Burned Area Emergency Response (BAER) Report

Hidden Lake Fire

August 3, 2003

Dillon District
Beaverhead-Deerlodge National Forest

Hidden Lake BAER

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Executive Summary

The Hidden Springs fire started on July 19, 2003 and burned about 3,400 acres in the Grasshopper Drainage on the Beaverhead-Deerlodge National Forest. It was largely controlled on August 3, 2003. Suppression costs are estimated at $2.6 million as of August 3. It burned almost entirely on National Forest Land mainly in lodgepole pine/spruce forest.

The burned area was left in a patchwork of high and low severity. Large areas of un-burned forest remain in the burn perimeter. Soils in the burned area are primarily developed in glacial till and colluvium from granitic rocks. They are extremely rocky and are moderately-coarse textured. Soil erosion potential is moderate in most of the area.

Values at risk include the potential for noxious weed invasion in areas having "high" vegetation burn severity. No downstream dwellings are at significant risk.

Our analysis concentrated on values at risk from watershed/soil/site post-fire events and the nature of those events.

Vegetation and Noxious Weeds - The burn appears to be within the range of historic variability for fire in the Pioneer Mountains. In areas of high intensity particularly along a 3000 foot stretch White Creek and in a few places along Clark Creek the burn is likely to have suppressed the native vegetation and its recovery such that windborne seed from Canada thistle, Musk thistle and Spotted knapweed from existing populations will have a competitive advantage in establishment of invasive populations. This will probably damage the ecological integrity of the area. Populations of noxious weeds with windborne seed are located within the seed dispersal range of the burned sites with conditions along the riparian corridor of White Creek and Clark Creek at the highest risk.

Watershed/Soil and Fisheries - None of the streams within the fire perimeter support known recreational fisheries. Grasshopper Creek, in the vicinity of the fire is listed in the Montana Fisheries Information System as having "limited" sport fisheries value. No threatened or endangered species occur in these streams. Stormflow analysis and sediment analysis indicate only marginal increases and these do not significantly affect values at risk. Soil erosion is likely to be marginal.

Wildlife - Fire is a natural part of wildlife ecology. Native species respond and adapt to environmental changes in areas they occupy. A number of species will benefit from the fire. Both black-backed and three-toed woodpeckers will benefit from the stand structure created by the fire. Elk will benefit from the early seral stage created by the fire. No known endangered species are expected to be affected by fire or suppression activities.

Cultural Resources- Some potentially historical structures were within the fire perimeter. The fire damaged no known structures.

Social and Visual - The fire location is steep, timbered terrain. Much of the terrain is visible from the Grasshopper road called the Wise River Polaris Scenic byway. Construction

of cat line (dozer line) was avoided in the visual corridor as much as possible. Wheel tracks that were improved as secondary fire line are more visible now.

When the fire began many of the Grasshopper community were involved and worried about the potential outcomes of the fire. Many were concerned that the fire would ruin their views and consequently, their land values. At the second community meeting prior to the ½ inch rain most of the community members expressed their support of the Teams' efforts.

Travel Management - Prior to the fire, due to heavy accumulations of woody debris, few people could actually travel through the fire area, and therefore the fire will improve hunter access in this area. Recreation use was temporarily restricted with an emergency closure area for the Sawtooth trailhead and trail and the Lake Creek Drainage.

Downstream Private and Threats to Human Health and Safety - Though there are at least 14 homes below the fire boundary, none are in the active flood plain. No culverts on roads were found in the three watersheds on Forest or State land. No culverts were found on private roads where access was possible. No threats to human health and safety were identified.

Our recommendations include monitoring and treating noxious weeds for the next year. However, monitoring should be continued for three years using BAER funds, and program funds for treatment.

Burn Severity Map and Soil Erosion
Henry F. Shovic
BAER Team Leader/Soil Scientist
August 3, 2003

Objectives

Our objectives were to estimate burn effects on values at risk. Both vegetation and soil burn effects were rated. These provide inputs to hydrologic, fisheries, and ecological analyses to develop recommendations for treatments.

Methods

The map shown below was made using a topographic map, helicopter reconnaisance, and field review. Using these data, classes of burn intensity and burn severity were developed by the Hidden Lake Burned Area Emergency Response (BAER) team.

Water Repellency

About 1/3 of our samples showed "high" water repellency. This was also noted outside the burned area. Within burned areas, most samples indicated "low" or "moderate" repellency. It is probable that repellency is present due to other factors than the wildfire.

VEGETATION BURN SEVERITY: This is the effect of fire on vegetation. The degree of burn severity depends on litter and duff depth, slope, burning conditions, and fuels. It generally relates to the proportion of vegetation blackened or consumed. Vegetation burn severity affects residual ground cover, hydrologic calculations, hydrophobicity of the ash layer, regrowth of surface-seeded grasses, and regrowth of trees dependent on cone-based seeds.

High Vegetation Burn Severity:
Wildfire produced intense heat that blackened greater than 90% of all trees and consumed all ground vegetation; some black needles occur in the ash; remnants of cones, needles and grass crowns occur in the ash layer. many crowns have brown needles; small fuels (branches, needles, shrub stems) remain, but are blackened. All surface plants are dead. Standing burned trees are blackened and snags are charcoaled.

Moderate Vegetation Burn Severity
This is a mosaic of canopy burn, surface burn, and unburned area. On the average 10% to 90% of the tree canopy has burned. There is a patchwork of unburned and surface-burned forest floor vegetation. Standing trees are blackened partway up the trunk, but not charcoaled.

Low Vegetation Burn Severity
This is a mosaic of unburned and burned vegetation in forested areas.

About 45% of the area in the burn perimeter burned. Of this area, 17 % of the area was in a "High" Vegetation Burn Severity Class. The remainder is a mixture of "Low" and "Moderate" Vegetation Burn Severity with large areas of unburned remaining in the interior.

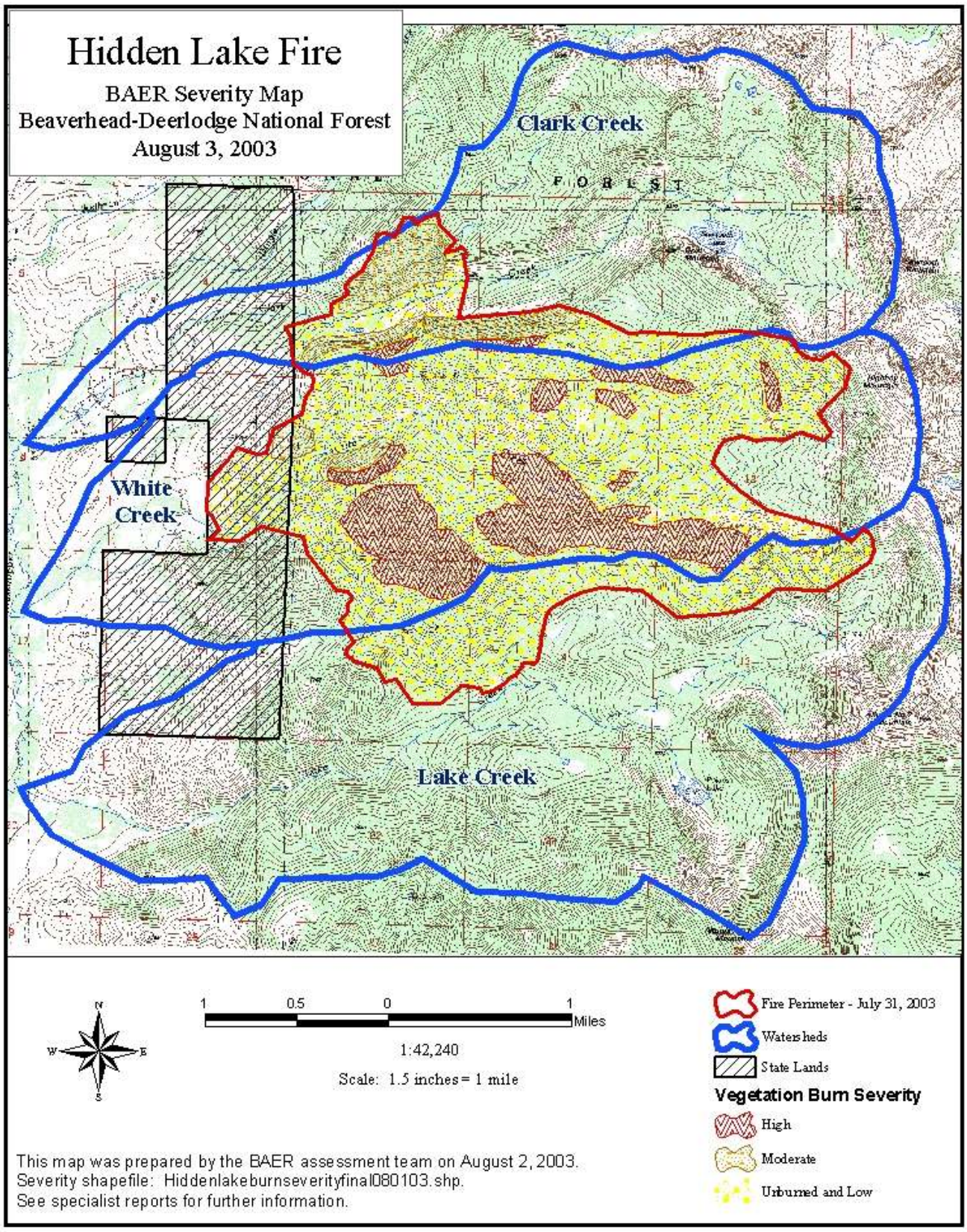
SOIL BURN SEVERITY: This is an effect of fire on the ecosystem, primarily concerned with soils. It is only loosely correlated to burn intensity, since some highly intense fires may be of such a duration that soil is largely un-heated, whereas some surface burns may severely affect soils because of extended heating by burning litter and duff. Litter and duff depth, antecedent soil moisture, soil texture, and slope can also affect soil heating. Severity affects hydrophobicity (water repellency) as well as the regrowth of shrubs and grasses dependent on sub-surface sprouting.

High Soil Burn Severity: Deep ground char occurs where the duff is completely consumed and the top of the mineral soil is visibly reddish or orange. Color below 1 cm is darker or charred from organic material. Downed logs are consumed or deeply charred. All shrub stems are consumed. Hydrophobicity can extend up to 5 cm in depth. Lethal temperatures can extend to 10 cm. Infiltration potential can be lessened, and erosion potential can be significantly increased. Roots and rhizomes may be killed and revegetation is delayed.

Moderate Soil Burn Severity: Litter is consumed and the duff is deeply charred. The underlying mineral soil surface is altered only in terms of darkening. Lethal temperatures occur down to depths of 5 cm. Hydrophobicity is limited to the surface 2.5 cm of soil. Roots and rhizomes will resprout within 3 years. Infiltration is reduced and erosion potential may be increased in the short run.

Low Soil Burn Severity: Litter is partially consumed. Soil is normal color. Lethal temperatures occur down to depths of 1 cm. Hydrophobicity occurs to 1 cm. Root crowns and surface roots will resprout quickly (within two years). Infiltration and erosion potential is not significantly changed.

These classes are shown on the map illustrated below. Larger versions of this map are available.


Hidden Lake Fire
BAER Severity Map
Beaverhead-Deerlodge National Forest
August 3, 2003
Clark Creek
F O R E S T
White Creek
Lake Creek
N
W
E
S
1
0.5
0
1
Miles
1:42,240
Scale: 1.5 inches = 1 mile
Fire Perimeter - July 31, 2003
Watersheds
State Lands
Vegetation Burn Severity
High
Moderate
Unburned and Low
This map was prepared by the BAER assessment team on August 2, 2003.
Severity shapefile: Hiddenlakeburnseverityfinal080103.shp.
See specialist reports for further information.

Almost all soil burn severity was rated "moderate" or "low" for this fire (see map and table 2.) There are a few isolated areas of "high" severity, under burned logs or in a few intensely burned areas.

Following are tabular summaries of the results shown on the map.

Table 1. Total Watershed Area

Watershed Name	Area (acres)
Clark Creek	2,907
White Creek	3,651
Lake Creek	4,337

Table 2. Soil and Vegetation Burn Severity Area by Class

		Burn Severity Soil			
Burn Severity Vegetation	Data	low	low to moderate	moderate	Grand Total for Vegetation Burn Severity
high	Sum of Acres			583.4	**583.4**
	Percent of Total	0.00%	0.00%	17.71%	**17.71%**
moderate	Sum of Acres	22.8	188.5	32.2	**243.5**
	Percent of Total	0.69%	5.72%	0.98%	**7.39%**
unburned and low	Sum of Acres	2466.8			**2466.8**
	Percent of Total	74.89%	0.00%	0.00%	**74.89%**
Total Sum of Acres		**2489.6**	**188.5**	**615.6**	**3293.7**
Total Percent of Total		**75.59%**	**5.72%**	**18.69%**	**100.00%**

Table 3. Burn Severity Area by Ownership

			Ownership		
Burn Severity, Soil	Burn Severity, Vegetation	Data	B-D NF	State of Montana	Grand Total
low	moderate	Sum of Acres	22.8		**22.8**
		Percent of Total	0.69%	0.00%	**0.69%**

	unburned and low	Sum of Acres	2345.9	120.8	**2466.7**
		Percent of Total	71.23%	3.67%	**74.90%**
low Sum of Acres			*2368.7*	*120.8*	***2489.5***
low Percent of Total			*71.92%*	*3.67%*	***75.59%***
low to moderate	moderate	Sum of Acres	177.5	11	**188.5**
		Percent of Total	5.39%	0.33%	**5.72%**
low to moderate Sum of Acres			*177.5*	*11*	***188.5***
low to moderate Percent of Total			*5.39%*	*0.33%*	***5.72%***
moderate	high	Sum of Acres	583.3		**583.3**
		Percent of Total	17.71%	0.00%	**17.71%**
	moderate	Sum of Acres	32.2		**32.2**
		Percent of Total	0.98%	0.00%	**0.98%**
moderate Sum of Acres			*615.5*		***615.5***
moderate Percent of Total			*18.69%*	*0.00%*	***18.69%***
Total Sum of Acres			**3161.7**	**131.8**	**3293.5**
Total Percent of Total			**96.00%**	**4.00%**	**100.00%**

Table 4. Soil and Vegetation Burn Severity By Ownership

		Ownership		
Burn Severity, Soil	Data	B-D NF	State of Montana	**Grand Total**
low	Sum of Acres	2368.7	120.8	**2489.5**
	Percent of Total	71.92%	3.67%	**75.59%**
low to moderate	Sum of Acres	177.5	11	**188.5**
	Percent of Total	5.39%	0.33%	**5.72%**
moderate	Sum of Acres	615.5		**615.5**
	Percent of Total	18.69%	0.00%	**18.69%**
Total Sum of Acres		**3161.7**	**131.8**	**3293.5**
Total Percent of Total		**96.00%**	**4.00%**	**100.00%**

		Ownership		
Burn Severity, Vegetation	Data	B-D NF	State of Montana	**Grand Total**
high	Sum of Acres	583.3		**583.3**
	Percent of Total	17.71%	0.00%	**17.71%**

moderate	Sum of Acres	232.5	11	**243.5**
	Percent of Total	7.06%	0.33%	**7.39%**
unburned and low	Sum of Acres	2345.9	120.8	**2466.7**
	Percent of Total	71.23%	3.67%	**74.90%**
Total Sum of Acres		**3161.7**	**131.8**	**3293.5**
Total Percent of Total		**96.00%**	**4.00%**	**100.00%**

Table 5. Burn Severity Area by Watershed

			Watershed Name			
Burn Severity, Soil	Burn Severity, Vegetation	Data	Clark Creek	Lake Creek	White Creek	Grand Total
low	moderate	Sum of Acres			22.8	22.8
		Percent of Total	0.00%	0.00%	0.69%	0.69%
	unburned and low	Sum of Acres	260.5	566.4	1636.1	2463
		Percent of Total	7.92%	17.22%	49.73%	74.87%
low Sum of Acres			*260.5*	*566.4*	*1658.9*	*2485.8*
low Percent of Total			*7.92%*	*17.22%*	*50.43%*	*75.56%*
low to moderate	moderate	Sum of Acres	164.8		23.5	188.3
		Percent of Total	5.01%	0.00%	0.71%	5.72%
low to moderate Sum of Acres			*164.8*		*23.5*	*188.3*
low to moderate Percent of Total			*5.01%*	*0.00%*	*0.71%*	*5.72%*
moderate	high	Sum of Acres	18.3	2.6	562.5	583.4
		Percent of Total	0.56%	0.08%	17.10%	17.73%
	moderate	Sum of Acres	32.2		0	32.2
		Percent of Total	0.98%	0.00%	0.00%	0.98%
moderate Sum of Acres			*50.5*	*2.6*	*562.5*	*615.6*
moderate Percent of Total			*1.54%*	*0.08%*	*17.10%*	*18.71%*

Total Sum of Acres	**475.8**	**569**	**2244.9**	**3289.7**
Total Percent of Total	**14.46%**	**17.30%**	**68.24%**	**100.00%**

Table 6. Burn Severity Area By Watershed

		Watershed Name			
Burn Severity, Soil	Data	Clark Creek	Lake Creek	White Creek	**Grand Total**
low	Sum of Acres	260.5	566.4	1658.9	**2485.8**
	Percent of Total	7.92%	17.22%	50.43%	**75.56%**
low to moderate	Sum of Acres	164.8		23.5	**188.3**
	Percent of Total	5.01%	0.00%	0.71%	**5.72%**
moderate	Sum of Acres	50.5	2.6	562.5	**615.6**
	Percent of Total	1.54%	0.08%	17.10%	**18.71%**
Total Sum of Acres		**475.8**	**569**	**2244.9**	**3289.7**
Total Percent of Total		**14.46%**	**17.30%**	**68.24%**	**100.00%**

		Watershed Name			
Burn Severity, Vegetation	Data	Clark Creek	Lake Creek	White Creek	**Grand Total**
high	Sum of Acres	18.3	2.6	562.5	**583.4**
	Percent of Total	0.56%	0.08%	17.10%	**17.73%**
moderate	Sum of Acres	197		46.3	**243.3**
	Percent of Total	5.99%	0.00%	1.41%	**7.40%**
unburned and low	Sum of Acres	260.5	566.4	1636.1	**2463**

	Percent of Total	7.92%	17.22%	49.73%	**74.87%**
Total Sum of Acres		**475.8**	**569**	**2244.9**	**3289.7**
Total Percent of Total		**14.46%**	**17.30%**	**68.24%**	**100.00%**

Table 6. Burn Severity Area by Watershed and Ownership

		Ownership	Watershed Name						
		B-D NF			B-D NF Total	State of Montana		State of Montana Total	Grand Total
Burn Severity, Vegetation	Data	Clark Creek	Lake Creek	White Creek		Clark Creek	White Creek		
moderate	Sum of Acres			22.8	22.8				**22.8**
	Percent of Total	0.00%	0.00%	0.69%	0.69%	0.00%	0.00%	0.00%	**0.69%**
unburned and low	Sum of Acres	257.8	566.4	1518	2342.2	2.7	118.1	120.8	**2463**
	Percent of Total	7.84%	17.22%	46.14%	71.20%	0.08%	3.59%	3.67%	**74.87%**
		257.8	*566.4*	*1540.8*	*2365*	*2.7*	*118.1*	*120.8*	***2485.8***
		7.84%	*17.22%*	*46.84%*	*71.89%*	*0.08%*	*3.59%*	*3.67%*	***75.56%***
moderate	Sum of Acres	164.8		12.5	177.3		11	11	**188.3**
	Percent of Total	5.01%	0.00%	0.38%	5.39%	0.00%	0.33%	0.33%	**5.72%**
		164.8		*12.5*	*177.3*		*11*	*11*	***188.3***
		5.01%	*0.00%*	*0.38%*	*5.39%*	*0.00%*	*0.33%*	*0.33%*	***5.72%***
high	Sum of Acres	18.3	2.6	562.5	583.4				**583.4**

	Percent of Total	0.56%	0.08%	17.10%	17.73%	0.00%	0.00%	0.00%	**17.73%**
moderate	Sum of Acres	32.2		0	32.2				**32.2**
	Percent of Total	0.98%	0.00%	0.00%	0.98%	0.00%	0.00%	0.00%	**0.98%**
		50.5	*2.6*	*562.5*	*615.6*				***615.6***
		1.54%	*0.08%*	*17.10%*	*18.71%*	*0.00%*	*0.00%*	*0.00%*	***18.71%***
		473.1	**569**	**2115.8**	**3157.9**	**2.7**	**129.1**	**131.8**	**3289.7**
		14.38%	**17.30%**	**64.32%**	**95.99%**	**0.08%**	**3.92%**	**4.01%**	**100.00%**

Landscapes and Soil Erosion

Landscapes in the burned area are primarily steep, weekly glaciated mountain slopes. Stream channels are cut into relatively flat glacial moraines. Some steep glacial moraines occur on lower slopes. Long talus slopes occur on lower slopes.

Vegetation is primarily lodgepole pine forest at moderate elevations and whitebark pine forest on ridgetops and upper slopes.

Soils in the burned area are primarily developed in glacial till and colluvium from granitic rocks. They are extremely rocky and are moderately-coarse textured. Soil erosion potential is moderate in most of the area, but soil erodibility is high.

Soil erosion hazard is estimated by tallying the area in highly erodible soils having no vegetative cover and steep slopes. The area in the "high" vegetation burn severity class approximates exposed soils (583 acres from Table 2.) Steeply sloping land was about 70% of this based on ocular estimate from the air. This gives 408 acres of "high" erosion hazard.

BURNED AREA EMERGENCY REHABILITATION TEAM
Hidden Lake Fire
Vegetation Assessment
Prepared By: Robert L. Wooley
Forest Botanist/Ecologist
Beaverhead-Deerlodge National Forest

I ISSUES

The Hidden lake fire burned in a mosaic pattern over 3293 acres in the Clark Fork, Lake Creek, and White Creek Watersheds.
Most of the burn severity on vegetation was in the low to moderate range with about 583 acres of high severity burn in vegetation. Approximately 18 acres in the White Creek drainage experienced high soil severity.
Noxious weeds occur in proximity of the burn including Canada thistle, *Cirsium arvense*, Musk thistle *Carduus nutans*, Henbane *Hyoscyanum niger*, and Spotted knapweed *Centaureum maculosa*

II AFFECTED ENVIRONMENT

The Hidden Lake Burned area was examined on the ground along the trail leading to Sawtooth Lake up the Clark Creek drainage and by air on July 31 and August 1, 2003. The fire burned mainly in Douglas fir at lower elevations then into lodgepole pine on a predominantly ABLA/VASC CARU phase and an ABLA VASC habitat type.Much of this type is occupied by lodgepole pine stands At upper elevations some whitebark pine stands burned near ridge tops in the White Creek drainage. At lower elevations some Mountain Big Sagebrush/Idaho fescue burned primarily during backfires for suppression efforts. Along the Clark Creek drainage stringers of Engelmann spruce occupy the riparian zone.

Work by Barrett (Barrett 1997) on the fire history of the Pioneer Mountains indicates that lodgepole pine in this area experienced a pre-settlement pattern of mixed severity fires with light to moderate intensity burns occurring at intervals of 25-60 years. These fires thinned but did not produce stand replacement events on most of the lodgepole. About 18 percent of the stands on cooler more moist sites had longer fire intervals of 150-300 years that did produce stand replacement events. About 18 percent of the Pioneer lodgepole was subjected to these stand replacement fires.

Inspection of the burned area revealed a pattern similar to that described by Barrett.For example In the Hidden Lake burn 17.7% of the lodgepole stands were in the high severity class remarkably similar to Barretts finding of 18% being so effected on a given area.
A mosaic of burned and unburned stands with a ratio of approximately 45% burned to 50-55% unburned or lightly burned occurs in the fire perimeter. Most of the area burned in the low to moderate intensity range with incomplete consumption of the duff layer, and few areas where all of the ¼ inch fuel was completely consumed. Residence times of the fire were generally short on the order of 20 minutes. Patches and stringers exist where the crowns of conifers were completely consumed but for the most part even these areas did not experience long residence times or complete consumption of the down woody material

On approximately 18 acres on both sides of White Creek fire intensity was in the high severity for both vegetation and soils.

The soils in the area were tested for water repellency. About two thirds of the samples showed less than ten seconds required for water to be completely absorbed while one third showed water remaining balled for 40 seconds or more. This pattern was similar in both burned and unburned areas of the watershed. Some hydrophobicity appears to be a natural feature of this area. Little rill erosion was noted in the Douglas Fir and Lodgepole pine types following a rain event of ½ inch on Friday night July 25. Minor rill erosion was noted near the ridge tops on North aspects along White Creek in the Whitebark pine zone.

There appears to be a good buffer of live vegetation along most of the riparian zones of the perennial streams except for about 3000 feet along White Creek

Seed from serotinous cones of lodgepole pine has already been released in many of the lodgepole pine types.

This fire appears to be within the historic range of variability for fire disturbance in the Pioneer Mountains. In some of the lodgpole pine stands fire of low intensity passed through the understory without apparent killing of the tree layer. Most of the burn falls in the low to moderate intensity range with only small patches less than five percent showing evidence such as heavy white ash, red ash or complete consumption of the ¾ inch and larger woody material.

Inspection of the highway roadside leading to the fire along Grasshopper Creek revealed the presence of 4 noxious weeds. Canada Thistle *Cirsium arvense*, Musk thistle *Carduus nutans* Henbane *Hyoscyamus niger* and Spotted knapweed *Centauria* maculosa were noted in spoty patches Some of these weeds notably Canada thistle have the potential seed sources to move into the riparian zones where the fire did advance along White Creek and Clark Creek. Houndstongue *Cynglossum officional* is rapidly invading the Beaverhead-Deerlodge National Forest and not all populations have been mapped.

III EFFECTS

The burn appears to be within the range of historic variability for fire in the Pioneer Mountains. In areas of high intensity particularly along a 3000 foot stretch White Creek and in a few places along Clark Creek the burn is likely to have suppressed the native vegetation and its recovery such that windborne seed from Canada thistle, Musk thistle and Spotted knapweed from existing populations will have a competitive advantage in establishment of invasive populations.

IV DETERMINATIONS

In the forested areas the seed release from lodgepole pine will most likely reforest the sites rapidly.

Populations of noxious weeds with windborne seed are located within the seed dispersal range of the burned sites with conditions along the riparian corridor of White Creek and Clark Creek at the highest risk. In addition houndstongue Cynnglossum officionale is rapidly colonizing areas on the Beaverhead-deerlodge and could be introduced via domestic livestock wild ungulates, or human visitors especially in the Clark Creek drainage that has a much used trail passing through the burned area. Houndstongue, Canada thistle, and Musk thistle and Spotted knapweed are all known to establish and quickly spread on disturbed sites.

V RECOMMENDATIONS

Monitoring for the incursion of noxious weeds during the recovery period for the native vegetation is recommended. The area is currently not heavily infested with noxious weeds. Prevention of the establishment of new populations in areas not already infested is a primary objective of the Beaverhead-Deerlodge Noxious weed control strategy The Beaverhead-Deerlodge National Forest has a Noxious Weed Control Program in effect per the May 2002 FEIS and ROD Treatment of noxious weeds that invade the burn area can be suppressed under the Noxious weed EIS.

VI LITERATURE CITED

Barrett, Stephen W. 1997, Historical Fire Regimes on the Beaverhead-Deerlodge National Forest, Montana, Beaverhead Portion Final report Contract # 43-0356-6-010726p.
Final Environmental Impact Statement and Record of Decision Beaverhead-Deerlodge National Forest Noxious Weed Control May 28, 2002

Monitoring Strategy and Estimated Cost

Monitoring will involve inspections along the burned areas of White Creek and Clark Creek beginning with the 2004 growing season. Any populations of noxious weeds will be mapped in GIS. Small startups(1-25 plants) will be hand pulled at the time of discovery. Follow-up monitoring in 2005 will occur as these growing seasons are the most likely time noxious weeds will be in evidence.

Estimated Weed monitoring Cost

2004	1 GS-5 Seasonal 4days 1 GS 3 Seasonal 4 days I Pickup	150/day 111/day .22/mile * 400 miles	$620.00 $444.00 $100.00
2005	1 GS-5 Seasonal 4days 1 GS 3 Seasonal 4 days	150/day 111/day .22/mile*	620.00 $444.00 $100.00

	I Pickup	400 miles	
		Total Cost	$2328.00

* mileage and FOR

Aquatic Assessment/Recommendations – Hidden Lake Fire
Burned Area Emergency Response
Steven J. Gerdes, Fisheries Biologist
2 August, 2003

Aquatic Resource Values

Chris Riley, Zone Fisheries Biologist, prepared background information on fish species composition from data contained in Dillon Ranger District files.

Westslope cutthroat trout (WCT) is the fisheries resource value of concern with the Hidden Lake fire. WCT are native to the streams in the upper Missouri River basin, including streams within the fire area. They are designated a Region 1 "Sensitive Species". Sensitive species are those species for which viability is a concern. WCT have also been petitioned for listing as a threatened species under the Endangered Species Act.

The Hidden Lake Fire occurred in the Clark, White and Lake creek drainages, tributaries of Grasshopper Creek in the Middle Grasshopper Creek sub-watershed. Based on predicted fire behavior, fire suppression activities also occurred in the Dingley Creek drainage, to the north of Clark Creek.

None of the streams within the fire perimeter support known recreational fisheries. Grasshopper Creek, in the vicinity of the fire is listed in the Montana Fisheries Information System as having "limited" sport fisheries value.

Dingley Creek
Electrofishing results in Dingley Creek, surveyed in 1989 above and below the culvert on FS Road 7441 indicate the WCT population is fairly small with limited habitat; no brook trout were caught during this survey. Given the lack of brook trout in this system, it should be given a high priority for protection throughout the drainage. An analysis of WCT from Dingley Creek tentatively indicates fish from this population are genetically pure.

Clark Creek
Electrofishing results in Clark Creek, sampled in 1989 300 feet upstream of the second trail crossing (just upstream of Hidden Lake) indicate a very small population of WCT, rainbow trout (RBT), and WCTxRBT hybrids – all based on visual interpretation on site – along with a small number of non-native golden trout (also likely hybridized with RBT). Golden trout evidently were planted in both Hidden and Sawtooth Lakes in the past. No information describing molecular genetic analyses is available. The B-D NF Lake inventory lists Hidden Lake as supporting EBT along with the species listed above.

White Creek
Electrofishing results in White Creek, sampled in 1989 in Section 10 indicate a small brook trout population in the NW quarter. WCT individuals were observed visually upstream of the electrofishing reach. A 2002 sample in Section 9, SW ¼, yielded only a very few EBT.

I walked approximately 2.5 miles of White Creek, from the private land boundary in Section 9, upstream to approximately the eastern edge of the west half, Section 11, on August 2, 2003. I observed no fish at all. A series of high gradient cascades, in the NW1/4 of Section 10 most likely excludes fish passage to the stream above. I walked the stream edge in an attempt to determine fish

presence above the cascades and observed no fish. I am fairly comfortable that White Creek does not support a population of WCT.

I. Lake Creek

Electrofishing results in Lake Creek, sampled in 1989 in Sections 22 and 15 of the southern braid indicate a small brook trout population. WCT individuals were observed visually upstream of the electrofishing reach. Polaris Lake, at the headwaters of Lake Creek has historically been planted with "cutthroat trout" – most likely Yellowstone cutthroats, greatly increasing the likelihood that any cutthroat trout in Lake Creek are hybridized.

Effects of the Fire

Acreage values referenced in the following evaluation were obtained from tables generated by a GIS based on visual mapping of the fire conducted on 31 July 2003 by members of the BAER team.

The Hidden Lake Fire perimeter encompassed about 3,293 acres in the Clark, White, and Lake creek drainages in the Middle Grasshopper Creek 6th field sub-watershed. Of the entire area within the fire perimeter, approximately 25% burned with moderate-high vegetation severity. The potentially greatest impact to aquatic resources occurred in the White Creek drainage, where 62% of the drainage burned, of which 50% consisted of high vegetation severity burn.

I focused my assessment of potential fire effects to aquatic resources from the Hidden Lake fire to White Creek based on the amount and location of area burned. I walked most of the length of White Creek on 2 August, 2003. The portion of White Creek on State (east ½ Section 9) land burned lightly. Only 5-10% of the stream length was burned, and this was very light. About 400 meters in the NW1/4 of Section 10 burned with moderate-high vegetation severity on both banks although the upslope extent of the burn is generally limited, reducing the potential for a large magnitude event. The next ½ mile of stream is relatively unburned. While the fire did, in places, burn to the stream edge, it mostly stayed out of the inner gorge, leaving a 30-100' wide buffer of herbaceous vegetation. The lower gradient portion of White Creek in the west half of Section 11 burned very hot. There's about 1/2-3/4 mile of stream with virtually no herbaceous vegetation buffer remaining along the stream margin to filter sediment or nutrients. Most (~75%) of the length of this stream segment still has some duff remaining, but portions burned hot enough to destroy this layer and cook the soil. The bottom line: there may be localized impacts to the channel, but these impacts will not affect any occupied westslope cutthroat trout habitat.

Approximately 16% of the Clark Creek drainage burned in the Hidden Lake fire. Less than 1% of the burned area consisted of high severity (vegetation) burn. Only small areas of riparian vegetation burned, leaving unburned buffers to filter sediment and nutrients before they enter the stream. Fisheries resource values will be unimpacted in the Clark Creek drainage as a result of the fire.

The Hidden Lake fire burned about 476 acres (13%) in the Lake Creek drainage. Only 4% of the burned portion of the drainage consisted of high severity vegetation burn. The entire area burned lies on upper slope locations. The fire will have no impact on fisheries resource values in Lake Creek.

The fire did not burn into the Dingley Creek drainage, although containment line was constructed. The fire line was rehabilitated as part of the fire suppression activities. Fisheries resource values were unaffected by the Hidden Lake fire.

Grasshopper Creek is the receiving water for all streams inside the burn. Grasshopper Creek supports populations of introduced rainbow, brown and eastern brook trout downstream of the tributary steams within the fire perimeter. The Hidden Lake fire is unlikely to affect the recreational fishery in Grasshopper Creek.

Fisheries Recommendations

Given the size, location and severity of the Hidden Lake fire relative to critical fisheries resource values, I recommend no treatments in the burned area.

Burned Area Emergency Response
Hidden Lake Fire

Watershed/Hydrology/Stream Assessment

Jennifer A.S. Hickenbottom, B-D NF Hydrologist
Mark Story, Gallatin NF Hydrologist

August 3, 2003

I. OBJECTIVES

- Assess overall potential watershed changes from the fire, particularly changes to stream channels and those that pose threats to human life, property, water quality, and loss of water control.
- Evaluate sedimentation, hydrophobicity, and mass wasting for each watershed.
- Assess potential downstream effects of burned areas.
- Identify future assessment and monitoring needs.

II. ISSUES

- Increased potential for storm runoff and flooding, especially downstream of areas with high burn severity.
- Threat of erosion and mass wasting.
- Threats to water quality and TMDLs, particularly from sedimentation.
- Increased flooding.

III. OBSERVATIONS

A. Background

The Hidden Lake Fire burned primarily in 3 sub watersheds, Clark Creek, White Creek, and Lake Creek. The fire perimeter was approximately 3293 acres as of July 31, 2003, and includes the burned and unburned areas within the perimeter of the fire. The fire burned within the Beaverhead-Deerlodge National Forest, Dillon Ranger District. Streams within the analysis area include:

--Clark Creek and tributaries
--White Creek and tributaries
--Lake Creek and tributaries

B. Reconnaissance Methodology

An aerial reconnaissance flight and field review was used to evaluate watershed effects in the Hidden Lake analysis area. The fire was evaluated by 6th level watersheds and sub-watersheds.

Clark Creek

Clark Creek Watershed (2907 acres) had 14.5 % burned, with 0.56 % high severity. 5.99%, moderate severity and 7.92% with low/unburned severity.

Ground review of the stream channels indicated very low impact due to the fire. Channels are predominantly "B" stream types. Large woody debris was present with an increase in some areas; the floodplain was intact and connected to the channels, and riparian plant, mortality was low and should return with some vigor in a couple of years. Burn conditions on the slopes, with the size of buffer zones from the high severity burned areas, were not enough to suggest a soils erosion emergency. No rilling was observed even though there had been a significant precipitation event the previous evening. Hydrophobicity conditions within this watershed appeared to be low to moderate, with evidence of natural hydrophobic conditions. No increase in mass wasting is expected. Burn severity along the stream is low. There is some increase in sand within the channel.

Clark Creek. Notice the vegetation along the banks, the LWD along the stream, and the presence of bank protection and minimal bank and near bank damage. The first picture also shows the amount of sand that is present in the stream at this particular crossing.

Water Quality Project Impacts: Ash and a short-term severe turbidity pulse would be expected to occur during the first significant precipitation event causing high stream flows from Clark Creek. Sedimentation of the channel is not expected to be significant.

Clark Creek Summary: No emergency conditions were found. No treatments will be recommended for fluvial or sedimentation impacts.

White Creek

The White Creek watershed (3651 acres) had 68.24 % of its area burned, with only 17.1 % of high severity. 1.41% of the drainage burned with moderate severity and 49.7% with low/unburned severity.

Only a small portion of the stream length was burned. About 5-10% of White Creek on State of Montana land was burned with low severity. About 400 meters was burned with moderate to high severity. The fire in places, burned to the stream edge, mostly out of the inner gorge, leaving a wide buffer of vegetation About 0.5 to 0.75 mile of White creek burned extremely hot with no vegetation left along the stream. This small section was judged to be too limited to severely impact resources of concern.

White Creek. These pictures show the high severity burn along the creek. Notice the vegetation burned away up to the edge of the creek. Also notice the high severity burn does not go to the entire slope fo the steep draw.

Water Quality Project Impacts: Ash primarily and a short-term severe turbidity pulse would occur during the first significant precipitation event causing high stream flows from White Creek. Sedimentation of the channel is not expected to be significant.

White Creek Summary: No emergency conditions were found; no emergency is anticipated from the burn severity and soil conditions. No treatments will be recommended for fluvial or sedimentation impacts.

Lake Creek

Lake Creek Watershed (4337 acres) was 17.3 % area burned, with 0.08% of high severity. None of the drainage burned with moderate severity and 17.22% with low/unburned severity.

The entire area burned lies on upper slope locations. There was minimal amount of high severity burned area, and zero amount of moderate severity burned areas. Most of this drainage burned with low to unburned severity.

Low severity burn in Lake Creek

Water Quality Project Impacts: Ash primarily and a short-term severe turbidity pulse would occur during the first significant precipitation event causing high stream flows from Lake Creek. Sedimentation of the channel is not expected to be significant.

Lake Creek Summary: No emergency conditions were found; no emergency is anticipated from the burn severity and soil conditions. No treatments will be recommended for fluvial or sedimentation impacts.

C. Findings

Burn Severity by Drainage—Hidden Lake BAER Area

		Burn Severity						
		High		Moderate		Low/Unburned		Burned
Drainage	Total Acres	Acres	% of drainage	Acres	% of drainage	Acres	% of drainage	% of drainage
Clark Creek	2907	18.3	0.56	197	5.99	260.5	7.92	14.46
White Creek	3651	562.5	17.10	46.3	1.41	1636.1	49.7	68.24
Lake Creek	4337	2.6	0.08	0.0	0.0	566.4	17.22	17.3
TOTALS		583.4	17.73	243.3	7.4	2463	74.87	

Potential sediment effects from the Hidden Lake fire were evaluated using the R1R4 sediment model (Cline, 1981) and adjusting sediment coefficient based on existing road and burn conditions.

Gallatin National Forest Sediment standards (for comparison to the Beaverhead) include:

Category	Management Objectives	% Fines	Annual % over Natural	20 year % Cumulative Sediment
A. Sensitive Species and/or Blue Ribbon Fisheries	90%	21-24%	30%	300%
B.Regionally/locally significant fisheries	75%	25-27%	50%	500%
C. Viability Consideration	60%	28-30%	60%	600%
D.Non-fishery, maintain channel integrity	--	--	100%	1000%

Clark, White, and Lake Creek have book trout and would be considered viability consideration streams. The annual % over natural is the amount the sediment in the watershed at the accounting point (Forest boundary). Natural (baseline) is the amount of average annual sediment which would be produced in the absence of any man caused disturbances (primarily roads and timber harvest). The sediment model was run in a cumulative mode factoring in existing roads and burn areas.

Clark Creek (Category C)

	Natural sediment	Timber sediment	Road sediment	Fire sediment	Total sediment	% over natural sediment
Year	tons/year	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr
2002	67.5	0	7.2	0	74.7	14
2003	67.5	0	7.2	1.17	75.8	16
2004	67.5	0	7.2	0.27	75.0	14
2005	67.5	0	7.2	0.04	74.7	14
2006	67.5	0	7.2	0	74.7	14

White Creek (Category C)

	Natural sediment	Timber sediment	Road sediment	Fire sediment	Total sediment	% over natural sediment
Year	tons/year	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr
2002	62.7	0	0.6	0	63.3	1
2003	62.7	0	0.6	34	97.3	55
2004	62.7	0	0.6	7.4	70.7	13
2005	62.7	0	0.6	1.54	64.8	3
2006	62.7	0	0.6	0.28	63.6	1

Lake Creek (Category C)

	Natural sediment	Timber sediment	Road sediment	Fire sediment	Total sediment	% over natural sediment
Year	tons/year	tons/yr	tons/yr	tons/yr	tons/yr	tons/yr
2002	72.1	0	3.4	0	72.1	3

2003	72.1	0	72.1	0.14	72.2	4
2004	72.1	0	72.1	0	72.1	3
2005	72.1	0	72.1	0	72.1	3
2006	72.1	0	72.1	0	72.1	3

Sediment effects of the Hidden Lake fire are fairly limited. For Clark and Lake Creeks, modeled sediment increases are 2% and 1% over natural respectively. These levels are below measurable change and are not significant. White Creek, which as the majority of the high burn intensity area has a modeled increase from a pre-fire of 1% over natural to a post fire of 55% over natural. Projected White Creek sediment declines to 13% over natural the 2nd year and to pre-fire levels within 4 years. The projected increase would comply with the Gallatin NF sediment standards of 60% over natural for a Category C stream. The sediment increase in White Creek could place minor stress on the resident fish during the stormflow periods within 1 year after the fire but would be well within the natural range of sediment levels the brook trout have adapted to.

The WILDCAT 4 Model was used based on the SCS RCN Method, using triangular unit hydrographs as outlined in the SCS National Engineering Handbook, Chapter 2, Estimating Runoff. This model was developed by Pete Hawkins of the Watershed Management Department of the University of Arizona. A CN number or 58 was assumed for Lodgepole Pine. The CN for High intensity burn was assumed to be 90 and the CN for moderate burn intensity was assumed to be 70. A 25 year, 1-hour storm with 0.9 inches of precipitation was run on White creek with a peak Q of 59 cfs. A NRCS excel spreadsheet was used to evaluate longer duration storms of 2, 5, and 10 year events based on 6 and 24 hour storms with a peak flow of 25 cfs.

IV. RECOMMENDATIONS

Potential flooding from the Hidden Lake fire is low. Snowmelt runoff increases are expected to be minimal which is typical for Montana fires – even with a higher percentage of high burn severity. Due to the low potential of flooding or sediment increases in Clark Creek, White Creek, and Lake Creek no sediment control or runoff treatments were identified. Though the fire will accelerate natural and accelerated erosion processes, it is not enough to economically or ecologically justify any treatment recommendations. There are no other resources that will be severely impacted by the hydrologic responses of the fire.

Grasshopper Creek is currently on the TMDL 303(d) stream list. Grasshopper Creek is listed due to flow alteration, metals, siltation, and other habitat alteration. The watershed area is not scheduled to be completed for TMDL analysis until 2006. Although Clark, White, and Lake Creeks flow into Grasshopper Creek, the increased sediment and runoff effects will be minimal in these streams, with minimal anticipated impacts to Grasshopper Creek. Given the size, location, and severity of the Hidden Lake Fire relative to critical resource values, and the fact that Grasshopper Creek (303(d)) itself is not in the burned area, no recommended watershed treatments occur in the burned area.

Literature Cited:

Cline R., Cole, G., Megahan, W., Patten, R., and J. Potyondy, 1981. Guide for Predicting Sediment Yields from Forested Watersheds. USFS/USDA, Region 1 and Region 4, Missoula, Montana.

Miller, J.F.; Frederick, R.H.; and Tracey, R.J. 1973. Precipitation-Frequency Atlas of the Western United States. NOAA Atlas 2, Volume 1—Montana. US Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service; Silver Springs, Maryland.

National Resources Conservation Service. Engineering Field Manual, Chapter 2: Estimating Runoff.

Hidden Lake Fire BAER Team Costs
(estimate)

H19999 **Override xx xx**

						tour		Total Itemized Cost			
Team Member	Skill	Begin Date	14-day Date	Regular Rate	OT Rate	01	21	Salary	Motel/PD	Other	Grand Total
Shovic, H.	Team Leader	7/30/2003	8/12/2003	$40.00	$60.00	$800.00	$1,200.00	$2,000.00	$300.00	$0.00	$2,300.00
Wolley, R.	Ecologist/Noxious	7/30/2003	8/12/2003	$37.00	$55.50	$740.00	$1,110.00	$1,850.00			$1,850.00
Hickenbottom, J.	Hydrologist	7/30/2003	8/12/2003	$34.00	$51.00	$408.00	$510.00	$918.00			$918.00
Story, M.	Hydrologist	8/3/2003	8/16/2003	$42.00	$63.00	$84.00	$630.00	$714.00			$714.00
Gerdes, S.	Fish Biology	7/30/2003	8/12/2003	$35.00	$52.50	$700.00	$630.00	$1,330.00			$1,330.00
McKnight, H.	GIS	8/2/2003	8/15/2003	$35.00	$52.50	$0.00	$735.00	$735.00			$735.00
	other		1/13/1900		$0.00	$0.00	$0.00	$0.00			$0.00
	other		1/13/1900		$0.00	$0.00	$0.00	$0.00			$0.00
	other		1/13/1900		$0.00	$0.00	$0.00	$0.00			$0.00
	other		1/13/1900		$0.00	$0.00	$0.00	$0.00			$0.00
Strahm											
Totals				$223.00	$334.50	$2,732.00	$4,815.00	$7,547.00	$300.00	$0.00	$7,847.00

TOTAL $8,397.00