design Report." Hamilton, Montana. September 2002.

FIELD ASSESSMENTS

Field assessments were completed in January and April of 2011 during periods of high flow and spring melt conditions. The field assessments consisted of site visits to known problem areas with the Lewis County Commissioners to photograph current conditions and locations of flood damage, meet with concerned residents, and verify mapped priority locations using GPS and GIS software for the creation of flood hazard zones.

RISK CATEGORIZATION

Risk categories were determined through a combination of modeling, statistical representations, historical events, previous documentation, and the results of the field assessments and interviews with local residents. Each of these categories were analyzed in order to determine the threat level for each risk area identified during the assessment.

Existing Data

All existing data available was collected and reviewed. Lawyer Creek in particular has been evaluated and assessed for various purposes and at different points in time. To the extent available, this information was integrated and built upon as part of the risk assessment project. In addition to past studies, databases, and agency records, a review of local area newspaper articles regarding flooding on Mission Creek, Lawyer Creek, and the Clearwater River was conducted. The timeframe for newspaper coverage is limited to the 1920's thru 2011, but this information helps establish a record of flood frequency and reported damages, which doesn't currently exist in other resources.

Contour Mapping

Project Impact stream surveys and stream cross-sections as well as GIS-based 1-foot, 2-foot, and 3-foot contour mapping were coupled with USGS streamflow data and computer modeling results for both Mission Creek and Lawyer Creek to aid in the development of a basis for defining threat levels.

Historic or Current Flood Damage

Since very little documentation of historic flood damages exists for Lawyer Creek or Mission Creek, this risk category is limited to information collected during the field assessments (i.e. physical evidence of damage) and interviews with residents and city and county personnel. More recent flood events are formally documented, particularly if a disaster declaration was issued or there were extensive damages to county or city property. Establishing a record of repetitive damages is not only a good indicator of high risk areas, this information is also critical for obtaining grant funding for mitigation projects. This risk category is important for determining threat levels because it helps establish a record of flood frequency and magnitude as well as vulnerable structures and infrastructure.

Population Centers and Developing Areas

Areas within 5 feet elevation from the stream channel where private or public infrastructure was located, currently exists, or is likely to be developed were assessed. This information is critical for understanding current stream conditions, flood control features, and channel location. Future land management decisions and flood mitigation projects will be highly influenced by both established and future development potential as well as past precedents regarding the watershed. Currently populated areas and known developing areas were automatically considered for inclusion at the "Area of Concern" threat level. Some of these areas include locations for potential city expansion and private or tribal residential and commercial development.

Degradation of Water Quality

Water quality degradation through erosion, bedload transport, and/or sediment deposition was considered during determination of threat levels. In addition to a concern for fish and other wildlife

habitat, clean water, and other intrinsic values, degradation of the stream channel can lead to additional flood concerns as well as costly restoration efforts. Areas showing signs of degradation or potential for decreased water quality, were immediately flagged as either a high or medium threat level.

Water Retention and Stream Energy Dissipation Potential

Stream segments that have the potential for improved water retention capacity or energy dissipation were thoroughly identified by Project Impact. The stream surveys and water retention design areas identified by Project Impact are supported by the flood history and modeling information gathered during this risk assessment. Identified project areas were analyzed and integrated into the threat level determination as well as mitigation project recommendations.

Channel Migration Patterns

A review of historic photography and conversations with local area residents revealed that natural stream channel migration as well as straightening and entrenchment of the channel had occurred on both Mission Creek and Lawyer Creek over time as a result of development and infrastructure expansion and changes in land use. Movement of the channel greatly affects the flood potential and risk exposure; thus, consideration was given to this eventuality in determining the threat level for certain areas.

Frequent Use and/or Safety Concerns

Residential, commercial, agricultural, and recreational uses within the Mission Creek and Lawyer Creek drainages was evaluated to determine not only the affect of these uses on flood potential, but also to determine if any of these uses would be threatened by flood events or flood control measures. Usage patterns in areas that have historically flooded or pose a concern for public safety during flood events were assessed during the determination of threat levels.

Flood Control Infrastructure

Flood control infrastructure assessments consisted of the Corps' levee inspection reports, stream flow control infrastructure proposed by Project Impact, and field surveys and time-lapse assessments of active erosion and levee degradation during the spring 2011 high water events. The current condition rating of existing flood control infrastructure as well as feasible proposals for improvements to infrastructure or stream channel dynamics that will alleviate or reduce flood potential was integrated into the threat level determinations as well as the recommendations for flood mitigation projects.

DETERMINATION OF THREAT LEVEL

There are three flood threat levels: High Risk Areas, Medium Risk Areas, and Areas of Concern. These levels were determined using GIS mapping and an evaluation of the risk categories affecting each area.

High Risk Areas

The definition of a High Risk Area is any area that is within 0-1 foot of elevation above the center of the stream channel as well as consideration of the level of exposure to each risk category.

Three specific locations were identified as High Risk Areas. These include the Upper Flying B Homesite, the Tommy Robinson Pond site, and the Bountiful Grain & Craig Mountain Railroad Bridge.

Upper Flying B Homesite

The Upper Flying B Homesite is located approximately 4.3 miles from the confluence of Lawyer Creek and the Clearwater River and is 3.5 miles upstream from the City of Kamiah on Lawyer Creek Road in the Lawyer Creek Canyon. At this location, Lawyer Creek abruptly changes from flowing almost due

east to flowing in a southerly direction. The bank elevation at this location is very low with 3 to 4 feet of elevation change from the center of channel to bankfull height in some areas. During the spring melt season of 2011, rain-on-snow preceded by short durations of warmer temperatures caused Lawyer Creek to overtop its banks at this location cutting off access to and threatening the Flying B Homesite structure as well as washing out part of Lawyer Creek Road.

Figure 25. Photos of Flying B Homesite.

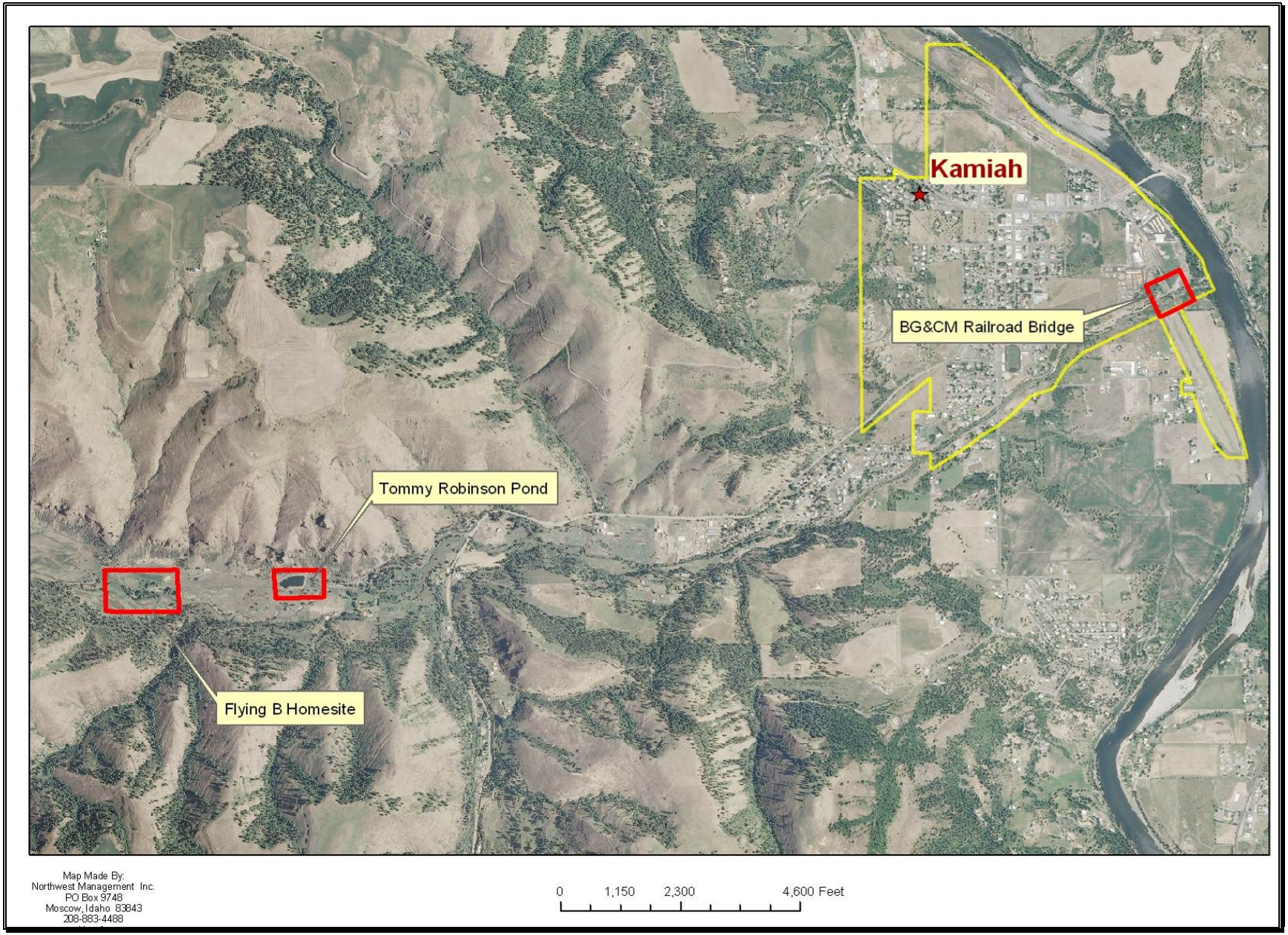
Flying B Homesite Access Road Washout

Lawyer Creek Overflow and Temporary Dike

Washout from Lawyer Creek Overflow on April 2011

Flying B Homesite and Lawyer Creek Washout

Figure 26. High Risk Areas on Lawyer Creek.



Tommy Robinson Pond Site

The Tommy Robinson Pond is located approximately 3.6 miles from the confluence of Lawyer Creek and the Clearwater River, 2.8 miles upstream from the City of Kamiah on Lawyer Creek Road off of State Route 162, and 0.7 miles downstream of the Flying B Homesite. The Tommy Robinson Pond constructed near Lawyer Creek Road provides public access fishing and other recreational uses for local residents. The design of the Pond consists of an inflow on the west bank fed by a pipeline point of diversion nearly 3,000 feet upstream in Lawyer Creek. The overflow and outlet for the Pond is also on the west end near the diversion pipe. The dike built to form the pond exhibits signs of settling and soil migration. Two locations on the east and southeast corners have receded to a level only slightly above the height of the overflow.

During the 2011 spring runoff, a rain-on-snow event and warmer temperatures caused Lawyer Creek to overflow its banks north of the Pond. The excess water flowed down several natural terrain features as well as along the side of Lawyer Creek Road and through the diversion pipeline. This influx of water effectively overwhelmed the Tommy Robinson Pond design by hydrologically blocking the overflow. This occurred in part due to 1) the design of the intake and over flow on the same westward side of the pond meaning the flood waters entering the Pond through the outflow structure were sufficient to stop water from draining as it was designed and 2) because the levee used to create the Pond was in need of maintenance. The levee was not capable of retaining enough water to raise the level of the Pond to a point at which the volume needing to be released through the outflow could hydrologically "over power" the incoming flood waters. The lack of storage capacity in the Pond caused excess water to overtop the levee on the east edge bordering Lawyer Creek Road. Both the road and the levee were damaged. Lawyer Creek Road was closed due to repairs for three days.

Figure 27. Photos of Tommy Robinson Pond Site.

Tommy Robinson Pond Overflow and Road Damage on April 2011

Bountiful Grain & Craig Mountain Railroad Bridge

The Bountiful Grain & Craig Mountain (BG&CM) Railroad Bridge is located on the southeastern edge of the City of Kamiah at the end of Railroad Street approximately 850 feet from the confluence of Lawyer Creek and the Clearwater River. The primary concern at this site is the deposition of sand, gravel, and other debris within the channel and along the levee on the north bank of Lawyer Creek just upstream of the Bridge. During the 2011 spring runoff season, no damage was sustained by the Bridge even though some large woody debris was trapped against the bridge supports.

Figure 28. Photos of BG&CM Railroad Bridge in February 2011.

BG&CM Railroad Bridge During Spring Runoff in February 2011

The piers and abutments on the 160 foot long structure impede the flow of Lawyer Creek through constriction of the channel and pier placement. This has caused scour and deposition areas leading to the need for streambed excavation in order to alleviate flooding impacts and protect the existing levee.

Figure 29. Photos of BG&CM Railroad Bridge in April 2011.

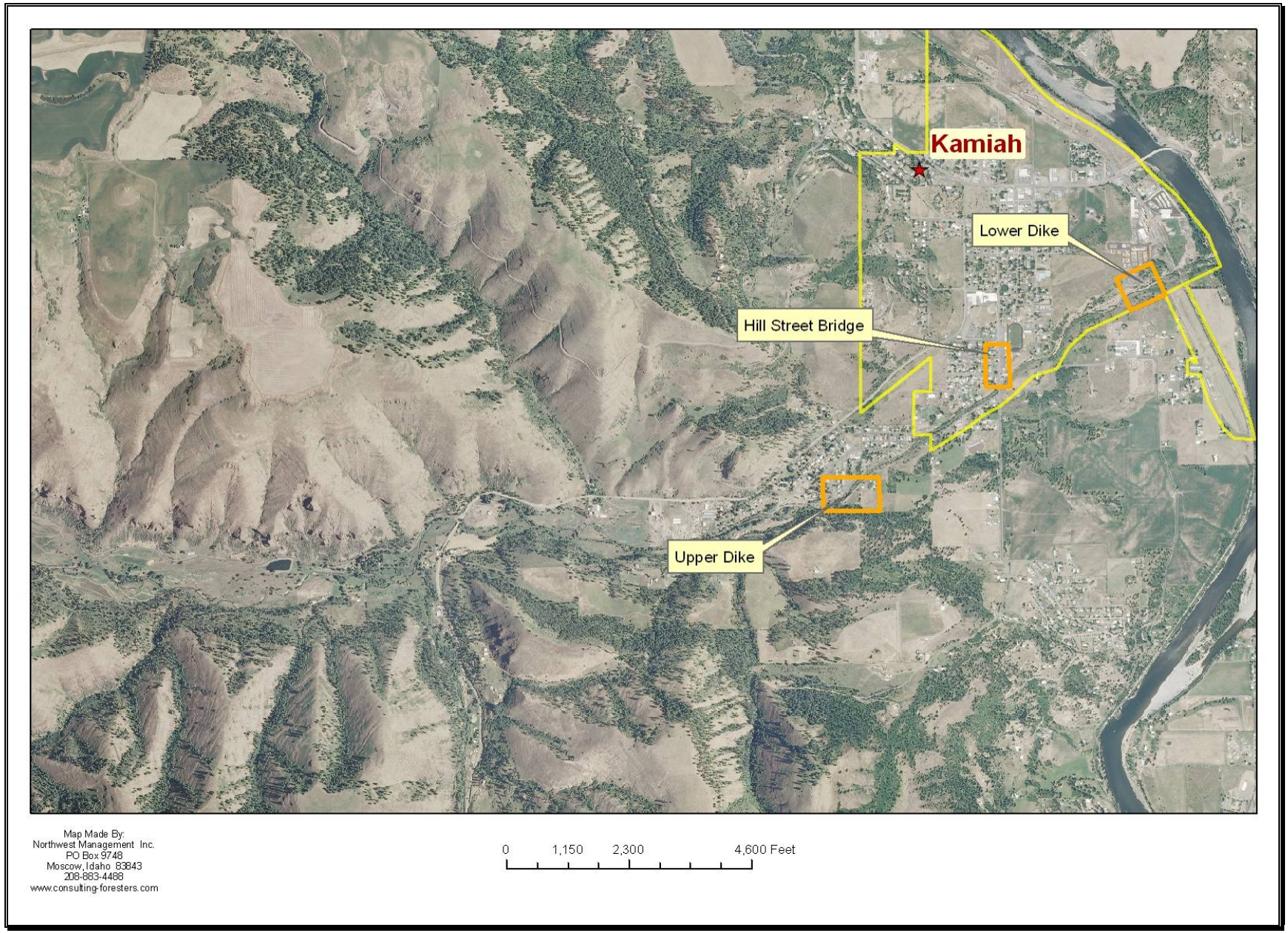
BG&CM Bridge During Spring Flows in April 2011

Medium Risk Areas

The definition of a Medium Risk Area is any area that was within 1-3 feet of elevation above the center of the stream channel as well as consideration of the level of exposure to each risk category.

Three Medium Risk Areas were identified in this assessment. These areas are the Hill Street Bridge, the Upper Dike Site, and the Lower Dike Site.

Figure 30. Medium Risk Areas in Lawyer Creek.



The Hill Street Bridge

The Hill Street Bridge is a known constriction point on Lawyer Creek. The current structure is 45 feet wide, but the floodplain in this area is nearly two times that distance.[34] When water levels exceed the normal flow rates, water will backup and inundate areas upstream of the Bridge. Furthermore, the additional water pressure on Railroad Bridge may undermine the structure's integrity creating a potential safety issue and increased risk for damages. The design of the Bridge does not support natural stream channel dynamics that encourage lower flow rates and reduced stream energy, which produce less bedload transport and better water quality.

Figure 31. Photos of Hill Street Bridge in Kamiah.

Hill Street Bridge During Spring Melt in February 2011

Upper Dike Site

The levee at the Upper Dike Site is approximately 3,800 feet in length. The specific point of concern is at an upstream location where the Lawyer Creek channel has migrated to the base of the levee. The levee structure is in disrepair with trees and human infrastructure encroachment. A depression that carries water during high flow years is present from the upstream start of the levee across private property to Hill Street. In past years, flood waters flowing through this depression have been pumped back into Lawyer Creek by the landowner in an effort to protect private property and assets. In the event that the Lawyer Creek eroded or undercut the head of this levee, a 100 year flood would likely inundate 40 to 50 acres of residential properties including 8 or more residences and would have the potential to impact 600 to 1,000 feet of Hill Street.

[34] Water Consulting Inc. "Lawyer Creek Restoration and Flood Mitigation Project Final Design Report." Hamilton, Montana. September 2002.

Figure 32. Photos of Upper Dike Site.

Pictures of Upper Dike Site on the Eastern Edge of the Ruth Property

Lower Dike Site

The Lower Dike Site consists of a section of approximately 450 feet of levee on the north bank of Lawyer Creek just upstream of the Clearwater River confluence. Before and after photos of the 2011 spring runoff event illustrate the degradation and undercutting of this levee. Vegetation and human infrastructure has encroached on the levee in the Lower Dike Site. This levee immediately borders an undeveloped area commonly inundated with water during the spring. However, the Kamiah Mills Inc. lumber mill is adjacent to the inundation zone and would be at risk of damage and inventory loss during a large flood event. An event equal to a 100 year event (6,840 CFS) or multiple lesser year events (3,700 – 5,840 CFS) are expected to overwhelm the current levee and pose a flood threat to the Kamiah Mill.

Figure 33. Photos of the Lower Dike Site.

Dike Condition Upstream of the BG&CM Railroad Bridge in February 2011

Dike Upstream of the BG&CM Railroad Bridge on April 2011
(Note loss of material in the pictures on the right since February 2011)

Areas of Concern

The definition for an Area of Concern is any area that is 3 feet or more in elevation above the center of the stream channel with potential for damage during a 100 year or greater event. Areas of Concern are also affected by one or more of the identified risk categories. Even though the Areas of Concern locations are less finite, these zones should not be construed as less important as they pose a potential risk to public safety and existing infrastructure. These sites are at risk of flooding, but are typically more stable, would require a 100 year plus flood event to incur damage, or contain areas that may have broad management needs, flood mitigation precautionary measures already in place, or have a low likelihood of damage due to the current development.

Identified Areas of Concern include infrastructure within 3 to 4 feet of elevation from the stream channel and locations that have historically experienced flood water displacement. There are currently five Areas of Concern. They are the levee at Slickpoo on the east bank of Mission Creek, the dam at Lapwai Lake (Winchester Lake State Park), the Kamiah Airport, the Bettman Addition on Lawyer Creek, and the Lawyer Creek floodplain upstream of Kamiah. These locations and structures have flooded historically and remain at risk until the floodplain of Lawyer Creek and Mission Creek can be stabilized.

Spillway on Lapwai Lake in 2011.

The earthen dam on Lapwai Lake is currently owned and operated by the Idaho Fish and Game. When the original spillway was widened, the new structure was engineered to slow the overflow of excess water with concrete blocks and gravel that are designed to mimic the natural erosion process; thus, washing away over time. During periods of high water on Lapwai Lake, the combination of heavy overflow and wind often exceed the capacity of this structure resulting in rapid erosion of the gravel and blocks causing downstream flooding on Lapwai Creek.

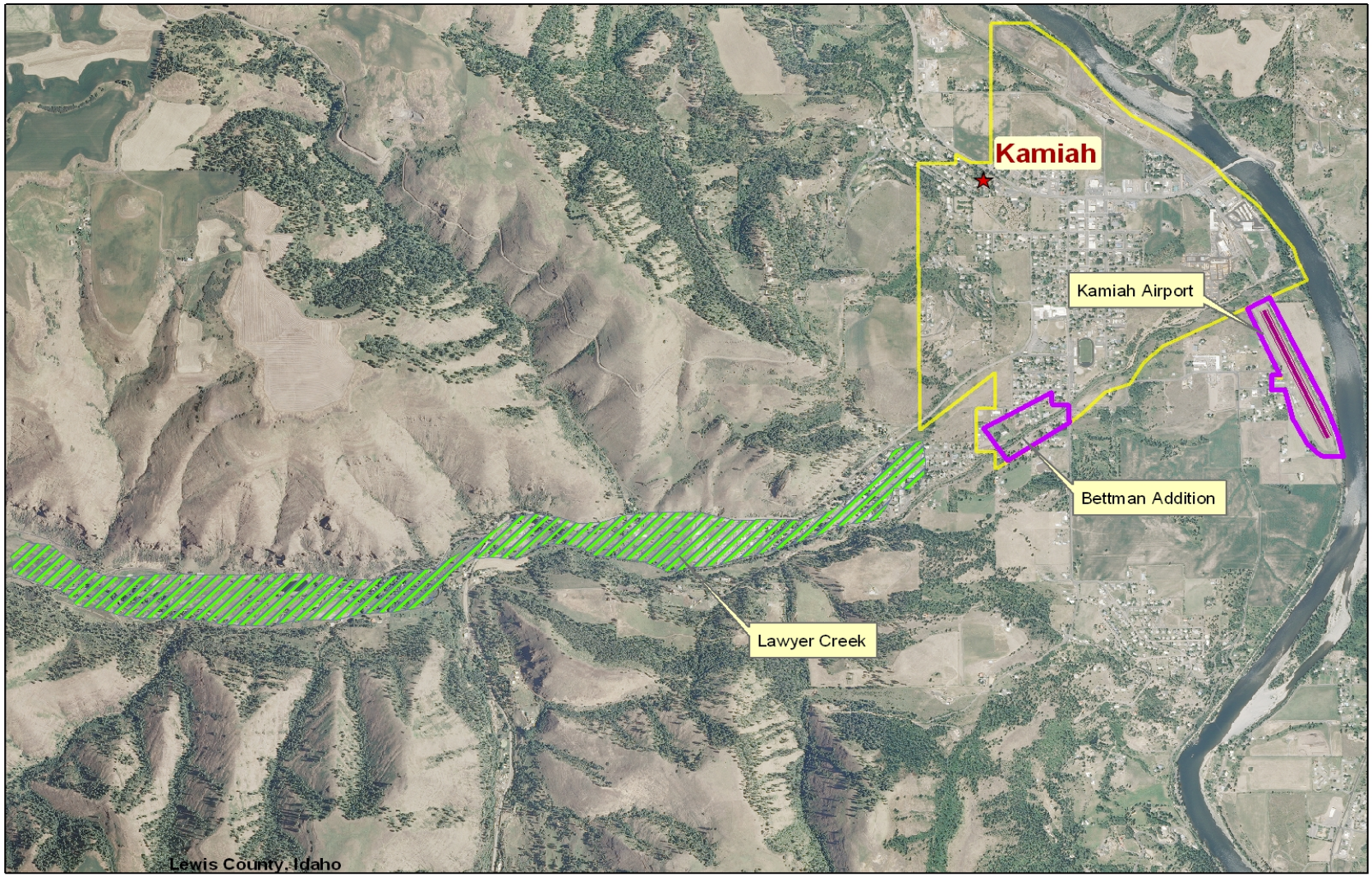
During the spring of 2011, site visits to Mission Creek revealed scouring from high water flows at the base of the 1,300 foot long Levee in three different locations. Additionally, the most recent assessment from the Corps rated the Levee condition as minimally meeting qualifications citing the need for vegetation management and removal of encroaching infrastructure including cattle fencing, a power pole, and irrigation pipelines. If the Slickpoo Levee failed, 6 to 14 structures and approximately 20 acres would be subject to flooding damages. Additionally, the historically significant Saint Joseph Mission could be impacted as it is located only 760 feet from the stream channel and is within the floodplain.[35]

[35] Water Consulting Inc. "Lawyer Creek Restoration and Flood Mitigation Project Final Design Report." Hamilton, Montana. September 2002.

Figure 34. Photos of Mission Creek.

Mission Creek near Slickpoo During Spring Melt of April 2011

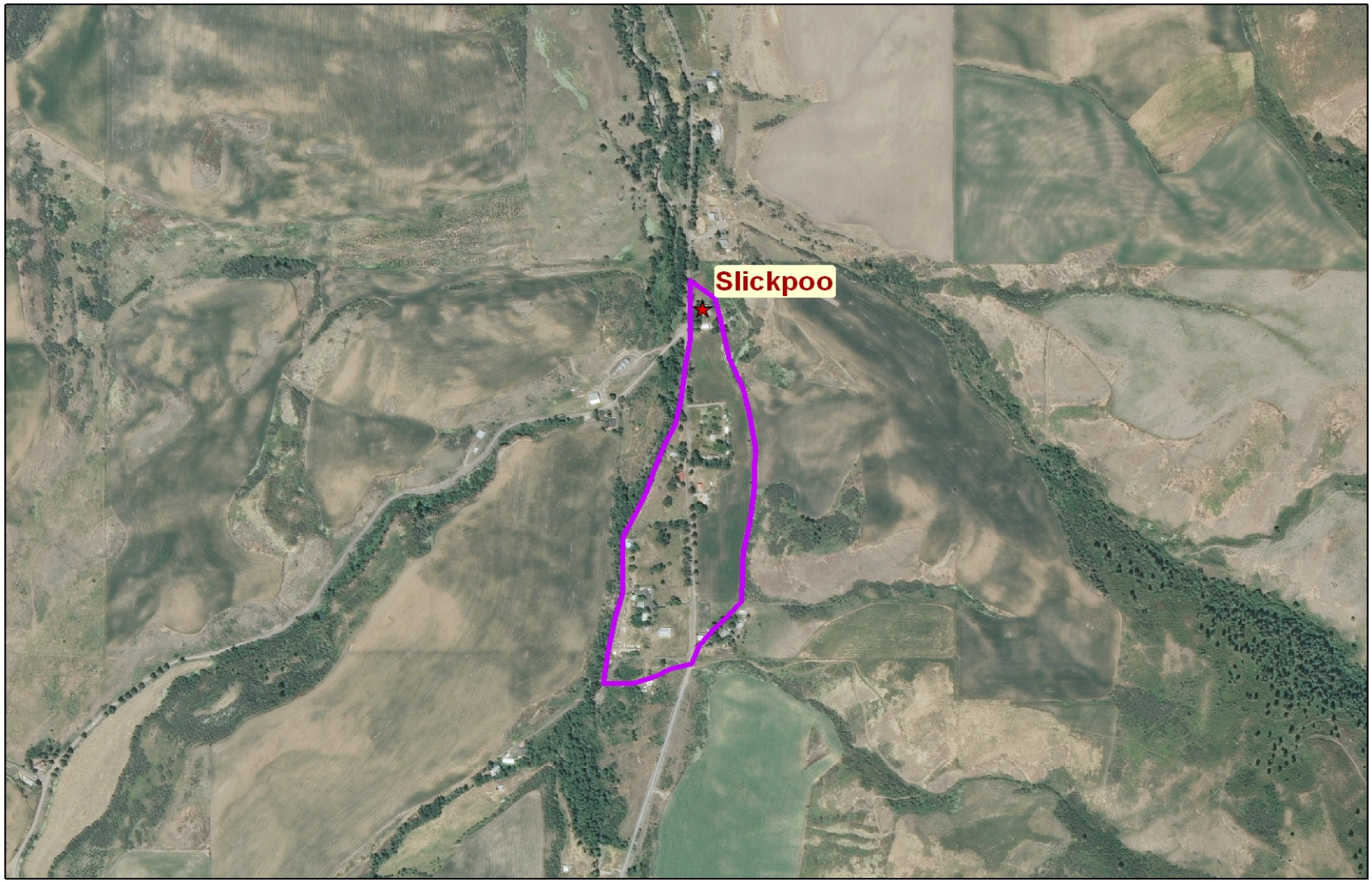
Figure 35. Identified Areas of Concern on Lawyer Creek.



Map Made By:
Northwest Management Inc.
PO Box 9748
Moscow, Idaho 83843
208-883-4488
www.consulting-foresters.com

0 1,050 2,100 4,200 Feet

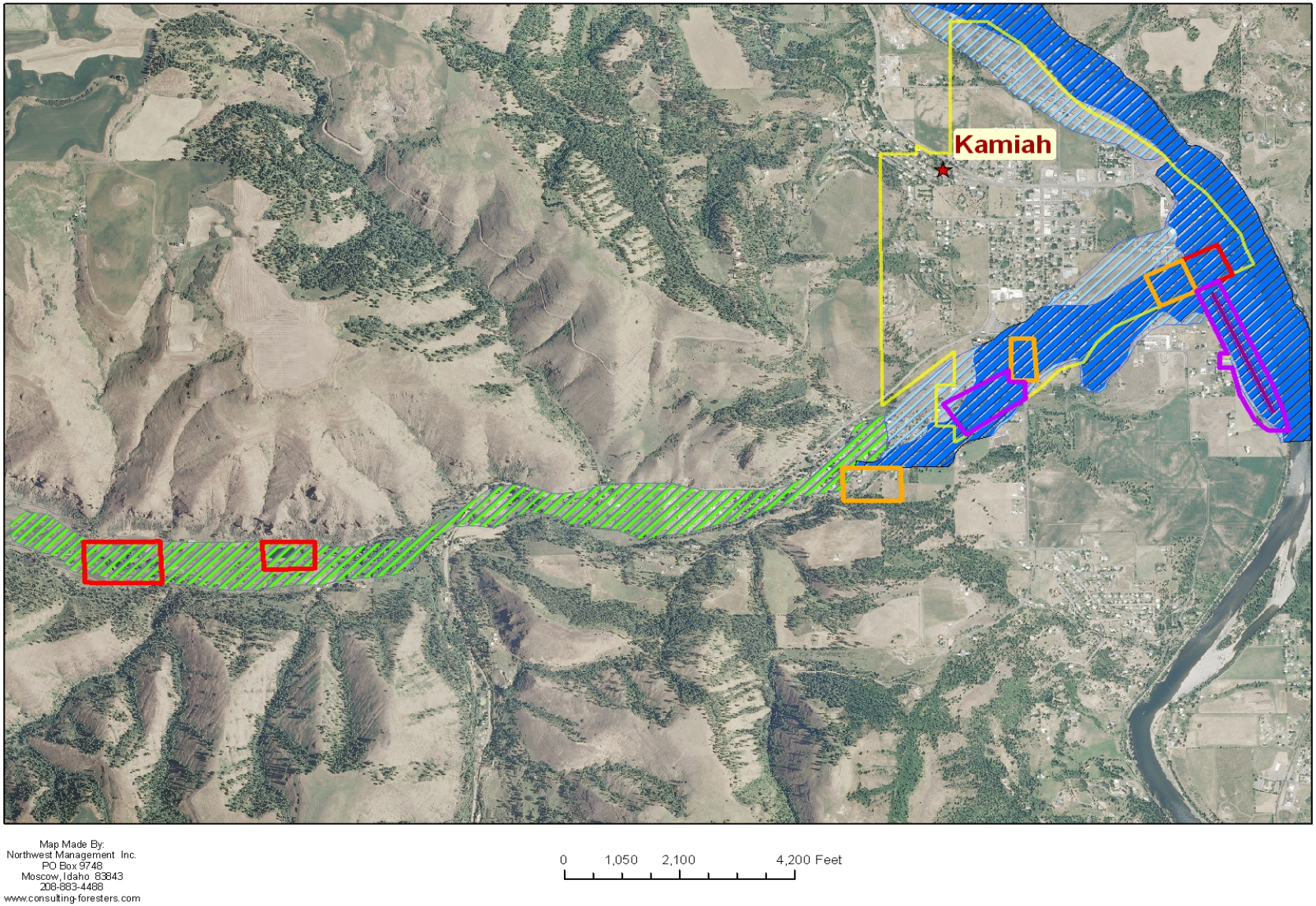
Figure 36. Identified Area of Concern on Mission Creek.



Map Made By:
Northwest Management Inc.
PO Box 9748
Moscow, Idaho 83843
208-883-4488
www.consulting-foresters.com

0 380 760 1,520 Feet

Figure 37. Heightened Threat Level Areas & FEMA-Identified Floodplain Areas.



Flood Mitigation Project Recommendations

Critical infrastructure has been identified within the existing FEMA floodplain or Areas of Concern. The objective of critical infrastructure enhancement projects is to accommodate Lewis County's Project Impact goals and promote the protection and safety of residents and the Lawyer Creek watershed. The projects identified in this assessment are necessary for the City of Kamiah to complete stream stabilization and stormwater mitigation projects that will increase the effectiveness of flood prevention and mitigation efforts within the city limits and amend the FEMA Flood Insurance Rate Map (FIRM). Project Impact noted the importance of the Hill Street Bridge as a "pinch point" for Lawyer Creek.[36] This means the Creek is constrained during flood events. Impeded flow forces water into undesirable areas. Correction of flood hazards upstream will enhance stream energy dissipation and other projects for the mitigation of future high flow events and public safety and infrastructure concerns within the City of Kamiah.

FLYING B HOMESITE ACCESS ROAD

Currently there is no wetland area or floodplain for flood water to occupy and be contained once it has breached the Lawyer Creek channel near the Flying B Homesite. As an emergency response measure, a temporary dike/river-rock barrier was placed at the edge of Lawyer Creek in 2011 to protect the Flying B Homesite access road and divert flow back into the stream channel. The dike has not been engineered and will not sustain another high flow event similar to what occurred in the spring of 2011, which was estimated at a level between a 50 and 100 year event. Stream bank armoring, rip-rap, and/or stream channel modification is necessary to provide protection to this area as well as to downstream infrastructure.

Figure 38. Photos of Flying B Homesite Access Road.

LAWYER CREEK ROAD

There are two locations along Lawyer Creek Road that were damaged during the spring of 2011 from flooding on Lawyer Creek. One location was approximately 100 yards downstream of the Flying B Homesite access road washout. The floodwaters of Lawyer Creek followed the natural topography until they were intercepted by Lawyer Creek Road. Loss of the road base and some scouring occurred during the brief period before the dike was built upstream to redirect water back into the stream channel. The potential for damage or loss of Lawyer Creek Road during a longer duration or 100 year flood event is likely; however, with the proper armoring of the upstream channel and/or construction of floodwater retention areas, damage to this road could be avoided.

[36] Water Consulting Inc. "Lawyer Creek Restoration and Flood Mitigation Project Final Design Report." Hamilton, Montana. September 2002.

Figure 39. Photos of 2011 Lawyer Creek Road Damage.

TOMMY ROBINSON POND

The inlet and overflow design for the Tommy Robinson Pond was shown to be inadequate in the spring of 2011. During this flood event, it was necessary to construct a barrier to divert flood waters away from the inlet to protect the Pond's retention dike from failure. Sections of the dike on the northeast, east, and southeast sides of the Pond are in need of maintenance and an elevation survey. If the current inlet and outflow are to be maintained and downstream areas are to be protected from a potential failure, increasing the height of the dike should be considered. This will accommodate an increased holding capacity during high water events and allow for the release of excess waters through the west-facing outlet. Increasing the Pond's water holding capacity would also allow for a more controlled release of excess water through storage and natural infiltration. Additional mitigation options would include redesigning the inflow and outflow structures at the Pond to accommodate a 100 year flood event and/or removing sediment that has accumulated in the Pond.

Figure 40. Photos of Tommy Robinson Pond Emergency Diversion Dam.

BOUNTIFUL GRAIN & CRAIG MOUNTAIN RAILROAD BRIDGE

Project Impact identified this structure as a priority and proposed two projects that would minimize the effects of the Railroad Bridge on Lawyer Creek flow. The two options proposed were 1) installation of a "w" flow weir that could direct flow to a more desirable place within the channel or 2) replace the wooden piers of the bridge with two concrete piers spaced further apart so that the thalweg of the stream was not impeded. These projects would improve stream flow; thereby, reducing sediment deposition and continued channel degradation.

In 2011, members of the community suggested removing the Railroad Bridge altogether. While this may improve stream flow issues, this option has not been fully vetted. Ultimately, the decision to remove the Bridge would be at the discretion of the BG&CM Railroad.

OTHER TYPES OF FLOOD MITIGATION PROJECTS

There are several other types of mitigation projects that will help reduce the flood risks in Lewis County. These projects typically require additional planning, partnerships with federal and/or tribal agencies, and/or long-term management modifications.

1. Reinforce the stream bank and mitigate issues concerning the flow path in Lawyer Creek Canyon above the Flying B Homesite.
2. Assess replacement value and procedural needs required to maintain the Slickpoo Levee on Mission Creek.
3. Install a USGS gauging station on Lawyer Creek.
4. Install a USGS gauging station on Mission Creek.
5. Establish a more comprehensive floodplain ordinance in cooperation with the Idaho Department of Ecology.
6. Update the FEMA Flood Insurance Rate Maps for Kamiah and surrounding area.
7. Work with the Idaho Fish and Game and Nez Perce County to address flooding issues associated with the dam infrastructure at Lapwai Lake.