Prescribed Burn Unit 9 & 11 Vehicle Accident

Learning Review

Sherburne National Wildlife Refuge April 23, 2016

"Smoke on the road, shut it down."

Incident Type: Vehicle Accident, privately owned vehicle rear-ended government vehicle

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Submitted By: Seth Grim, West Zone Fire Management Officer

Location: FWS, Region 3, Sherburne Wildlife Refuge, Minnesota

Date of Accident: 04/23/2016

Review Team Members:

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Regional Office Review Members:

Rob McGinn – SHEC Manager, Region 3
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Jason Riggins – Regional Fire Management Coordinator, FWS Region 3

Executive Summary:

On Saturday April 23, 2016, Sherburne National Wildlife Refuge (NWR) conducted a 1,675 acre prescribed burn. While completing the ignition phase of the prescribed burn there was a brief and un-forecasted wind shift that caused smoke to impede visibility on an adjacent county highway. During this time, a private vehicle (mini-van) rear ended a government vehicle (F250 pickup) operated by the Burn Boss during ignition operations along Highway 5.

Following initial first aid by on-scene medical personnel, the private citizen was transported to the hospital via ambulance for further evaluation. The Burn Boss was shaken up but after evaluation by an EMT no injuries were identified. The private vehicle required a tow truck to have it removed from the scene and the Burn Boss was able to drive the government vehicle back to the refuge maintenance facility. Subsequent findings by the insurance company of the driver of the POV determined the driver was liable for damages to the government vehicle.

Narrative:

The unit is comprised of a mosaic dry oak savanna forest, aspen hardwoods, prairie grasses and cattails. The unit was last burned the spring of 2009. Prior to the briefing, fire fighters set up traffic control signage around the burn unit on County Road 9 and County Road 5 following the FWS Region 3 Prescribed Fire Traffic Control Policy (Appendix A). All highways adjacent to the burn are posted with 55 mph speed limits. Full complements of signs were set up at 500 foot increments that consisted of: “Prescribed Fire Ahead Do Not Report,” “Caution Smoke Ahead,” “Be Prepared to Stop,” and “Flagger Ahead.” Additionally each flagger was given a reflective vest, a “Slow/Stop” paddle and a vehicle with emergency lights. They were also assigned a separate tactical radio frequency. In 2015 Sherburne NWR hosted a DOT flagger refresher training that was put on by MN-DOT. Protocols from this training were utilized during this burn.

Burn notifications were sent out via email and a phone call to dispatch to alert them of the burn. The possibility of high volume traffic from public interest was anticipated and a request was made to dispatch to have a county sheriff periodically patrol roads in the vicinity of the prescribed burn to keep traffic flowing. Refuge law enforcement is typically used in this capacity but the position is currently vacant. Briefing for the prescribed burn occurred at the refuge maintenance facility 1 ½ miles north of the burn unit at 1030. The weather forecast for Saturday April 23rd predicted a high temperature of 70 degrees, minimum RH of 44%, a southeast wind of 9 mph with gusts to 20 mph and a slight chance of rain showers after 1400.

The test fire took place at the junction of Muskrat Break and St. Francis Dike Road at 1110 with favorable results (Ignition Map, Figure 4). Division A was to ignite from the test fire east towards DP2 on Highway 5 and then turn south and carry fire to DP4 along the west side of Highway 5. Division B was to ignite west from the test fire towards DP1 and then turn south to carry fire to DP 6 and turn east to complete ignition at DP 4 with Division A.

Sherburne County is a 45 minute drive from the Minneapolis/ St. Paul metropolis with a dense rural population that commutes to the cities. Personnel anticipate an increase in traffic during weekend

operations due to public interest. During these situations, it is common to request assistance from the Sheriff's Office for a deputy to patrol the road. At 1229, the Burn Boss called the Sherburne County Sheriff Dispatch asking if they could send a deputy to patrol because ignition was 100 yards from reaching County Road 5. Dispatch said "We do not have anyone available to dedicate to the burn."

At 1305 Division A reached County Road 5. With smoke pulling off the highway, ignition continued south along the west side of County Road 5. Division A sent two igniters south along the highway as he followed behind in his truck with emergency lights. The Burn Boss, with hazard lights flashing, proceeded south behind the igniters and Division A monitored fire behavior. The igniters were approaching the junction of Highway 5 and Highway 9 while Division A went ahead at a slow pace of approximately 20-25 mph to the junction to make sure traffic was not going to be affected as the igniters approached.

Figure 1

Facing south along Highway 5 at 14:05

At 1412 a sudden change in the wind from the southwest occurred, causing immediate heavy smoke on the road. The Burn Boss slowed down to less than 5 mph and pulled over so his vehicle was half in the south bound lane and half on the shoulder. His visibility was limited to inside the cab and he could not see the hood of his own truck. The Burn Boss radioed to both North and South traffic control personnel and ordered them to shut the road down.

The road guards were 0.25 miles from the north and south end of the burn unit and saw the smoke roll over the highway at the same time the Burn Boss radioed in the closure request. They both responded immediately and copied the orders

to close the road. Seconds after the radio traffic to close the road was transmitted the Burn Boss called on the radio "I have been hit, dial 911." Division A called 911 and reported a two vehicle accident with possible injuries. The Burn Boss was able to drive out of the smoke into clean air and requested the EMT on the burn which was one of the two igniters along the highway to check on the occupant of the POV. The EMT was picked up by Division A and proceeded to the private vehicle.

Figure 2

Private vehicle

Figure 3

Government vehicle

The wind switched back to the southeast within two minutes at approximately 1414 and the smoke cleared off the road. The EMT and Division A arrived on scene at this time. The Burn Boss said he was OK and directed Division A to become the Incident within an Incident (IWI) IC of the medical incident and assigned another single resource boss to take over Division A of the burn unit. The driver was the sole occupant of the privately owned vehicle (POV). The air bags deployed and the driver was conscience and complaining of pain to his legs and arms. At 1425, the local volunteer fire department arrived and was assisting with the road closure. The county sheriff and state patrol were on-scene documenting the accident. An ambulance arrived at 1430, received preliminary information from the EMT and continued with assessment of the patient. No visual injuries were present on the private citizen and he walked from the vehicle to the ambulance to be transported to the hospital for further evaluation. The accident scene was cleared of the road at 1500.

At 1510, the Burn Boss and IC of the medical IWI conversed and it was decided to relieve the Burn Boss of his duties and the IC of the medical incident would then resume as burn boss for the rest of the shift. The relieved Burn Boss proceeded to the shop to finish out his shift. Transfer of command was broadcast to all personnel. The prescribed burn continued with temporary closures of the road allowing vehicles to travel through when deemed safe. Ignition was completed at 1540. General mop-up occurred followed by an After Action Review on the accident as well as an After Action Review of the prescribed burn at 1730.

Figure 4

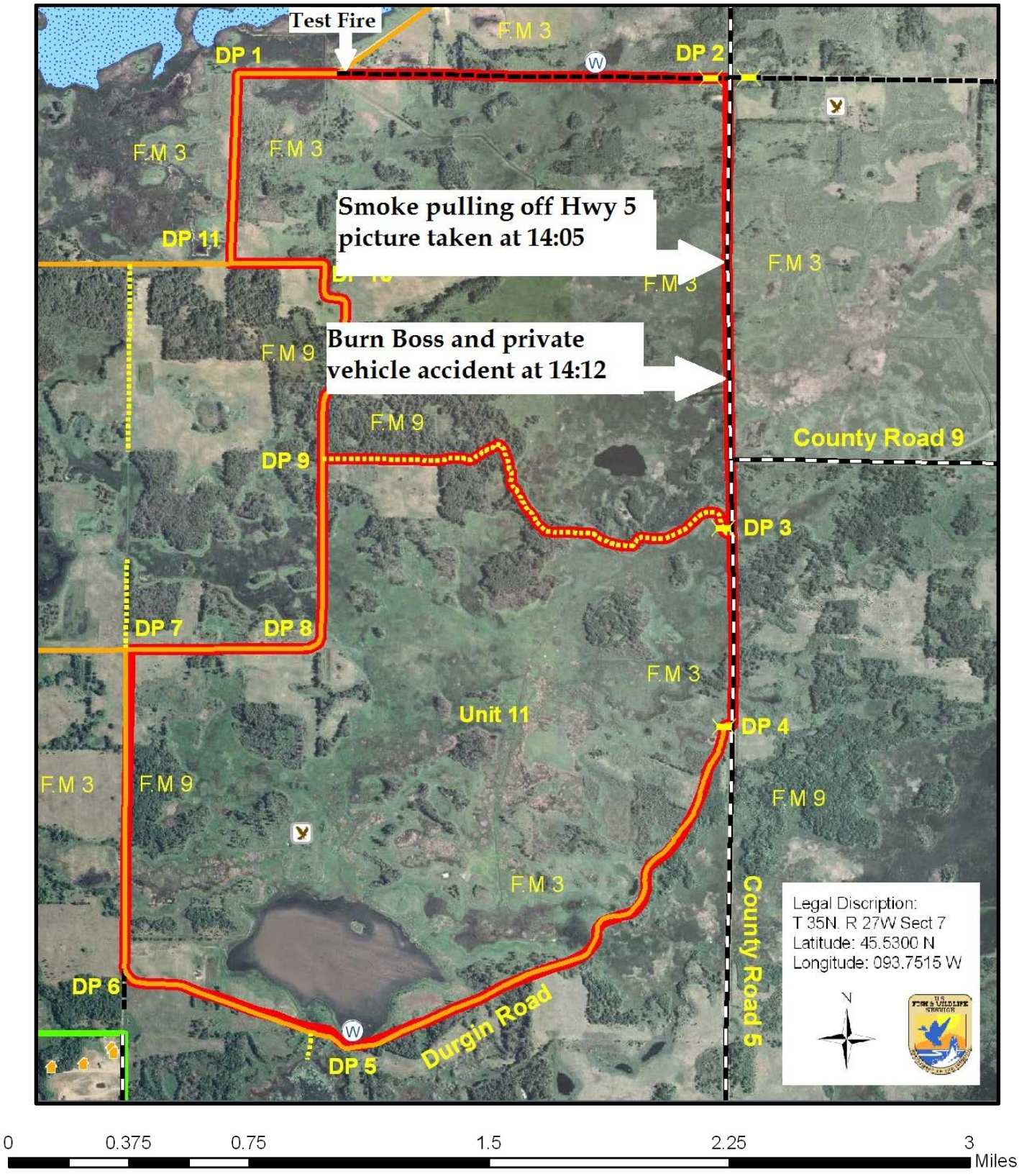
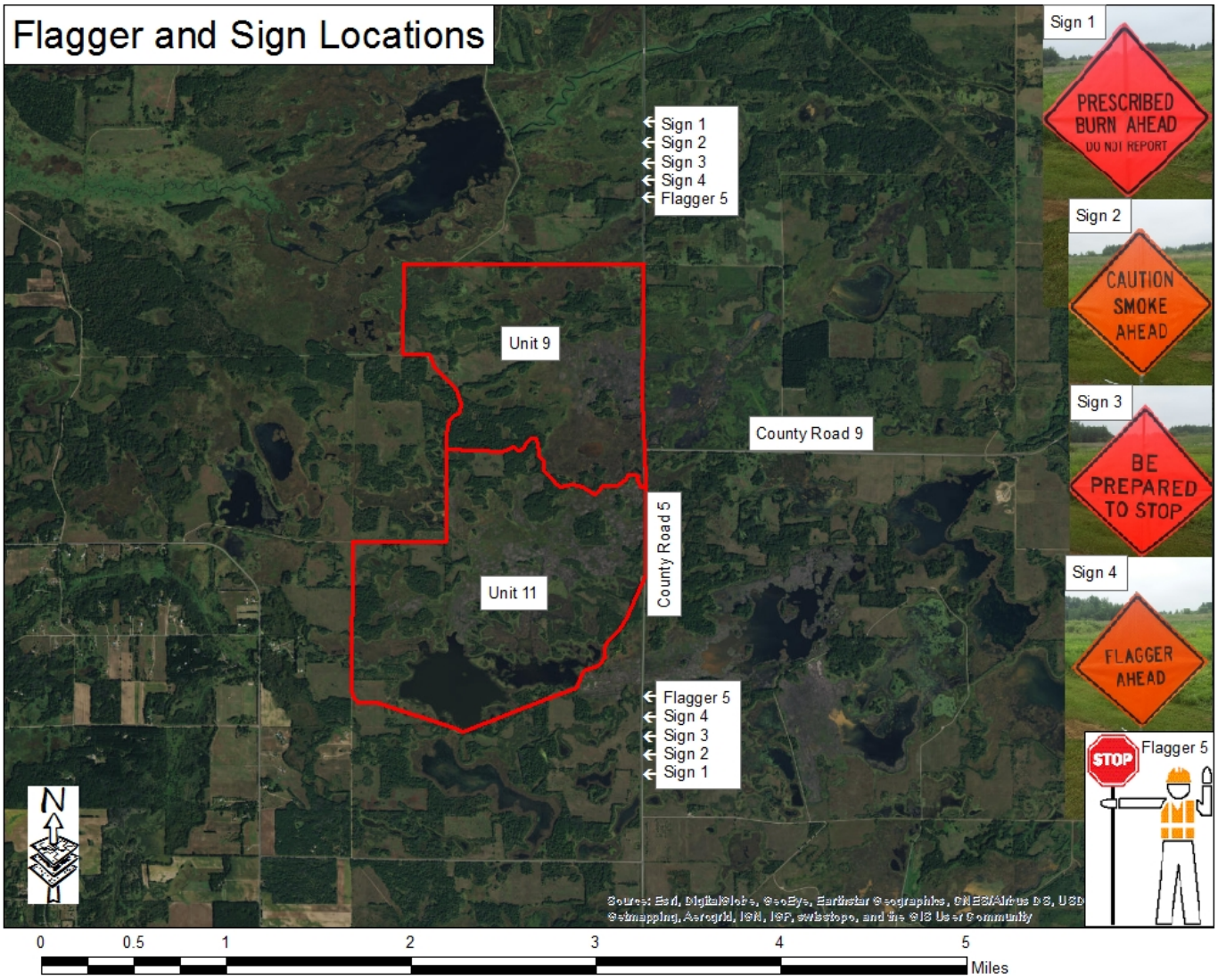

Test Fire
DP 1
DP 2
DP 3
DP 4
DP 5
DP 6
DP 7
DP 8
DP 9
DP 11
F.M 3
F.M 9
Smoke pulling off Hwy 5
picture taken at 14:05
Burn Boss and private
vehicle accident at 14:12
County Road 9
County Road 5
Durgin Road
Unit 11
Legal Discription:
T 35N, R 27W Sect 7
Latitude: 45.5300 N
Longitude: 093.7515 W
N
0
0.375
0.75
1.5
2.25
3
Miles

Figure 5



Learning Review Process:

The FMO was assigned to lead a learning review of the accident. Environmental, human and material factors were considered. Witness statements were obtained from the Burn Boss, Division A Line Boss, Ignitor/EMT, Road Guard North and Road Guard South. A police report was obtained from the Sherburne County Sheriff's Department. Video of the highway prior to the accident was acquired and photos of the vehicles were taken.

Findings (Environmental, Human, and Material):

Environment Factors:
Weather forecast was for southeast winds with an occasional south wind. There were no southwest or west winds forecasted for the day.

Human Factors:
The burn boss met all regional, Service, and interagency requirements for the assigned task and position. The burn boss has experience running 35 plus Type 2 burns. He has a valid driver's license and has completed agency required Defensive Driving course.

Material Factors:
The Burn Boss was wearing his seatbelt during the accident. The vehicle is regularly maintained and fully operational for highway use. The vehicle driven by the Burn Boss was not yet equipped with reflective striping and emergency lighting. Although not required, reflective striping and identification numbers are installed on all wild land fire chase and command vehicles. In this case, striping and emergency lighting had been purchased but not yet installed.

Observations and Recommendations from the Review Team:
Adherence to regional traffic control guidance (number, type, and location of signage) and flaggers trained to DOT standards allowed for a rapid response to a change in conditions. Organizations conducting prescribed burns near roadways are encouraged to review their traffic control guidelines to ensure adequate risk mitigation measures are known and utilized.

1) Recognize there is always the potential for vehicles to be present on roads regardless of traffic control, signage, and/or closure status and act accordingly.

2) Medical response utilized established IWI processes to ensure an IC was identified, timely care was provided by first responders and appropriate medical resources were dispatched.

3) In addition to meeting flagger vehicle and engine lighting and striping requirements, all prescribed burn personnel should utilize vehicles with reflective striping and emergency lights for high visibility when working along roadways during prescribed burn operations.

4) Utilize Agency law enforcement officers to the extent possible to assist personnel in anticipating road closures and assisting with traffic control as cooperator law enforcement may not always be available.

5) Maintain training of staff in flagger and temporary traffic control duties and responsibilities.

6) Ensure all roads potentially impacted by smoke as well as access points to the project area are considered when placing signage and flaggers.

Additional Actions post-incident:

On June 14, 2016 a meeting was held at the Sherburne National Wildlife Refuge with refuge management, local and zone fire staff, Sherburne County Sheriff Department, and the Sherburne County Right-of-Way Permit Agent. Topics discussed were the "Region 3 FWS Temporary Traffic Control Guidelines for Prescribed Burn Smoke Management," "MN Department of Transportation Flagging Handbook" and "Interagency Prescribed Fire Pan." It was reaffirmed by both the Sheriff and County Right of Way Agent that the refuge is taking a comprehensive and thorough approach to mitigating smoke and traffic related hazards to the public and firefighters during prescribed fire operations when working along highways.

To further improve public safety, the Sherburne NWR fire staff is in the process of developing a Memorandum of Understanding (MOU) with the Sherburne County Sheriff's Department. This will provide an option to utilize and commit local sheriff's department resources when conducting prescribed burn operations adjacent to highways within the Sherburne NWR. An additional MOU is being developed with the Public Works Department of Sherburne County. The Public Works Department will temporarily loan out extra traffic control signage if Sherburne NWR staff deem it necessary for additional awareness and traffic management for the public on a day-by-day basis during prescribed fire activities.

APPENDIX A: SUPPORTING DOCUMENTS

Region 3 FWS Temporary Traffic Control Guidelines for Prescribed Burns, March 2011

Region 3 FWS
Temporary Traffic Control Guidelines for
Prescribed Burn Smoke Management
March 2011

Region 3 has developed smoke management guidelines for use in prescribed burn planning and implementation in order to adhere to Federal and state laws governing traffic control. The guidelines are based on the Code of Federal regulations (23CFR 655.603) which adopts the Manual on Uniform Traffic Control Devices as the national standard for all traffic control devices installed on any street, highway, or bikeway open to public travel. The Federal Highway Administration's complete Manual of Uniform Traffic Control Devices (MUTCD) and Standard Highway Signs and Markings (SHSM) book can be found at http://mutcd.fhwa.dot.gov/ .
MUTCD: http://mutcd.fhwa.dot.gov/pdfs/2009/pdf_index.htm
SHSM: http://mutcd.fhwa.dot.gov/ser-shs_millennium.htm

Authority for Placement of Traffic Control Devices (Section 1A.08):

> "Traffic control devices, advertisements, announcements, and other signs or messages within the highway right-of-way shall be placed only as authorized by a public authority or the official having jurisdiction, for the purpose of regulating, warning, or guiding traffic."

The above standard requires individuals to contact State, County or City authorities and request authorization before placing or using temporary traffic control devices. It is recommended that field stations identify prescribed burn areas that may impact adjoining roadways, the authority having jurisdiction over the identified roadways must be contacted and informed that prescribed burns will be conducted in these areas. Field stations will obtain permission to utilize temporary traffic control on the roadways during the prescribed burn operations as necessary to meet public safety requirements. When the official having authority over the roadway authorizes the placement of temporary traffic control devices the date, time and authorizing official name must be recorded.

Traffic Control Options:
The field stations have three options for traffic control:

1. Obtain traffic control contractors to maintain safe traffic control during burning operations. Contractors may not be available in some areas. Also, response time to changing conditions and site selections may present problems.

2. Request traffic control through the state, county or city authority administering the roadway. This may not be an efficient method since the need for traffic control can come on suddenly and must be dealt with immediately. A cooperative agreement should be in place addressing responsibilities and fiscal information.

3. Field stations obtain traffic control signs, personal protective equipment and provide employee training and assume the duties of traffic control during prescribed burn operations. (Exception: Interstate/Express Highways. Only authorized state Department of Transportation employees can implement traffic control on these roadways).

If the field stations choose to assume the duties of traffic control, they will need to meet the following minimum requirements for conducting traffic control in the event that smoke from our burns or from wildfires on Service lands cause public safety hazards on area roads. The following information outlines the requirements.

What constitutes the need to post signs and/or have flaggers?
Due to the increased hazard of putting people on roadways to implement flagging operations, the Federal Highway Administration suggests that we only use flaggers if we will be impacting traffic flow for safety and emergency measures.
Whenever a work operation (RX burn) is going to impact a roadway or interrupt traffic flow, signing and flagging operations must be implemented to maintain safety and control of traffic flow.
Flaggers should also be in place when operations involve working along a roadway to provide for the safety of the workers.
If a burn is adjacent to a roadway, but the planned and forecast winds are within 30 degrees from parallel with the roadway, signing should be in place with personnel assigned and ready (vests and paddles at hand) to implement flagging operations if an unexpected wind shift should occur.
Keep in mind that smoke from our burns often times attracts attention, and actually increase traffic and onlookers. This scenario may constitute the need to implement flagging operations to keep traffic flow moving in a safe manner.

EQUIPMENT

Paddle: The STOP/SLOW paddle is the main traffic control device. The sign shall be at least 18 inches by 18 inches with 6 inch high letters and should be mounted on a rigid handle. A 5 foot minimum mounting height is required. **(Note: Some states, including Iowa require 24" x 24" signs. Check with your specific state Department of Transportation office.)**

Vest: The high-visibility safety vest must meet must meet the (MUTCD) standard as proposed in Section 6E.02 High-Visibility Clothing and the ANSI/ISEA 107-2004 standard. The Class 3 rating for high-visibility safety apparel is for workers exposed to traffic speeds above 50 mph, and where workers are exposed to a wide range of weather conditions. Class 3 apparel exceeds the 1000-foot distance visibility recommendation in the MUTCD. An example can be found at the following web-site: http://www.roadtech.com
(It is highly recommended that ORANGE, retroreflective vests be used for smoke operations to increase the flaggers' visibility and set them apart from firefighters in yellow.

Hats: A brightly colored hat (preferably a hard hat) is also recommended to increase flagger visibility.

Warning Signs: These signs are diamond shaped, having a black symbol or message on an orange background. As a general rule, these signs are located on the right-hand side of the road. Normally, the first advance warning sign used is the ROAD WORK AHEAD sign. The UTILITY WORK AHEAD or WORKERS sign may be substituted where appropriate.

For prescribed burn operations additional signs must include a PREPARE TO STOP and a FLAGGER AHEAD (or the international Flagger symbol). An informational sign such as a CAUTION SMOKE OR FOG sign can be added between the first sign and the PREPARE TO STOP signs to further inform drivers of the approaching hazard.

When purchasing warning signs, signs must meet the standards as specified by in the "Standard Highway Sign Book" http://mutcd.fhwa.dot.gov/ser-shs_millennium.htm as referenced in the "Manual on Uniform Traffic Control Devices."

Sign Placement

Suggested advance warning sign placement:

Road Type (Posted Speed Limit)	Distance from work or impact area to Flagger (Buffer, Taper, etc.)**	Distance from point of restriction (Flagger) to the first sign	Distance from the first sign to the second sign	Distance between additional signs
		A	B	C
Urban low speed*	Distance determined by traffic speed and total width of lanes closed. (see MUTCD)	100 feet	100 feet	100 feet
Urban high speed* (generally 35-45 mph)		350 feet	350 feet	350 feet
Rural		500 feet	500 feet	500 feet
Expressway/ Freeway		1,000 feet	1,500 feet	2,640 feet

*Speed category to be determined by the highway agency.

** Buffer/Taper zones optional with full road closure or when work performed is outside the shoulder but within Right-of-Way.

Size - The standard size for advance warning signs in work zones is generally 48 inches by 48 inches. Where speeds and volumes are moderately low, a minimum size of 36 inches by 36 inches may be used (see Part VI of the MUTCD for specific sign sizes).

Mounting - Standards for height and lateral clearance of roadside signs are included in Part VI of the MUTCD. With signs mounted on portable supports or barricades used solely as a sign support, the bottom of the sign shall be not less than one foot above the traveled way.

Illumination and Retroreflectorization - All signs used during the hours of darkness shall be made of retroreflective material or illuminated. (Street or highway lighting is not regarded as meeting the requirements for sign illumination.)

Removal - When work does not have the potential for impacting traffic, all signs that are no longer appropriate shall be removed, covered, turned, or laid flat so they are not visible to drivers.

Channelizing Devices: Channelizing devices are used to warn and alert drivers of conditions in work zones, to protect workers, and to guide and direct drivers safely. Channelizing devices include cones, tubular markers, vertical panels, drums, barricades, and barriers.

Cones are used most commonly for short-duration work. Cones used at night shall be retro-reflectorized and a minimum of 28 inches high. During daytime, where speeds are less than 40 MPH, 18 inch, non-reflectorized cones may be used.

Warning Lights: Warning lights may supplement retro-reflective on warning and channelizing devices. They are especially useful in areas with smoke or fog. Warning lights shall have a minimum mounting height of 30 inches. The principle types and uses are:

1. **Low intensity flashing lights (Type A)** May be mounted on barricades or drums to warn of an isolated hazard at night. They may also be mounted on signs.
2. **High intensity flashing lights (Type B)** May be mounted on advance warning signs, or on independent supports to draw attention to extreme hazards both day and night.
3. **Low intensity steady-burn lights (Type C)** May be used in a series to delineate the edge of the travel way and channelize traffic at night.

TRAINING

The following website presents specific flagger training and certification requirements for each state.
http://www.workzonesafety.org/training/flagger_training

MUTCD Requirements

Fundamental Principles of Temporary Traffic Control (Section 6B.01):
Individuals who are knowledgeable (for example, trained and/or certified) in the principles of proper temporary traffic control should be assigned the responsibility for safety in temporary traffic control zones.

Qualifications for Flaggers (Section 6E.01):
Because they are responsible for road user safety, and because they make frequent contact with the public, flaggers should have the following minimum qualifications:
Adequate training in safe temporary traffic control practice.

Although some states have flagger training programs available, there isn't a standard format or certification process available from the state DOT's. Each state must meet MUTCD guidelines, but can implement more stringent standards. The link above can be used to find each state's requirements.

At a minimum, personnel assigned as flaggers should be familiar with their states flagger handbook (if available), and with MUTCD guidelines for signing. Supervisors should ensure that these people are knowledgeable in the principles of proper temporary traffic control and supplied with the tools to do it correctly.

If your state doesn't have a flagger handbook or offer training.

The Federal Highway Administration in conjunction with the North Carolina Department of Transportation developed a training program which has since been adopted and updated by the Wisconsin DOT along with the

University of Wisconsin. This program is simple, thorough, and relatively inexpensive. It consists of a combination of classroom demonstrations, field exercises, a video and each student is given a comprehensive Flaggers Handbook and a Work Zone Safety Flipbook. The training can easily be done in ½ day. Several FWS employees have been trained as flagger trainers and could be available on a limited basis to instruct it. (Contact your Zone Fire Office.)

The following list contains contact points for flagger information within the Region 3 area.

Illinois
Dekalb Co.
Illinois Highway Department
(815) 756-8705

Wisconsin
Wisconsin State Highway Operations
(608) 266-8370

Missouri
Rick Kimberling
Missouri DOT
(816) 390-3641

Minnesota
Leigh Kriewall
Minnesota DOT
(651) 366-4217

Michigan
Bruce Monroe
Traffic and Safety Division, Michigan DOT
(517) 335-285

Indiana
Calvin Lee
Safety Manger, Indiana DOT
(317) 232-5191

Ohio
David Breydon,
Safety Division, Ohio DOT
(614) 644-8405

Iowa
Traffic and Safety, Iowa DOT
(515) 239-1557

Fundamental Principles

The principles listed below provide a guiding philosophy of good temporary traffic control and enhance the safety of motorists, pedestrians, and workers in the vicinity of temporary control zones.

1. Make traffic safety and temporary traffic control an integral and high-priority element of every project from planning through implementation.
2. Inhibit traffic movement as little as possible.
3. Provide clear and positive guidance to drivers and pedestrians as they approach and travel through the temporary traffic control zone.
4. Inspect traffic control elements routinely and make modifications when necessary.
5. Pay increased attention to roadside safety in the vicinity of temporary traffic control zones.
6. Train all persons that select, place, and maintain temporary traffic control devices.
7. Establish proper authority to implement incident management.
8. Keep the public well informed.

Summary:
In summation, field stations should identify prescribed burn areas that may impact adjoining roadways when developing prescribed burn plans. **A smoke management/traffic control section should be incorporated into each prescribed burn plan that covers the various aspects of traffic control discussed in this document.** State DOT, County Highway Commissioner, and City offices will be contacted to obtain approval to conduct temporary traffic control on the identified roadways. This contact and approval must be documented and kept on file at the station. Field stations may elect to contract out the traffic control work or purchase signs, PPE and schedule flagger training for station employees. In order to ensure the safe movement of vehicles, bicyclists, and pedestrians and provide protection for workers and traffic controllers, the Manual on Uniform Traffic Control Devices (MUTCD) shall be followed for all areas of temporary traffic control.

Traffic Control Sign & Personal Protective equipment Vendors

Vendor	Phone	Web Site	Signs	PPE
RX Fire Signs	909-795-0869	www.rxfiresign.com	X	
Dicke Tool Company	630-969-0050	www.dicketool.com	X	X
Direct Safety	800-528-7405	www.directsafety.com		X
Lab Safety	800-356-0783	www.labsafety.com	X (some)	X
Forestry Supplier	800-647-5368	www.forestry-suppliers.com	X	X
Ben Meadows	800-241-6401	www.benmeadows.com	X (some)	X
Roadtech Manufacturing	800-880-3073	www.roadtech.com	X	X

Questions concerning the Region 3 fire traffic control policy should be directed to your Zone FMO, Regional Fire Staff, or Regional Safety Staff.