Independent Prescribed Fire
Camas NWR

Escaped Prescribed
Fire Review

Final Report - 5/28/2009

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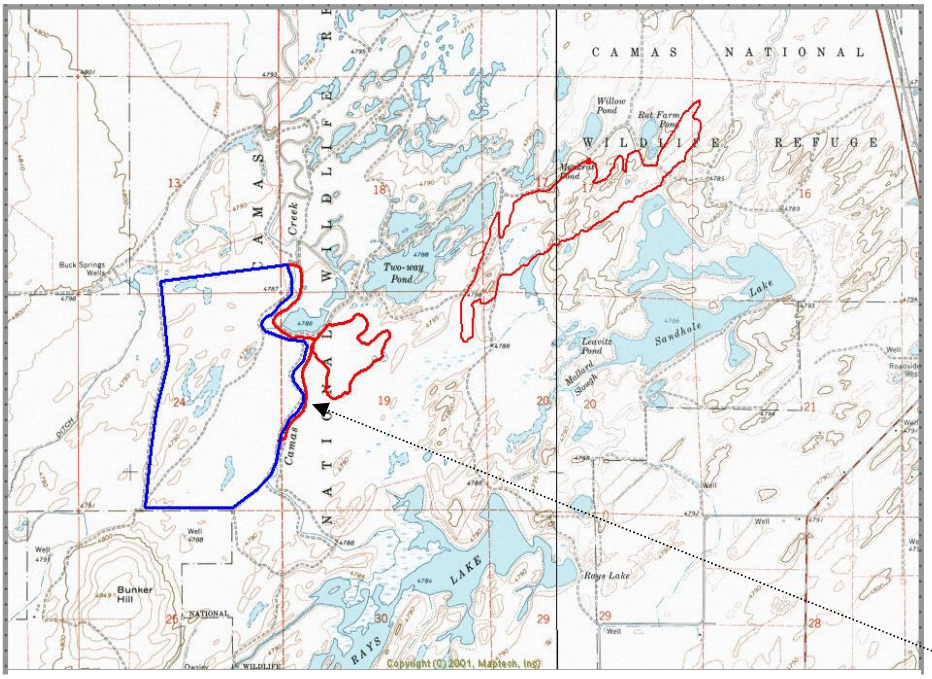
Quick view

- Where: Camas National Wildlife Refuge, 40 miles north of Idaho Falls Idaho
- Prescribed Burn name: Independent
- When: April 20th 2009
- Description: A 410 acre grass prescribed fire unit had an escape area of 55 acres
- Ownership: all National Wildlife Refuge managed lands
- Mechanics of escape: The fire spread outside of a holding line into a patch of willows
- Reason for escape declaration: The prescribed burn was declared an escape because it was outside of the unit boundary and it was anticipated that it would not be contained with planned resources

Introduction

This is the second escaped prescribed fire review conducted on this refuge in three weeks. The previous review was conducted on the Mallard Slough prescribed fire when slash piles initially surrounded by snow, escaped and burned 172 acres eight days after the fire was ignited.

This prescribed fire escape (Independent) occurred one month later, less than one mile southwest while broadcast burning light to moderate grass.



The map above illustrates two separate prescribed burns. The Mallard Slough Rx is on the right and the Independent Rx is on the left. Red boundary is the escape area and the Blue boundary is the prescribed fire unit boundary

Ignition on the east flank at approximately 1400

Summary Narrative

The Independent prescribed fire was ignited on April 20th 2009 on the Camas National Wildlife Refuge (NWR) in southeast Idaho. The objective of the prescribed fire was to consume 95 – 100% of the grass in the Unit to reduce hazard fuels and create favorable wildlife habitat conditions.

Prior to morning briefing 4/20/09

- Prescribed Burn Unit Size – 410 acres – escape fire size 55 acres – all on Refuge managed land
- The unit is surrounded by roads on the west and south sides, a dry creek channel on the east side and a mow line to the north
- The unit rated at Moderate complexity and 20 people implemented the burn
- Two type 6 engines, one type 3 engine, Utility Terrain Vehicle (UTV) with 60 gallon spray tank, one 4-wheeler, one 1800 gal agricultural tank on a trailer, two filled 1200 gallon pumpkins, a tractor with disk and a type 3 dozer were on the unit

The fire escaped from the burn unit on the east flank apparently due to the fire "creeping through" the mow line after approximately 30 minutes. That was when apparently the foam/wet line had dried out enough to allow the fuels to burn.

Ignition near the foam/mow line on the east side of the unit. Approximately 1400

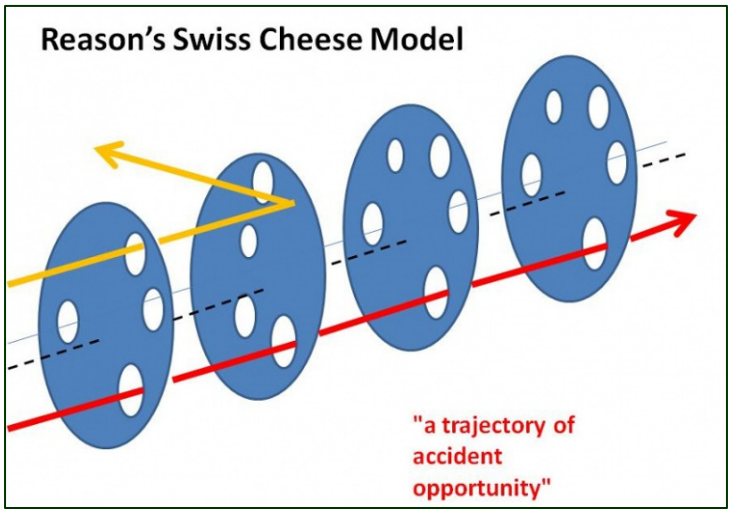
Scope of review

Since the two escapes occurred on the same Refuge, conducted by the same burn boss, this review will consider elements of both escapes to consider systemic elements.

Initially, the Independent will be analyzed looking for small failures that could have contributed to the escape. We will identify how these elements may have combined to create a situation where the fire could escape.

Review team on-site were the fire crossed out of the unit

Method



We will be using the standard seven elements required by the Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide.
The causes of escaped prescribed fires are never simple. We often oversimplify events to try to identify a single cause.

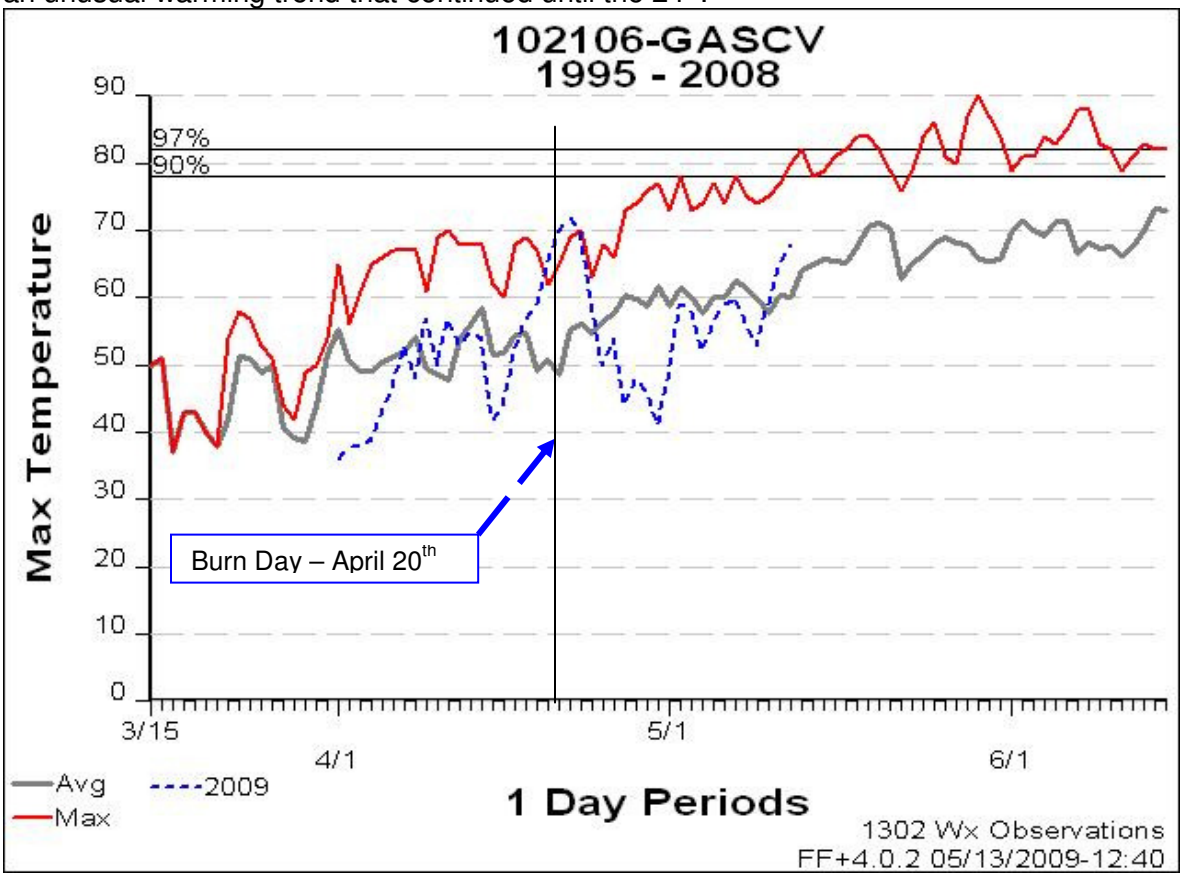
In this review, we are going to use an adaption of the James Reason model (1990) commonly named the Swiss Cheese model to consider the events leading up to the escape.
This model is readily understood by the fire community and allows for a more complex assessment of an unintended outcome (i.e. escaped prescribed fire).
Our approach is to identify the small "holes" that contributed to escape and to identify how certain holes may become larger because of their interaction with other events.

Primary Findings

Required review elements

1. An analysis of seasonal severity, weather events, and on-site conditions leading up to the wildfire declaration.

   Information taken from the Gas Caves RAWS station (30 miles NE) indicate normal seasonal trends up to about a week before the burn date. On about April 15th there was an unusual warming trend that continued until the 24th.



2. Analysis of actions taken leading up to the wildfire declaration for consistency with the Prescribed Fire Plan.

   Actions taken were consistent with the burn plan. Examples of the burn plan elements are below.

   Description of Unique Features
   In the plan it was identified that the east side of the unit had brush and willows that they wanted to keep the fire out of. The unit boundary line would be mowed and lined with foam prior to ignition.

   Organization and Equipment

   Minimum required personnel were listed as: 1 Burn Boss (RXB2), 2 Lighters (FFT1), 4 Holders (FFT2), and 3 engine Bosses (ENGB).

Minimum equipment was listed as: 4 drip torches, 2 type 6 engines, 1 type 3 engine, 1 ranger UTV w/60 gal water tank, 1 ATV, 1 portable pump + kit, 1 1,800 gallon water tender, 15 gallons of drip torch fuel, 2 five gallon cans of unleaded fuel.

Narrative of Ignition Assignment

Burn Plan: "The second lighter will start igniting south on the east flank. The type 3 engine will be used to lay down a wet line or foam line in the mowed grass to keep fire out of the willows bordering the creek channel. The lighter will ignite a narrow strip next to the wet/foam line; multiple passes may be needed to widen black to 50 feet. A type 6 engine will follow the lighter to extinguish the edge if needed."

Holding Plan
General Procedures Narrative for Prescribed Fire Holding

Burn Plan: "The holding forces will consist of two person crews in the type 3 and both type 6 engines, and one person patrolling in the ATV Ranger (seven personnel total). Unit control lines will be two-track road on the south and west boundary; mow line/black line on the north; wet line and creek channel on the east flank. The type 3 engine will be used to lay a wet/foam line on the east flank to keep fire away from the willows that border the creek channel. The creek channel will be the secondary control point on the east flank. A type 6 engine will follow each lighter to monitor the line; the east flank engine may need to extinguish the fire edge in the thick grass."

Section Summary
Based on the burn plan and the narrative of events, it would appear that the burn boss was following the established plan and was consistent with the elements identified in the plan up to the point of escape. The fire escaped from the burn unit on the east flank due to the fire "creeping through" the mow line after the foam/wet line had evaporated. The plan called for a patrol of the line by holding personnel.

The identified failure occurred due to the lack of training and experience of the assigned individual and the shortage of a qualified ATV operator.

The patrol personnel was driving in a pickup truck and may not have been able to observe the smoldering–creeping fire as it worked its way through the mow line. Had the patrol personnel been on the ATV they might have been better able to monitor the fire edge and may have noticed the smoldering-creeping fire

3. An analysis of the prescribed fire burn plan for consistency with policy:

The plan is consistent with July 2008 Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide. The requirements for contingency resources as described in the guide may have lead to some confusion by burn plan authors. While the contingency section of the template requires a "response time" for resources, policy does not describe the need for identifying if all resources must be on site or if they just need to be available in the response time indicated. Many local templates have a check box to indicate if that resource is unavailable.

That ends with the question:
If a contingency resource is checked as unavailable should that require a new approval by the authorizing official?

The review team determined that in most cases – **yes**, a new approval is required. Unless the burn plan identifies the resource as *not required for implementation.*

4. An analysis of the prescribed fire prescription and associated environmental parameters:

The prescription was adequate and was consistent with the fuels present. The adjacent fuels were described appropriately.

5. A review of the approving line officer's qualifications, experience and involvement including adequate program oversight:

The Line Officer that approved the prescribed fire burn plan had the appropriate training and qualifications for the complexity of the prescribed fire. The local Refuge Manager that was on-site had limited experience over seeing a fire program, although he had experience implementing prescribed burns.

6. A review of the qualifications and experience of key personnel involved:

Implementation of the prescribed burn was conducted by 20 individuals with appropriate experience and qualifications.

- The Burn Boss was a Prescribed Fire Burn Boss II (RXB2) with over 30 years of prescribed fire application.
- The Safety Officer (SOF2) is a Complex Burn Boss (RXB1) and Fire Behavior Analysts (FBAN).
- The Firing Boss is qualified as Firing Boss and Long Term Analyst (LTAN)
- 4 single resource bosses (ENGB)
- The 13 other personnel were Fire Fighter Type 2 (FFT2)

Photo taken at approximately 1430, along the Southern boundary of the Unit.

7. A summary of causal agents contributing to the wildfire declaration:

The lack of experienced post ignition line patrol lead to this prescribed fire escape.

Beyond the basic review elements

Using James Reasons model - What were the "holes in the Swiss cheese"?

The review team and prescribed fire participants discussed events prior to and during implementation, focusing on what did not go as planned and how that may have affected the escape. The team focused on the detail of the planning and implementation – they resisted jumping to any individual cause. They, in effect, dissected the events that allowed for the opportunity for the fire to escape. The following is what the team determined to be some the '"holes".

A. The all terrain vehicle **(ATV) drip torch** on scene the day of the burn was malfunctioning and could not be used because it was unsafe.

B. Another usable ATV was on scene but there were **no other qualified operators**. This eliminated an option for patrol of the lines.

C. There were no consistent **weather observations** during the burn and that lead to not realizing that the RH had dropped to near the limit of the prescription and may have contributed to the spotting or escape that afternoon at 1500. Later in the afternoon several individuals noticed increased fire activity with active burning near the foam line well after normal flaming had extinguished. Additionally, areas of sparse vegetation that had not burned or burned minimally during ignition were re-burning. (~ 1400).

D. This was the first attempt at a **"big" burn** (4x the usual acreage) at Camas NWR.

E. At the critical point of the burn the **type 3 engine** had run out of water and had to refill and at that point the fire left the lines. All of the water storage was on the opposite side of the burn and it took the engine a long time to refill due to the design of the fill intake.

F. Several key individuals had **collateral duties** or additional task during the burn. The holding boss was also an engine boss. This created a situation where the burn boss was in effect also acting as the holding boss.

G. There was not a **dedicated holding boss** and no unified holding or patrol plan. The holding forces that were patrolling were also inexperienced in this critical task.

H. The **contingency resources** were on scene and one was not available as listed in the burn plan.

I. There was a **lack of local staffing** (Engine Captain) leading up to the day of the burn due to a vacancy that caused a delay in the scheduling of the burn. This person was a critical part of the burn preparations.

J. The **delay in scheduling** of the burn into April allowed the weather to be a major contributor to the fire behavior as there was almost two additional hours of burning period in April versus March when this operation is normally done.

K. There was **lack of clear objectives** in the burn plan regarding the willows and sagebrush. Operationally some time was spent protecting them when they could have burned them and this did slow down operations and distract resources at the critical time of escape.

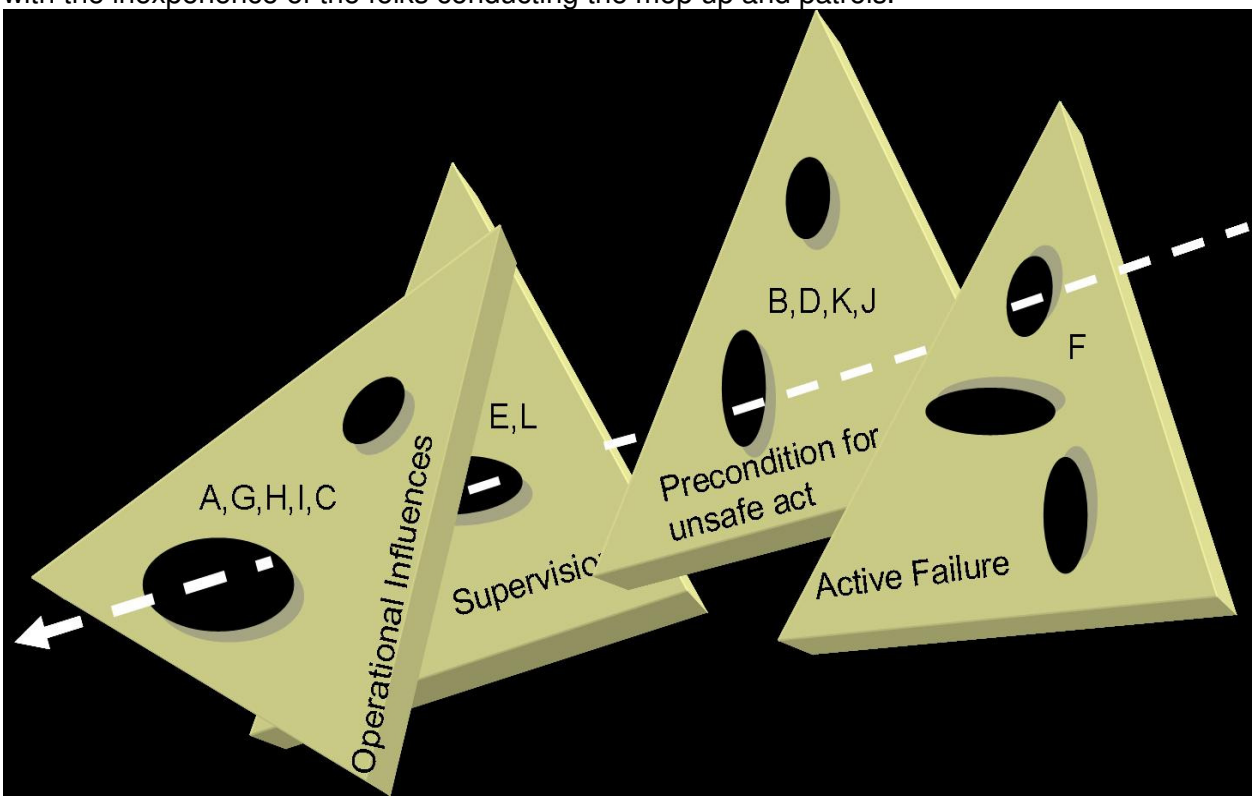
L. The Refuge Manger was new to his position and had **limited experience overseeing** a fire program.

Grouping of elements

Elements do not always fit into clear categories and some may exist in more then one category.

- For this analysis we grouped elements ***A,G,H,I,C*** under **Operational Influences**. These items are pretty large scale and can only be addressed by the larger group versus other items that can be handled with in our organizations.
- The next slice is **Supervision** and we put item ***E and L***.
- The next slice is **Preconditions** for unsafe acts and we grouped items ***B,D,K,J*** in this slice.
- The last item was the unsafe act or **Active Failure** item ***F*** fits best under that label.

When the escape occurred and the prescribed fire left the Independence unit the attached illustration shows us how all of the "holes" lined up and contributed to the event. On a similar note these same conditions aligned for the Mallard Slough prescribed fire and the last error to line all the holes up was the mop up procedures and standards that were not in place coupled with the inexperience of the folks conducting the mop up and patrols.



Holes

A: ATV Drip Torch	**C**: Weather Observations	**E**: Type 3 Engine	**G**: No dedicated Holding Boss	**I**: Lack of local Staffing	**K**: Lack of Clear objectives
B: No Qualified Operators	**D**: "Big" Burn	**F**: Collateral Duties	**H**: Contingency resources	**J**: Delay in scheduling	**L:** Limited experience in oversight

How could these holes have created the opportunity for the escape?

The broken **ATV drip torch** created a situation where it would take longer than anticipated to light the interior of the unit. Everyone was briefed that the wind would come up in the afternoon and they wanted to complete ignition before the wind materialized.

Only one person was able to ride the ATV, because there were **no other qualified operators**. This did two things: first no one was available to help light the interior (which made it take longer – see ATV drip torch above), but potentially more importantly, no one with experience was available to patrol the miles of perimeter after ignition.

This was the largest burn unit that had been conducted on the Refuge. The "**big**" burn nature highlights the potential lack of situational awareness on the type and capability of resources need to manage a perimeter of that length. People on foot or in a truck could have patrolled most of the units in the past; here they needed additional people on ATV / UTVs.

The long-term engine Captain left the complex for a new position prior to the burn. The **lack of local staffing** created more workload on the burn boss who had to work on odds and ends. The engine Captain was also qualified as an ATV operator and could have ridden the ATV patrolling the perimeter.

The **type 3** engine was staffed by a qualified engine boss and was the only "heavy" engine on the unit. It spent the majority of time putting down the foam line that was used to burn off of. The ability for larger amounts of water was provided by the trailer and pumpkins on site but there was no one identified to pull the trailer.

Common elements with the two prescribed fire escapes

A common attribute between the two escapes is that the limited depth of experience/qualified fire personnel on the complex. Although the local Fire Management Officer (and Burn Boss), did an outstanding job of setting things up for a successful prescribed burn, the lack of a experienced organization caused the "holes" to line up.

- The fact that **no one with experience** was available to check the Mallard prescribed fire piles was a key factor in that escape
- The fact the **no one with experience** was available to check the line post ignition on the Independent prescribed burn was a key element in that escape
- The fact that local agency administer had **limited experience overseeing** a fire management program created a situation were potentially some important questions were left unasked.

Recommendations

Small changes of the current Southeast Idaho fire organization could provide a broader experience base to implement a hazard fuels and prescribed fire program.

1. Locally review the current organization's structure to assess the ability to implement a Refuge Complex prescribed burn program with limited organizational depth for the intensity of fire experience required.

2. After a local fire organizational review, consider the effectiveness of a fuels technician verses staffing an engine.

3. Strengthen agreements with local Federal and State cooperators so they can consistently provide expertise for prescribed fire implementation.

Appendix a - Chronological narrative

Fall 2007 – the burn was originally proposed by Camas NWR Refuge Manager Rob Larranaga, the Complex Biologist was consulted and approved the project. A Cultural Resource Clearance request was submitted to the Regional Office Archeological staff and clearance was received.

March 12, 2008 – The Independent Burn Plan was completed by Southeast Idaho NWRC (SEID) FMO Lance Roberts.

March 14, 2008 – Technical review was completed by Gary Bishop (RXB2, USFS Portnuef RD AFMO-Fuels).

March 19, 2008 – Camas NWR Refuge Manager approved the burn plan.

March 26, 2008 – SEID Project Leader approved the burn plan.

April 4-19, 2009 – Pre-burn preparation work was conducted at the burn site; control line mowed and portable water tanks were filled on the lines.

April 17, 2009 – Smoke approval for the unit was requested via internet from the Montana/Idaho Smoke Monitoring unit; approval was received.

April 20, 2008 – A spot weather forecast was requested and received from the Pocatello NWS, two observations had been taken at the unit on 4/19 at 1200 and 1400. The refuge Manager and FMO signed the Agency Administrator GO/NO/GO checklist; notification calls were made to neighbors and local government agencies.

Interagency burn resources gathered at the Camas NWR headquarters; the burn boss conducted a briefing at the burn unit. Burn resources included: RXB2, SOF2, FIRB, Type 3 Engine (FWS, ENGB + 2), Type 6 Engine (FWS, ENGB + 1), Type 6 Engine (USFS, ENGB + 1), ATV lighter, refuge Tractor/disc w/operator, and 10 person Idaho department of Corrections fire crew. One of the Type 6 Engine Bosses was assigned as Holding Boss.

Fuels in the unit were comprised of mostly short grass with some clumps of rabbit brush and sage in the southwest corner. The eastern boundary of the unit was the Camas creek channel, (dry at the time of ignition). On each side of Camas Creek is a continuous band of willows ranging from 10-100 feet wide. A mow line had been placed along the willows to serve as a control line.

The test fire was successfully completed at 1000 and Eastern Idaho Interagency Fire Center (EIIFC) was informed that unit ignition was underway. The ignition started in the NW corner on mow line; the Type 3 engine put down a foam line (two feet wide, see photo) using a foam generator. The lighting crew ignited adjacent to the foam line and slowly widened the black as they progressed. A type 6 engine followed the lighting crew patrolling for spots and cooling down the edge of the foam line.

At approximately 1430 95% of the unit had been ignited when one of the engine crews reported smoke in the northeast corner of the unit, (an area that had been relatively smoke free). The eastern mow/foam line had been patrolled periodically during ignition by the burn boss in UTV w/w60 gallon water tank, Type 6 engine crew and IDOC crew leader. The burn boss and engine crew discovered four spots where the fire had burned through the mow line becoming established in willows, (foam had evaporated by then).

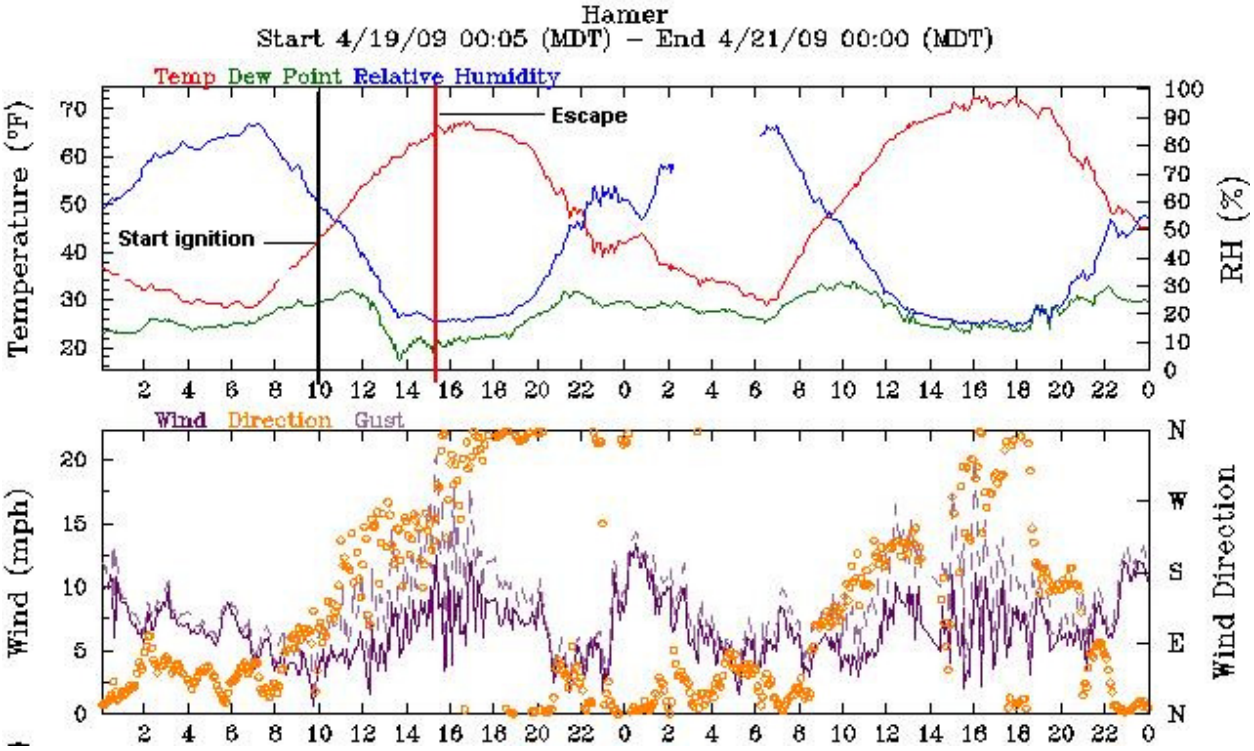
The willows torched during minor wind gusts and spotted across the dry creek channel in two locations. The burn boss moved the Type 3 and 6 engines and tractor/disc to the gravel road just east of Camas Creek to work on spots and burn out from road if needed.

At approximately 1500 the burn boss called EIIFC to report having trouble with holding the burn. At approximately 1515 the fire spotted across the gravel road east of creek and started spreading east; one Type 6 engine and tractor/disc started line construction. At 1539 the burn boss called EIIFC to declare the burn an escaped wildfire and request additional resources (engines and water tender).

Additional fire resources that arrived on the fire included Hamer VFD Type 6 engine, 1,400 gallon brush truck, and water tender. The BLM sent a type 4 engine and water tender and USFS sent Type 6 engine. By 1715 the slop-over had been lined by tractor/disc and fire behavior died down due to decreased winds and cloud cover. The fire was contained at 2100, an AAR was conducted and crew released for the evening.

On 4/21 the fire was mopped up by IDOC crew, FWS Type 3 and 6 engines, USFS Type 6 engine, and BLM water tender. 4/22-23 the fire was patrolled and mopped up by the IDOC crew and FWS Type 3 engine. The fire experienced wind storms in the afternoon on 4/22 and 23, wind 20-30 mph gusting to 40 mph. The fire was controlled at 1800 on 4/23.

Appendix b – Weather Summary

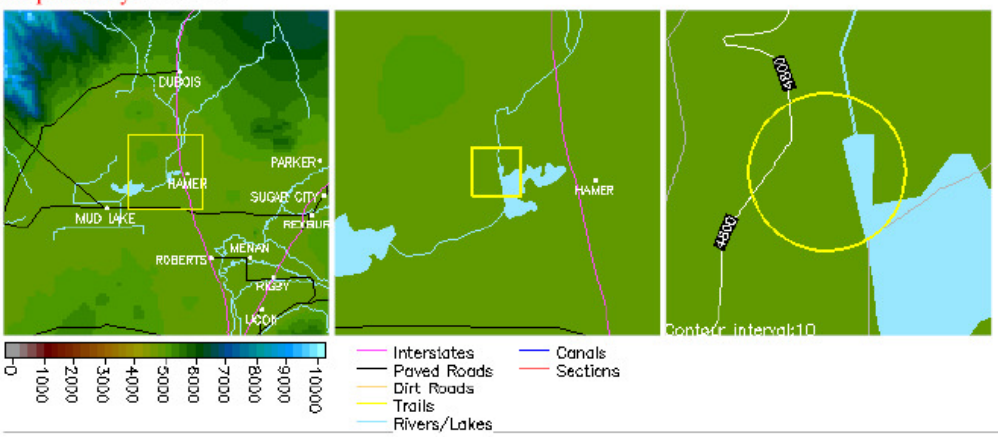


Appendix c – Spot Weather Forecast input

Independent (Proposed ignition time: 1000 MDT 4/20/09) (Requested: 628 MDT 4/20/09)

Forecast complete at 657 MDT 4/20/09

Requested by: USFWS



Location: Legal: Lat/Lon: 43.9306/112.2798 Quad: Rays Lake
Calculated: (43°55'50"N 112°16'47"W) (RAYS LAKE ID)

Elevation: 4795 Drainage: Camas Creek Aspect: Flat Size: 410

Fuel Type: FM 1 (Unsheltered)

Observations:

Place	Elev	Time	Wind	Temp	Wetbulb	RH	Dewpt	Remarks
Ham	4795	0600	4 NE	30	29	89	27	clear
				Calculated:		91	28	
onsite	4795	1400	3-5 G10SSW	68	50	28	34	clear
				Calculated:		30	36	
onsite	4795	1200	3-5 SSW	63	48	34	34	clear
				Calculated:		36	35	

Requested Parameters	Remarks
XX. Clouds / Weather	0600 weather observations from INL
XX. Temperature	HAM station 7 miles north of the
XX. Relative Humidity	burn unit.
XX. Wind - 20 FT	
... Chance of Wetting Rain	
XX. Mixing Height	
XX. Transport Winds	
... Haines Index	
... Lightning Activity Level	

Appendix c – Spot Weather Forecast 4/20/09

Spot Forecast for Independent Burn

National Weather Service Pocatello
657 AM MDT Mon Apr 20 2009

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IF CONDITIONS BECOME UNREPRESENTATIVE,
CONTACT THE NATIONAL WEATHER SERVICE.

SPOT FORECAST FOR INDEPENDENT...USFWS
NATIONAL WEATHER SERVICE POCATELLO ID
657 AM MDT MON APR 20 2009

FORECAST IS BASED ON IGNITION TIME OF 1000 MDT ON APRIL 20.
IF CONDITIONS BECOME UNREPRESENTATIVE...CONTACT THE NATIONAL WEATHER
SERVICE.

.DISCUSSION...AN UPPER LEVEL HIGH PRESSURE RIDGE POSITIONED TO THE
WEST OF THE BURN AREA WILL KEEP CONDITIONS DRY AND STABLE TODAY AND
TONIGHT.

.TODAY...

SKY/WEATHER.........MOSTLY SUNNY UNDER A FEW HIGH CLOUDS.
TEMPERATURE.........MAX 69-71...45 AT 1000 MDT.
RH..................MIN 15-18 PERCENT...53 PERCENT AT 1000 MDT.
WIND (20 FT)........WINDS NORTHEAST AT 6 MPH BECOMING EAST AT
                    IGNITION TIME...THEN INCREASING AND BECOMING
                    SOUTHWEST AT 8 TO 10 MPH WITH GUSTS TO 18 MPH
                    AFTER 1400 MDT THIS AFTERNOON.
MIXING HEIGHT.......INCREASING TO 13000 MSL THIS AFTERNOON.
MIXING WINDS........WEST-NORTHWEST TO 12 MPH THIS AFTERNOON.

.TONIGHT...

SKY/WEATHER.........CLEAR.
TEMPERATURE.........MIN 31.
RH..................MAX 82 PERCENT.
WIND (20 FT)........WEST TO NORTHWEST WINDS AT 8 MPH WITH GUSTS TO
                    16 MPH EARLY IN THE EVENING THEN BECOMING
                    NORTHEAST BY MIDNIGHT AND DECREASING TO 5 MPH
                    AFTER 0300 MDT.
MIXING HEIGHT.......DECREASING TO 6400 MSL LATE TONIGHT.
MIXING WINDS........BECOMING NORTHEAST TO 5 MPH LATE TONIGHT.
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Appendix d – Review participants

The Review Team consisted of:

Brett Fay, Assistant Pacific Region Fire Management Coordinator, USFWS.
Greg Burch USFS Zone FMO, Caribou/Targhee NF
Doug Fredrick USFWS Turnbull NWR

The following individuals participated in the review and/or were involved in the burn:

Lance Roberts, South/East Idaho National Wildlife Refuge Complex, Fire Management Officer
Brian Wehausen, Camas Refuge Manager
Tracy Casselman, Project Leader South East Idaho Refuge Complex