Tract 17 Declared Wildfire Review
Sacramento National Wildlife Refuge

Willows, California
September 17, 2014

Table of Contents

Executive Summary

On September 17, 2014, a prescribed burn implemented by the U.S. Fish and Wildlife Service (FWS) on Sacramento National Wildlife Refuge (NWR) escaped control lines and was declared a wildfire. An interagency review team convened on October 2-3 to analyze the incident, determine the elements that led to the escape, and provide recommendations for improvement of the fire management program.

The moderate-complexity prescribed fire was conducted on a 60-acre grassland unit of the refuge to reduce hazardous fuel loadings and provide quality browse for ducks, geese, and other waterfowl. During blacklining operations, fire crept undetected across a wetline at the test fire location. The escaped fire grew quickly and exceeded the capabilities of on-site resources, eventually burning a total of 410 acres before being controlled by on-site and contingency resources. No injuries occurred on the incident; however, the refuge headquarters was evacuated and damage to power poles briefly disrupted power to the town of Willows. Power poles and railroad ties associated with the California Northern Railroad were also damaged. Smoke briefly impacted I-5 and Highway 99W.

The Review Team found that the following contributed significantly to the escape and wildfire declaration:

- The programmatic burn plan and the supplemental burn day incident action plan did not contain adequate site-specific information regarding dominant fuel models, prescription, and firing and holding strategies and tactics.
- Implementation decisions were based on incorrect weather information.
- Decisions to alter conventional firing strategies, although justified, increased the risk of escape and were not properly mitigated. Holding resources were inadequate for the selected strategies.
- Wind speed exceeded the prescription one hour after ignition, but was not recognized by anyone on-site. Weather readings during the burn were insufficient to detect changes in wind speed that put the burn out of prescription.
- Both engines ran out of water at a critical point during suppression of the slopover; water resources were not used to their fullest potential.
- Access issues significantly increased water refill turnaround times and restricted movement of equipment within the unit after the slopover occurred.

Purpose of Review

Policy outlined in the Interagency Prescribed Fire Planning and Implementation Procedures Guide and the FWS Fire Management Handbook requires a review for all declared wildfire incidents. The overall goal of the declared wildfire review process is to help prevent future wildfire declarations by analyzing key prescribed fire plan and implementation actions and by gathering knowledge and insight from the local participants for incorporation into future resource management and prescribed fire planning and implementation. Furthermore, this process promotes individual and unit learning, respectful interaction, beneficial dialogue, and problem solving. Most importantly, engaging in this process increases experience and insight, reduces serious accidents, and results in more efficient firefighting and prescribed burning.

As required, a copy of this declared wildfire review will be sent to the FWS Branch of Fire Management in Boise.

Review Team

The FWS Regional Fire Management Coordinator (RFMC) for the Pacific Southwest Region appointed an interagency team (Table 1) to conduct a review into the key elements that led to the escaped prescribed fire and wildfire declaration. On October 2-3, 2014, the Review Team visited the site of the incident, interviewed key personnel associated with implementation of the burn, reviewed and analyzed events and actions leading up to and immediately following the escape, and analyzed the decision-making process. The team was tasked to determine if the burn plan was adequate for the project and complied with policy, determine if the prescription and procedures outlined in the burn plan were followed, determine the level of awareness and understanding of the personnel involved, and recommend methods to improve prescribed fire planning and implementation.

Table 1. Review Team members.

Name	Team Position	Home Position	Home Unit
Ross Wise	Team Leader	Assistant Fire Management Officer	U.S. Fish & Wildlife Service Pacific Southwest Region, Nevada Fire Management Zone
Corky Conover	Team Member	Regional Fuels Specialist	National Park Service Pacific West Region
Casey Boespflug	Team Member	Alturas Zone Fuels Specialist	Bureau of Land Management Surprise (CA) Field Office
James Roberts	Writer/Editor	Regional Fire Ecologist	U.S. Fish & Wildlife Service Pacific Southwest Region

Refuge Description and Fire Management Organization

Sacramento NWR is located in California's Central Valley about 70 miles north of Sacramento (Figure 1). The Refuge was established in 1937 to provide refuge and breeding habitat for migratory birds and to provide habitat and manage for endangered, threatened, or sensitive species. The refuge consists of 10,819 acres of wetlands with some riparian habitats and upland grasslands (Figure 2). Prescribed fire is used in a variety of habitats to remove hazardous fuel loads, control non-native invasive species, and enhance and maintain habitat values, and is often used in conjunction with other management tools such as grazing, mowing, and herbicide applications. The refuge is one of seven within Sacramento National Wildlife Refuge Complex (NWRC), and serves as the Complex headquarters.

The North Central Valley Fire Management Zone (Zone) is one of five within the FWS Pacific Southwest Region (R8). The Zone encompasses Sacramento NWRC (7 NWRs), Stone Lakes NWR, and Coleman National Fish Hatchery (NFH), and is headquartered at Sacramento NWR. Permanent staffing includes a Fire Management Officer (FMO), two Supervisory Forestry Technicians (Engine Captains), two Lead Forestry Technicians (Engine Operators). The Zone employs up to four seasonal firefighters per year and maintains a small force of collateral-duty (refuge militia) firefighters. One Type 3 and one Type 6 engine are fully-staffed May through October, with one engine on delayed response November through April.

Tract 17 Description and Prescribed Fire Objectives

Tract 17 is a 233-acre upland grassland unit of Sacramento NWR that is classified as vernal pool/alkali meadow complex. The dominant fuel models present are GR1 and GR2, and the topography of the area is generally flat with an elevation of 120 feet above sea level. The unit was formerly a rice field, and remnant 18-inch high water control berms snake across it. The Refuge's remote automated weather station (RAWS; SAC NWR #41102) is located on the unit. Tract 17 was most recently burned in 1997 and September 2008.

The original plan on September 17 was to burn a total of about 280 acres on Tract 17 and portions of Tract 18 and Pool 4; however, on the morning of the burn the Refuge received an allocation of 60 acres from the Glenn County Air Pollution Control District (Figure 3). The objectives of the prescribed fire were to provide for firefighter and public safety, maintain/rejuvenate quality "green browse" for ducks and geese in upland areas, and reduce the hazard fuel load by 50 to 100%. Out of the 410 total acres burned, 158 acres within Tract 17 met the objectives of the prescribed fire plan and were counted as prescribed fire; the remaining 252 acres were counted as wildfire.

Organization and Equipment

Table 2. Personnel and equipment involved with the Tract 17 prescribed burn.

Incident Position	**Code**	**Name**	**Title**
Agency Administrator	AGAD		Deputy Project Leader
Burn Boss (RXB2) Firing Boss (FIRB)	RXB2		Zone Fire Management Officer
Holding Boss	HOLB		Engine Captain
Engine 8430	E8430	Type 3 engine with 500-gal. water tank	
Engine Boss (ENGB)	HOLB		Engine Captain
Firefighter (FFT2)			Seasonal Firefighter
Firefighter (FFT2)			Seasonal Firefighter
Engine 8460	E8460	Type 6 engine with 350-gal. water tank	
Engine Boss (ENGB)			Acting Engine Captain
Firefighter (FFT2)			Seasonal Firefighter
Firefighter (FFT2)/Weather monitor	WxMon		Seasonal Firefighter
Ranger 1	Ranger 1	6-wheeled UTV with 75-gal. water tank & live reel	
Firefighter (FFT2)			Collateral Firefighter
Firefighter (FFT2)			Collateral Firefighter
Lighter 1/Firefighter (FFT2)	LGHT1		Collateral Firefighter
ATV Torch 1	ATV1	Quad-runner with torch mount	
Lighter 2/Firefighter (FFT2)	LGHT2		Collateral Firefighter
ATV Torch 2	ATV2	Quad-runner with torch mount	
Lighter 3/Firefighter (FFT2)	LGHT3		Collateral Firefighter

Chronology of Events

The following chronology details the events leading up to the wildfire declaration. The suppression response that followed was not within the scope of this review and is not included here. All individuals and equipment mentioned in the chronology are identified by the code listed in Table 2. Times are included when known; some have been approximated.

Monday, September 15

1000 RXB2 met with AGAD, Sacramento River NWR Refuge Manager, Sacramento NWR Refuge Manager, and Sacramento NWRC Supervisory Biologist to prioritize burns to complete within the Complex. The priority burns were determined to be Llano Seco Bedrock, Sacramento NWR

Tract 17, South Avenue Roadside, Capay Roadside, and Llano Seco Tract 15. RXB2 stated he would plan to burn Llano Seco Bedrock on Tuesday 9/16 and Tract 17 on Wednesday 9/17.

HOLB submitted request to burn 283 acres on Tract 17 of Sacramento NWR to Glenn County Air Pollution Control District (APCD) through the Prescribed Fire Information Reporting System (PFIRS).

Glenn County APCD requested that Tract 17 be split into more manageable units (40-80 acres) to limit smoke impacts.

1300 RXB2 met with AGAD to review burn plans for both Llano Seco Bedrock and Tract 17.

Tuesday, September 16

Fire staff burned 4 acres of grass on the Llano Seco Bedrock Unit at Sacramento River NWR in Butte County.

Wednesday, September 17

0800 RXB2 and HOLB on duty. HOLB printed Incident Action Plans (IAPs) for the Tract 17 prescribed fire.

0830 Fire crew on duty, including Engines E8430 (Type 3) and E8460 (Type 6); loaded drip torches and prepared for burning.

0920 HOLB contacted Glenn County APCD to obtain burn clearance. Glenn County APCD stated that they did not have an acreage allotment and would not until later, and that they wanted to wait to better see what the wind direction would be. If they did authorize the burn, they would want the Refuge to wait until 1200 to ensure a favorable wind direction.

0945 RXB2 asked HOLB to submit a PFIRS request for Capay Unit of Sacramento River NWR in the event that Tract 17 could not be burned. It is a roadside unit with only about 4 acres of burning and is in a location where a south wind would be preferable.

0950 RXB2 and HOLB contacted Glenn County APCD to ask for an earlier start time and negotiate acreage. Glenn County APCD agreed to a 60-acre allocation and revised start time of 1100.

0955 RXB2 and AGAD discussed the revised strategy including ignition, holding, and weather forecast. RXB2 decided that with a 60-acre allocation, the south (upwind) end of Tract 17 would be burned so that the balance of the unit could be burned at a later date under a greater variety of wind conditions. A blackline would need to be constructed as a control line on the north edge of the subunit.

1000 RXB2 conducted the incident briefing in the fire training room.

1030 All resources began travel to the burn unit.

1100 RXB2 evaluated start location and positioning of resources, and coordinated all resources to ensure they were at the assigned locations. 1100 ignition time was delayed until 1200 due to a delay in getting all resources to the proper positions.

E8430 was positioned across the wet ditch on the west side of the unit. All other resources were positioned on east side of the unit, and on the north side of a dry ditch that runs generally E-W across the unit. E8460 was positioned approximately 200 feet west of the main group on the south side of the dry ditch.

RXB2 made the decision to light the test fire and start blacklining at the east (upwind) edge of the subunit because a concentration of water control berms at the west (downwind) edge would hinder engine access.

1127 Weather reading from E8460 on the burn unit: air temperature 83°F, relative humidity 37%, wind direction and speed SE 5-7 mph (RAWS @ 1129: temp. 81°F, RH 42%, wind ESE 9 mph gusting to 13 mph).

1145 RXB2 made contacts from contact list on the burn plan, and completed the Go/No-Go Checklist over the phone with AGAD.

Wind reading from E8430/HOLB at the northwest corner of the subunit: SE 7-7.5 mph, gusting to 8 mph.

RXB2 communicated the ignition plan to on-scene resources: Ignite and extinguish the test fire in a 40' x 40' area at the northeast corner of the subunit; this area would become a safety area to park ATV1 and ATV2 and serve as an anchor point for blacklining operations. The lighting team (RXB2, LGHT1, LGHT2), with wetlining support by Ranger 1, would then burn a blackline 8-15 feet wide first between the test fire/safety area and the eastern edge of the unit for 30 feet to tie into a green field, then proceed westward for 200 feet from the test fire/safety area to the dry ditch at E8460's location. At that point the lighting team, with wetlining support by E8460, would cross to the south side of the dry ditch and continue blacklining westward towards the wet ditch on the west side of the burn unit. Once the blackline was established, ATV1 and ATV2 would strip fire the remainder of the unit.

1159 RXB2 contacted Mendocino National Forest Emergency Communication Center (MNF ECC) to notify of test fire ignition. LGHT1 began ignition of the test fire/safety area with a driptorch.

Ranger 1 extinguished the test fire before blacklining operations began.

1215 Wind reading from E8430/HOLB at the northwest corner of the subunit: SE 7-8 mph, gusting to 9 mph (RAWS @ 1229: SE 11 mph gusting to 15 mph).

1220 RXB2 and LGHT1 began blacklining from the east side of the test fire/safety area eastward across the ditch and tied into a green/unburnable field on the other side. Ranger 1 applied wetline to suppress edges of the burn. E8460 deployed a 100-ft. hoselay to help extinguish the fire, then returned to its original location.

1250 RXB2 and LGHT1 continued blacklining from the west side of the test fire/safety area and proceeded westward to the dry ditch where E8460 was parked. Ranger 1 applied wetline in support.

LGHT1 crossed to the south side of the dry ditch and burned a 40' x 40' safety area at that location to enable vehicles to be parked in the black before proceeding.

RXB2 and LGHT1 continued blacklining westward across the unit along the dry ditch, with wetline support from E8460.

RXB2 instructed E8430 to swap out with E8460 for wetline support because E8460 was low on water.

E8460 refilled Ranger 1's water tank then proceeded to the water refill point at the south end of the unit.

1415 Weather reading from E8460/WxMon at the water refill point: air temperature 90°F, relative humidity 24% (RAWS @ 1429: temp. 90°F, RH 22%, wind SE 17 mph gusting to 21). WxMon had difficulty determining wind speed and direction at that location.

RXB2, LGHT1, and E8430 were over halfway across the unit with blackline when LGHT2 reported fire burning across the blackline at the original test fire location and he needed water. RXB2 sent Ranger 1 to LGHT2's location to extinguish the slopover. Winds were pushing fire from the slopover towards the northwest.

Ranger 1 arrived at LGHT2's location but could not get the pump engine started. After multiple tries the pump started and Ranger 1 began extinguishing the fire on the right (NE) flank.

RXB2 instructed E8460 to finish refilling with water then assist Ranger 1 with the slopover. No instruction was given about which flank to attack at that time.

E8460 arrived at the slopover and began a hoselay along the left (SW) flank. At this point, all firing/blacklining operations stopped.

LGHT2 reported to RXB2 that he thought the slopover could be suppressed without additional help from E8430 (200 yards away).

RXB2 observed that Ranger 1 and E8460 were not making significant progress on the slopover and instructed E8430 to assist with suppressing the slopover. E8430 was not able to cross the dry ditch to engage in a mobile attack, but pulled live reels to attack the left flank of the fire as it approached their location.

Within a couple minutes, RXB2 instructed all resources to work the right (NE) flank of the slopover to ensure all hose, water, and personnel were committed to successful operations on one flank. The strategy was to work the right flank until it tied into the wet ditch on the west side of the unit. E8430 deployed a hoselay from the south side of the dry ditch across the black to attack the right flank.

E8460 was low on water but recognized that the RAWS was threatened and watered around it, then refilled from the wet ditch just south of that location on Pole Line Rd.

E8430 ran out of water on the right flank hoselay and returned to the water refill point. This allowed the fire to burn unimpeded to Pole Line Rd.

E8460 reported that the fire spotted across Pole Line Rd. and was continuing to burn to the west towards Highway 99W.

1456 RXB2 officially declared the prescribed fire a wildfire. RXB2 contacted MNF ECC and reported that the fire had crossed control lines and was burning outside of the unit, and requested contingency resources to respond.

Findings
The emphasis of the Review Team's findings is based on the elements outlined in the Interagency Prescribed Fire Planning and Implementation Procedures Guide (April 2014) for declared wildfire reviews. The Review Team found that overall agency policy and guidance on prescribed fire implementation is adequate, and that FWS staffs' awareness and understanding of prescribed fire procedures and guidance is satisfactory.

Element 1: Seasonal severity, weather events, and on-site conditions leading up to the wildfire declaration

Most of California has been under an extended drought over the last three years (Figure 7, 8); however, the local area had received some moderating weather prior to the implementation of the prescribed burn. Drought is not believed to have been a factor in the Tract 17 escape. The Burn Boss observed no difference in fire behavior compared to what would be expected in a non-drought year for the fuel models present on the unit and the weather conditions at the time.

The Energy Release Component (ERC) for the National Fire Danger Rating System (NFDRS) fuel model G is typically used to indicate fuel moisture conditions since it contains all the live and dead fuel moisture values for all size classes available for use in the model. The ERC-G graph indicates that the ERC was 56 on 9/17/2014, which is at the 72nd percentile (Figure 6).

The NFDRS model for Burning Index (BI) is typically used to help with staffing decisions on a land management unit that contains a significant amount of flashy fuels (grass/brush), and is very sensitive to wind speed. The BI graph indicates that on the day of the burn the BI was 43, which is at the 96th percentile (Figure 6). This value confirms or validates the high gusts of wind predicted by the spot weather forecast issued for the burn.

It is generally assumed that no prescribed burning will occur on a unit that is receiving short- or long-term wildland fire severity funding. Although the FWS Pacific Southwest Region had an active long-term severity funding request at the time of the Tract 17 burn that covered all of the California Central Valley refuges, the North Central Valley Fire Management Zone had not utilized any of that funding since August 11, and was not considered to be under severity conditions on September 17. The National and Northern California Area preparedness levels on September 17 were PL2 and PL3, respectively. No National or Regional level approval is needed to burn at National PL3 or below; therefore, no restrictions were in place for prescribed burning. On the morning of the Tract 17 burn, the Zone FMO/Burn Boss contacted the Regional Fire Management Coordinator (RFMC) to notify of the intent to burn. They discussed the burn, and the RFMC confirmed that no restrictions were in place.

Element 2: Qualifications and experience of key personnel involved

All personnel associated with the Tract 17 prescribed fire were qualified for their positions. Position codes listed on the Incident Qualification Cards for key personnel are listed below. Full position names, descriptions, and required experience can be found in the Wildland Fire Qualification System Guide (PMS 310-1). Trainee positions are indicated by "(t)" following the position code.

Burn Boss (RXB2)/Firing Boss: OSC2, OPBD, ICT3, DIVS, RXB1, RXB2, RXM2, FIRB, TFLD, ENGB, AOBS (t).

Holding Boss/Engine Boss (E-8430): ENGB, ICT4, FIRB, FELB, RXB2, FFT1, CRWB (t), TFLD (t).

Engine Boss (E-8460): ENGB, ENOP, ICT5, ICT4 (t), FFT1, FALA, FIRB (t).

The Review Team expressed concern with collateral duty (Refuge militia) FFT2s operating the Ranger 1 UTV as an engine without significant supervision. The Burn Boss assured that they have significant experience with FWS prescribed fires and at all times were under the supervision of an Engine Boss or the Burn Boss; therefore, they were within agency policy for the use of ATVs on fire.

Weather monitoring duties were assigned to a seasonal engine crewmember with 10 years of experience. The Zone currently does not have any staff qualified as Fire Effects Monitor (FEMO); however, FEMO qualification is not required to perform as a weather monitor.

All individuals with primary responsibility on this incident were permanent or seasonal employees of the U.S. Fish & Wildlife Service Pacific Southwest Region, North Central Valley Fire Management Zone (based at Sacramento National Wildlife Refuge).

Element 3: Approving agency administrator's qualifications, experience, and involvement

The Agency Administrator has responsibility to ensure that all prescribed fires are conducted in accordance with the approved implementation plan and established standards and guidelines. The Project Leader (PL) and Deputy Project Leader (DPL) for Sacramento National Wildlife Complex (NWRC) share Agency Administrator responsibilities for the North Central Valley Fire Management Zone, and meet regularly with the Zone FMO to discuss prescribed fire priorities and review burn plans.

The DPL was the Agency Administrator for the Tract 17 prescribed burn. DPL signed the Agency Administrator Ignition Authorization in March 2014, and went through the Prescribed Fire Go/No-Go Checklist with the Burn Boss on the morning of the burn.

DPL has been at Sacramento NWRC since 2011, and is generally responsible for Agency Administrator duties pertaining to the Zone. Both PL and DPL take fire management seriously, have great confidence in the fire management staff, and have personally observed several prescribed fire incidents in the Zone. DPL was previously DPL at another Refuge Complex in the Region for 10 years. Although no prescribed burns were implemented there during DPL's tenure, DPL was involved with several large fire suppression incidents.

In 2009, DPL attended the Fire Management Leadership course in Tucson, AZ; PL has also attended. Region 8 encourages all of its Project Leaders and Refuge Managers to attend this course to gain insight into the role of fire in natural resource management and learn about the responsibilities of the Agency Administrator within the fire management program.

Element 4: Analysis of the prescribed fire plan for consistency with agency policy and guidance related to prescribed fire planning and implementation

The prescribed fire plan for Sacramento NWR broadcast burning is a programmatic plan (Appendix C). Programmatic burn plans are typically used when multiple units on a refuge have similar objectives, vegetation/fuel types, and complexity. Each unit should have site-specific information developed for applicable plan elements such as ignition, holding, and contingency prior to technical review and approval. Programmatic plans are often supplemented with a more site-specific incident action plan (IAP; Appendix D) on the day of the burn. The programmatic plan was originally completed and signed

in 2008 and updated in 2014. Most elements of the plan were adequately written; however, there were some important issues that, in the opinion of the Review Team, ultimately invalidated the plan (Table 4).

When the plan was updated in 2014, it was not formatted to the newest approved burn plan template (Nov. 2013). The only changes made were updates to phone lists. The Agency Administrators or FMO were not aware of the new format requirements.

Multiple paper and electronic versions of the burn plan exist in different locations; it was unknown which version was the "final" document or which version was used for the technical review.

The plan does not have sufficient site-specific information for Tract 17 or any other unit. The plan should contain a description of each unit, including vegetation and fuel models present, special firing or holding issues, threatened and endangered species considerations, access issues, and water utilization issues. The only site-specific information contained in the plan is found in Appendix F (special/unique features) and Appendix G (habitat by fuel type).

The minimum organization and equipment required by the burn plan is adequate for some units, but may not be appropriate for all of them or for all weather conditions. If any units have special requirements for minimum resources, they should be listed here. This section should reference the table on page 27 of the plan, which uses probability of ignition to determine the recommended minimum holding resources.

The holding plan (or daily IAP) should identify critical holding points for each unit. The table at the bottom of page 27 should identify the required minimum holding resources for each holding level.

The general monitoring requirements specified in the burn plan are minimal, but adequate to determine if objectives are being met. The IAP should specify which weather, fire behavior, and smoke dispersal parameters need to be tracked, and how often they should be measured.

Although the IAP did include site-specific objectives, it did not address any other site-specific considerations. Additionally, a general regional weather forecast was attached instead of the more specific spot weather forecast which predicted high winds for the ignition period. All decisions to implement the burn were based on this incorrect weather information.

Issues pertaining to the prescribed fire prescription are discussed under Review Element 5.

Table 4. Prescribed Fire Plan Elements and Review Team Comments.

PRESCRIBED FIRE PLAN ELEMENT	**COMMENTS/FINDINGS**	**Did this play a role in the escaped fire?**
1. Signature Page	Does not include minimum required Burn Boss qualification.	No
2A. Agency Administrator Ignition Authorization	No issues; signed March 2014.	
2B. Prescribed Fire Go/No-Go Checklist	No issues; signed copy in project folder.	
3. Complexity Analysis Summary	No issues; moderate rating is fitting for Tract 17.	
4. Description of Prescribed Fire Area	Needs more site-specific information for each unit included in the plan.	Possibly

PRESCRIBED FIRE PLAN ELEMENT	COMMENTS/FINDINGS	Did this play a role in the escaped fire?
5. Objectives	No issues; IAP for 9/17 had unit-specific objectives.	
6. Funding	No issues.	
7. Prescription	See Review Element 5.	Possibly
8. Scheduling	No issues.	
9. Pre-burn Considerations and Weather	No issues.	
10. Briefing	No issues.	
11. Organization and Equipment	Minimum required may not be appropriate for all units.	No
12. Communication	No issues.	
13. Public and Personnel Safety, Medical	No issues.	
14. Test Fire	No issues.	
15. Ignition Plan	No issues; unit-specific plan was communicated on-site.	
16. Holding Plan	Table should show required (not recommended) resources at each holding level. Burn plan or IAP should identify critical holding points for each unit.	Possibly
17. Contingency Plan	No issues.	
18. Wildfire Declaration	No issues.	
19. Smoke Management and Air Quality	Should be updated to include PFIRS procedures/smoke management plan reference.	No
20. Monitoring	Does not specify which weather and fire behavior variables should be monitored. IAP should list what needs to be measured and how often.	Possibly
21. Post-burn Activities	Should add bullet about NFPORS reporting.	No
Burn Plan Appendices	B (technical review) – Completed by the burn boss. Question as to which version of the plan was reviewed and what was changed (not reflected in signed checklist). Should have another checklist with the 2014 amendment.	No
	C (complexity analysis) – Should be updated to the newest approved template.	
	G (unit fuel models) – GR7 not accurate for this unit; make sure these fuel models and percentages are more accurate for each unit.	
	I (fuel model descriptions) – Need to add GR2.	
Incident Action Plan for Tract 17 Prescribed Burn, 9/17/2014 (Appendix D)	Does not include sufficient site-specific information. A general regional weather forecast is attached instead of the spot weather forecast.	Yes

Element 5: Adequacy of the prescribed fire prescription

During the review, the Fire Management Officer indicated that the higher end of the prescription was applicable mainly to burning islands on a particular unit where the risk of escape was extremely low, and may not be appropriate for other units. However, this was not stated in the burn plan, and no

differentiation was made in the prescription tables. When a prescription is unit-specific, it should be listed separately in the burn plan.

The Review Team could not match numbers used in the prescription to numbers in the BEHAVE runs attached to the burn plan. Therefore, it was impossible to validate the prescription. It is the opinion of the Review Team that these inconsistencies must be corrected before the burn plan can be considered valid for implementation.

Ignition Type in the prescription tables includes only main ignition. There is no prescription indicated for blacklining. Assuming the prescription is the same, both should be included in this field.

The fire behavior discussion on page 14 of the burn plan acknowledges that from the BEHAVE runs it appears a spot fire could not be suppressed during initial attack, but that unburnable fuels in surrounding managed wetlands or recently burned units would act as natural barriers to fire spread. This was shown to be true with the Tract 17 wildfire; however, a burnable road corridor was not considered and the fire spread beyond the unburnable units. Other burn units may have similar situations. Consider revising this statement to acknowledge that burnable corridors do exist, and that they will be identified for each unit and treated as critical holding points.

The unit-specific prescription should be included in the daily IAP, and should focus on the dominant fuel model(s) present within the unit and expected fire intensity given the peak burning period conditions indicated in the spot weather forecast.

Appendix G of the burn plan lists the fuel models present on each unit. The table indicates that Tract 17 is 100% GR7, but at the time of the burn the unit was dominated by GR1 and GR2. Of those two, only GR1 was analyzed in the burn plan. Changes in fuel models for a unit should be addressed in more detail in the IAP.

The “low” and “high” columns in the prescriptions (see Table 5) should correspond to the “cool” and “hot” ends of the prescription, respectively. For some environmental parameters, such as relative humidity and fuel moisture, lower values correspond to more intense (hotter) fire behavior. The prescription tables in the burn plan appear to list all of the lowest values in the “low” column and all of the highest values in the “high” column, regardless of which end of the fire behavior spectrum they correspond to. Table 5 has been corrected so that the “cool” values are shown in the “low” column and the “hot” values are shown in the “high” column.

Table 5. Burn Prescription from the Prescribed Fire Plan.

PRESCRIBED FIRE PRESCRIPTION	**Fuel Models: GR1, GR7, GR8, TL9**	
Environmental Parameters	**Low (Cool)**	**High (Hot)**
Temperature (°F)	40	100
Relative Humidity (%)	100	20
20-ft. Wind Speed (mi/hr) (forecast)	0	20
Mid-flame Wind Speed (mi/hr) (40% of 20-ft.)	0	12
Wind Direction (desired)	Any	Any
Cloud Cover (%)	100	0
1-Hour Fuel Moisture (%)	12	2
10-Hour Fuel Moisture (%)	13	3
100-Hour Fuel Moisture (%)	14	4
Energy Release Component	0	80

Fire Behavior Parameters (GR1)	**Head Fire**	**Flanking Fire**	**Backing Fire**
Rate of Spread (ch/hr)	0.5-37.6	0.5-3.6	0.5-1.9
Fireline Intensity (BTU/ft/s)	1-67	1-6	1-1.1
Flame Length (ft)	0.3-3.1	0.3-1.1	0.3-0.8
Probability of Ignition (%)	19-100	19-100	19-100

Element 6: Analysis of prescribed fire implementation for consistency with the prescription, actions, and procedures in the prescribed fire plan

The IAP for the day of the burn, which is meant to supplement the burn plan with more unit-specific information that was not covered in the burn plan, did not sufficiently discuss the fuel models currently present on the unit, the fire behavior that might be expected for those fuel models, or the prescription being used for the unit. Most importantly, a general regional weather forecast was mistakenly included instead of the spot weather forecast. The go/no-go decision and other implementation decisions were all based on the incorrect weather information which predicted high winds much later in the day.

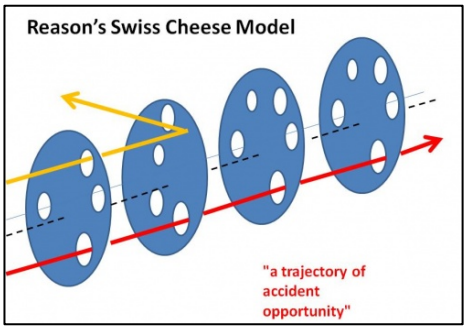
All weather parameters were within prescription at the time of ignition (Figure 5). Wind speed exceeded the prescription approximately one hour after ignition, but the burn was not shut down. Weather readings during the burn were not frequent enough or complete enough to detect the changes in environmental conditions which put the burn out of prescription. During the pre-incident briefing, the Burn Boss should specify what parameters need to be tracked and how often they should be measured, and should assign weather monitoring duties to a qualified FEMO or an experienced firefighter. Weather readings were broadcast over the radio to all personnel, with the exception of the final reading taken just before the slopover occurred.

The ignition and holding resources on the burn met the minimum requirements as specified in elements 11 and 16 of the burn plan, but were not adequate considering on-site conditions. When burning at the high end of the prescription, or when the selected firing strategies and tactics increase the risk of escape, more resources should be on hand to ensure control of the fire.

The holding plan was not implemented as outlined in the burn plan. The plan states that the holding resources will communicate with the Burn Boss and igniters and will control the speed of the firing process. The Holding Boss was also the Engine Boss for E-8430; therefore, he was attached to the engine which was staged on the west side of the unit for most of the blacklining operations, and had little direct involvement with the firing operations. The probability of ignition (PIG) was not calculated on the day of the burn, despite being required to determine the level of holding resources needed. However, the day before the burn, the Burn Boss calculated PIG for the burn day using the forecasted weather conditions and used it to determine the holding level that would be needed.

The Burn Boss correctly recognized when trigger points listed in the contingency plan had been reached and handled the wildfire declaration and immediate suppression actions appropriately.

Element 7: Factors contributing to the escape and wildfire declaration



The Tract 17 incident is a classic example of James T. Reason's Swiss cheese model of accident causality. Many layers of defense lie between hazards and accidents, but there are flaws (holes) in each layer that, when aligned, allow the accident to occur. If any of the flaws had been handled differently, the outcome might have been more favorable. The Review Team identified several "holes" that contributed to the Tract 17 escape and wildfire declaration:

All decisions to burn were based on incorrect weather information. A spot weather forecast (Appendix E) for the unit on the day of the burn indicated 20-ft winds becoming 10-15 mi/hr after noon with local gusts 25-30 mi/hr possible, which was out of prescription. However, the spot weather forecast was not included in the IAP briefing packet or used during the go/no-go process. A general weather forecast (Appendix D) that indicated winds 6-12 mi/hr with local gusts up to 25 mi/hr in the evening was mistakenly used instead, and resulted in the perception that the burning window was much longer than it actually was. Had the spot weather forecast been used, the burn likely would not have been implemented that day.

The planned start time was delayed from 1000 to 1100 while Glenn County APCD monitored wind conditions, and further delayed to 1200 by the time resources had gotten into position. The burning window, according to the spot weather forecast, had narrowed too much for the burn to be completed before the predicted high winds began.

On the morning of the burn, Glenn County APCD issued a 60-acre burning allocation for the refuge, which required a reduction of the burn unit from the planned 280 acres. The Burn Boss subsequently decided to burn the southern (upwind) portion of the unit instead of the northern (downwind) portion because this would allow burning of the remainder of the unit at a later date under a greater variety of wind conditions. Had the Refuge been allowed to burn the entire unit, ignition would have started at the downwind (NW) corner of the unit.

The decision to burn the southern portion of the unit required establishment of a control line on the north edge of the subunit. The Burn Boss made the decision to light the test fire and begin blacklining on the eastern (upwind) edge of the subunit, which was furthest from hard control lines, because engine access to the western edge would be restricted by a high concentration of water control berms there. This strategy required active control of both flanks of the blackline; if blacklining had begun at the downwind edge of the unit, only the north (downwind) flank would have required control.

Both of the above decisions to alter conventional firing strategies were justified by the Burn Boss; however, both increased the risk of escape and were not properly mitigated with extra holding resources or increased water use.

Both engines ran out of water at a critical time during suppression of the slopover, which allowed the fire to escape the burn unit. The Refuge is intensively managed for water resources; therefore, an abundance of water is typically available for use during prescribed fire operations. A pump and hoselay would have provided unlimited water, and the use of a water tender or portable water tank would have significantly reduced the 25-minute refill turnaround time for the engines.

Access to the subunit was complicated. A single in/out route was approved by biologists to minimize impacts on sensitive plant species. The 18-inch high water control berms that stretched across the unit significantly affected travel speed and prevented use of the Refuge's water tender to support blacklining operations. Additionally, the Type 3 engine could not safely cross the interior dry ditch to engage the slopover with a mobile attack.

High winds in the afternoon exceeded the burning prescription and should have shut down the burn. However, weather readings taken during the burn were not frequent enough or complete enough to detect the change in conditions that put the burn out of prescription. One pre-burn weather reading was taken at 1127; the only during-burn reading occurred at 1415, but did not include wind speed. Data from the Refuge's RAWS located on Tract 17 indicated that wind speed exceeded the prescription around 1300 (Figure 5). Shortly after the prescribed fire was officially declared a wildfire (about 1500), the RAWS measured winds at 18 mi/hr with gusts to 29 mi/hr. Weather monitoring duties were assigned to an experienced seasonal firefighter who was involved with blacklining operations at the same time. None of the Zone fire staff is FEMO qualified, which, although not required, provides the training and experience necessary to effectively monitor weather conditions.

Failure to consider the potential fire behavior in fuels outside of a project area has been identified as a common denominator of prescribed fires that have been declared wildfires. Much of the surrounding vegetation was considered to be unburnable because it was flooded, had recently been flooded, or was recently burned. However, the narrow burnable road corridor across from the NW corner of the subunit was overlooked and not identified as a critical holding point. With the prevailing wind direction (from the SE), the decision to start blacklining on the upwind side of the subunit aligned the test fire and escape location perfectly with the road corridor. As the fire hit Pole Line Rd., it readily spotted over the road into the burnable corridor and spread beyond the "unburnable" units.

Only the Burn Boss scouted the entire length of the proposed blacklining operation. Most resources did not have adequate situational awareness of hazards and barriers present on the unit that had the potential to impede firing or holding operations.

Because the burn occurred two weeks before the end of the fiscal year and the North Central Valley Zone was approximately 200 acres below its hazardous fuels target at the time, the Review Team questioned if there might have been pressure to complete burns in order to meet the target. The FMO and other staff asserted that no pressure had been given or received at any level, and that the burn could have occurred during any of the fall months.

Recommendations

The North Central Valley Fire Management Zone should be commended for maintaining its ability to accomplish important hazardous fuel reduction and habitat management work despite declining budgets and workforce. The Zone FMO (and Tract 17 Burn Boss) is highly respected by Project Leaders, Refuge Managers, and fire staff, and his decisions are trusted. The Zone effectively utilizes collateral duty

(Refuge militia) firefighters to supplement the fire-funded organization. A prescribed burn implemented in June 2014 likely prevented damage to the headquarters area from the Tract 17 wildfire (Figure 3).

Based on the factors listed above that contributed to the Tract 17 prescribed fire escape and wildfire declaration, the Review Team recommends the following actions to improve the prescribed fire program:

- Thoroughly revise all programmatic or site-specific prescribed fire plans using the latest templates available. Include sufficient site-specific information for each unit in the plan. Ensure that the burn prescription is valid for each unit, and that attached BEHAVE runs accurately reflect expected fire behavior. Consider technical review of prescribed fire plans by someone outside of FWS or from a different FWS region or fire management zone for an independent perspective. **The Review Team recommends that no prescribed fires occur until the plans are updated. The Agency Administrator has final authority to approve prescribed fire plans and ensure compliance with agency policies.**

- Ensure that daily IAPs used to supplement programmatic burn plans address site-specific fuel models, prescription, and firing and holding strategies and tactics. Ensure that the correct spot weather forecast is attached to the IAP and used to make go/no-go and other implementation decisions.

- The Burn Boss must ensure that overall situational awareness is maximized and that all decisions are based on current and accurate information. It is highly recommended that all resources scout the unit to identify hazards and barriers which could hamper or impede firing/holding operations. Furthermore, surrounding fuels and potential for fire spread should be thoroughly analyzed to identify critical holding points. If staffing and qualification levels permit, avoid assigning more than one role per individual (e.g., do not assign holding boss and engine boss to a single person).

- More frequent weather observations (every 15-30 minutes during ignition and the active burning period, and further apart as holding concerns diminish) will more effectively identify conditions that exceed the burn prescription. During the pre-incident briefing, the Burn Boss should specify what parameters need to be tracked, and how often they should be measured. A qualified Fire Effects Monitor (FEMO) who is not attached to another role should be designated if possible. It is recommended that the Zone provide FEMO training to its staff as needed.

- Prescribed fire ignition should occur at a downwind location within the planned unit unless a logical decision is made to start elsewhere and the increased risk of doing so is mitigated. In this case, the Burn Boss first made a decision to burn the upwind one-third of the unit, and then to start blacklining on the upwind corner of the planned control line. Both decisions were justified, but each increased the risk of escape and was not properly mitigated with extra holding resources or increased water use.

- Water use on prescribed fires should be maximized, especially when burning at the high end of the prescription, during peak fire season, or when firing strategies and tactics that increase the risk of escape are used. The turnaround time for water refill on the Tract 17 burn was too long, and both engines ran out of water at a critical point during suppression of the slopover. Having a staffed water tender or portable water tank on-site during a burn would significantly reduce refill turnaround times. A charged hoselay to support blacklining operations could have eliminated the need for engines to be inside the burn unit, and likely would have allowed a faster response to the slopover.

- Ensure that the holding resources on-site are commensurate with expected weather and fire behavior, and with the selected firing and holding strategies and tactics. Ensure that the holding boss, when

assigned, is actively engaged in the firing operations and dictates the pace of burning. Critical holding points must be identified prior to burning and discussed during the pre-incident briefing.

- Encourage collateral duty (Refuge militia) firefighters to obtain advanced fire qualifications (FFT1, etc.) to facilitate a deeper appreciation and understanding of fire management. Line officers should continue to support the program by allowing collateral duty staff to participate in fire management operations and attend advanced training courses.

- Continue to maintain relationships with neighboring agencies to both provide and receive assistance with prescribed burning. Sharing resources in this way will provide a greater range of training opportunities and prescribed fire experience.

- Continue to develop and maintain positive relationships with local air quality control agencies. Acreage allotments can often be negotiated within a county or between counties when it is undesirable or unsafe to reduce the size of a burn unit.

- The Zone fire program has a centralized network location to hold all fire management documents and other files; however, organization could be improved and file names should clearly differentiate between draft and final versions to eliminate confusion.

- Consider coordinating with Pacific Gas and Electric and California Northern Railroad to ensure annual hazardous fuel reduction treatments are completed around power poles. This will reduce the risk of power disruptions during prescribed fires or wildfires.

Appendix A: Maps

Figure 1. Sacramento National Wildlife Refuge Complex.

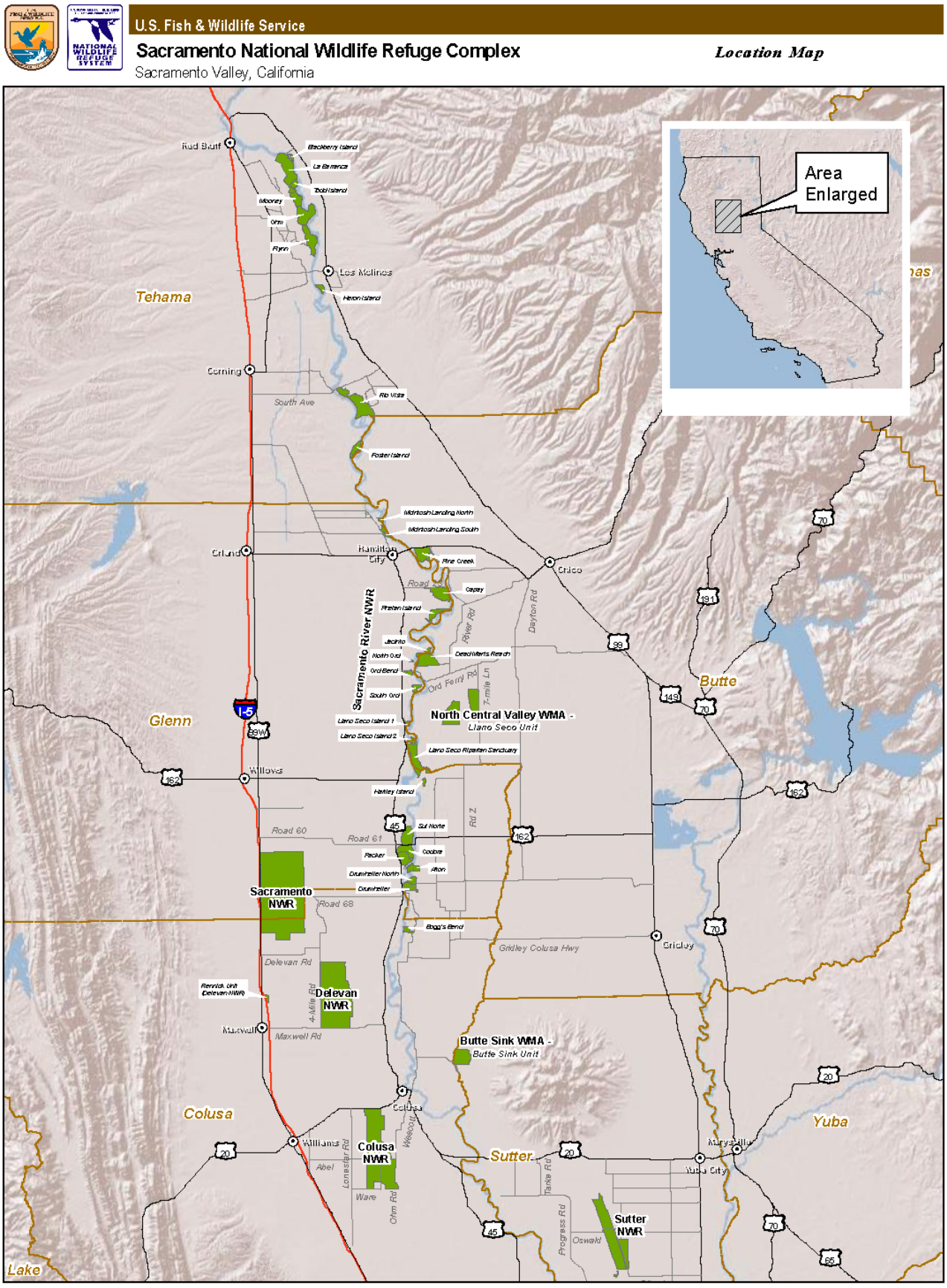


Figure 2. Sacramento National Wildlife Refuge habitats.

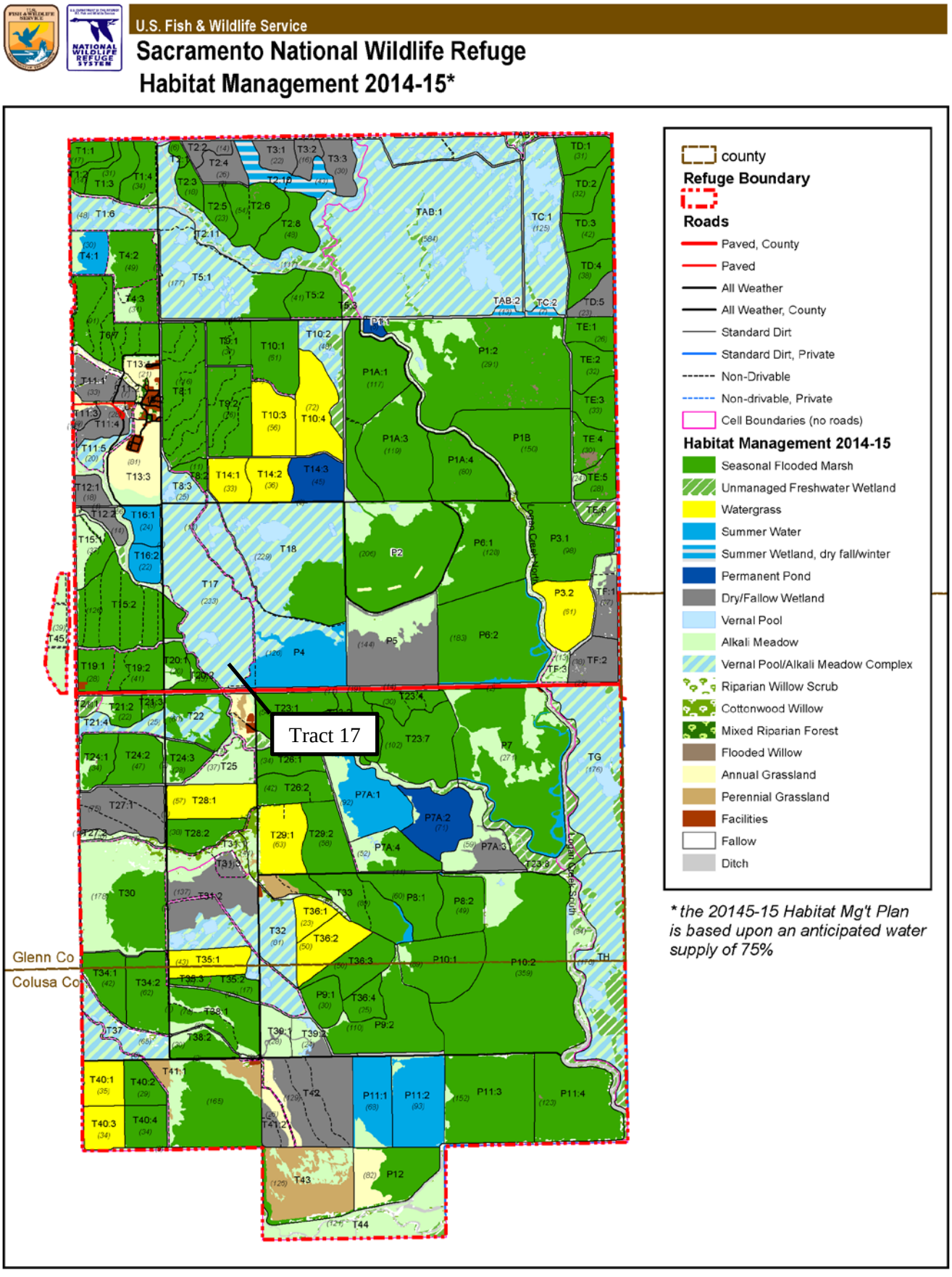
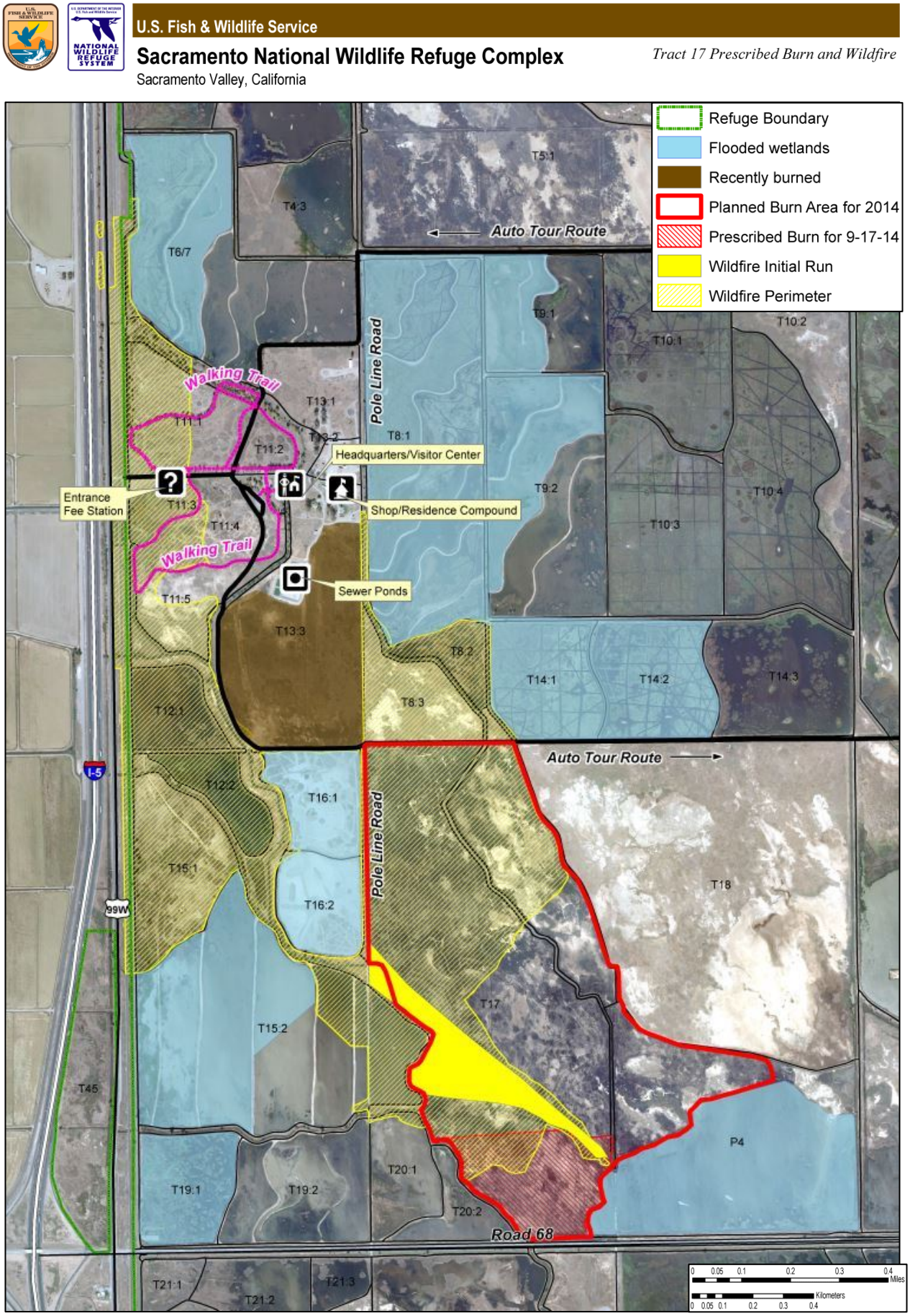


Figure 3. Tract 17 planned prescribed fire and wildfire perimeters, with initial wildfire run and adjacent flooded and burned units.



Appendix B: Photos

Figure 4a. Aerial photo of the Tract 17 wildfire showing the ignition point (upper right), flooded and recently flooded (green) units, and proximity to Highway 99W and I-5 (lower left).

Figure 4b. Aerial photo of the Tract 17 wildfire showing proximity to the Complex Headquarters (just left of center), a recently burned unit that influenced fire spread (middle right), and proximity to Highway 99W and I-5 (bottom). The fire advanced from upper right to lower left.

Appendix C: Programmatic Prescribed Fire Plan for Sacramento NWR Broadcast Burning.

Note: Prescribed Fire Plan Appendices A and C-I are omitted. To request a copy of any appendix, please contact the North Central Valley Zone Fire Management Officer at (530) 934-2801.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Sacramento National Wildlife Refuge Complex
752 County Road 99W, Willows, CA 95988
530-934-2801

Prescribed Fire Plan Amendment

Sacramento NWR Broadcast RX

This amendment page will serve to document the periodic review of this burn plan in accordance with the Interagency Prescribed Fire Planning and Procedures Guide. The following updates were provided during the January 2014 review.

- Element number 9-B Burn Notification Checklist: The phone list was updated by removing [redacted] from Region Fire Management Coordinator line and his information was replaced with [redacted]'s name and phone number.
- Element number 18-C Wildfire Conversion/Notifications: The phone list was updated by removing [redacted] from Region Fire Management Coordinator line and his information was replaced with [redacted]'s name and phone number.
- Signature updates: Refuge Biologist, Assistant Refuge Manager, Deputy Project Leader, and Project Leader will re-sign the document after review of this amendment and concurrence with the plan. New review and signatures are recommended because some prior signatures were from employee's no longer in service here. Signatures of the preparer, the technical reviewer, and the Project Leader meet the Interagency Prescribed Fire Planning and Procedures Guide minimum requirements. Additional Signatures of Refuge Biologist, Assistant Refuge Manager, and Deputy Project Leader serve to meet the requirement of the Sacramento NWR Complex.

I concur with this review and update of the plan:

Technical Reviewer: [redacted] March 10 2014

Refuge Biologist: [redacted]

Assistant Refuge Manager: [redacted] 3/13/2014

Deputy Project Leader: [redacted] 3/10/14

Project Leader: [redacted] 3/10/14

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

Sacramento National Wildlife Refuge Complex
Sacramento NWR Broadcast RX
PRESCRIBED FIRE PLAN
Table of Contents

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

PRESCRIBED FIRE PLAN
Sacramento National Wildlife Refuge Complex
Sacramento NWR Broadcast RX

ADMINISTRATIVE UNIT(S): Sacramento NWR

PRESCRIBED FIRE NAME: Sacramento NWR Broadcast RX

PREPARED BY: [redacted] DATE: 06/18/2008
Name & Qualification

TECHNICAL REVIEW BY: [redacted] DATE: March 10, 2014
Name & Qualification

COMPLEXITY RATING: MODERATE

REFUGE BIOLOGIST: [redacted] DATE: 3/10/14

ASST. REFUGE MANAGER: [redacted] DATE: 3/13/2014

DEP. PROJECT LEADER: [redacted] DATE: 3/10/14

APPROVED BY: [redacted] DATE: 3/10/14
Project Leader

A programmatic Section 7 is in place for this activity.

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 1: AGENCY ADMINISTRATOR PRE-IGNITION APPROVAL CHECKLIST

Instructions: The Agency Administrator's Pre-Ignition Approval is the intermediate planning review process (i.e. between the Prescribed Fire Complexity Rating System Guide and Go/No-Go Checklist) that should be completed before a prescribed fire can be implemented. The Agency Administrator's Pre-Ignition Approval evaluates whether compliance requirements, Prescribed Fire Plan elements, and internal and external notifications have been or will be completed and expresses the Agency Administrator's intent to implement the Prescribed Fire Plan. If ignition of the prescribed fire is not initiated prior to expiration date determined by the Agency Administrator, a new approval will be required.

YES	NO	KEY ELEMENT QUESTIONS
X		Is the Prescribed Fire Plan up to date? *Hints: amendments, seasonality.*
X		Will all compliance requirements be completed? *Hints: cultural, threatened and endangered species, smoke management, NEPA.*
X		Is risk management in place and the residual risk acceptable? *Hints: Prescribed Fire Complexity Rating Guide completed with rational and mitigation measures identified and documented?*
X		Will all elements of the Prescribed Fire Plan be met? *Hints: Preparation work, mitigation, weather, organization, prescription, contingency resources*
X		Will all internal and external notifications and media releases be completed? *Hints: Preparedness level restrictions*
X		Will key agency staff be fully briefed and understand prescribed fire implementation?
	X	Are there any other extenuating circumstances that would preclude the successful implementation of the plan?
X		Have you determined if and when you are to be notified that contingency actions are being taken? Will this be communicated to the Burn Boss?
		Other:

Recommended by: [redacted] Date: 3/18/14
FMO/Prescribed Fire Burn Boss

Approved by: [redacted] Date: 3/10/14
Agency Administrator

Approval expires (date): 3/1/15

ELEMENT 2: PRESCRIBED FIRE GO/NO-GO CHECKLIST

	YES	NO
A. Has the burn unit experienced unusual drought conditions or contain above normal fuel loadings which were not considered in the prescription development? If NO proceed with checklist., if YES go to item B.		
B. If YES have appropriate changes been made to the Ignition and Holding plan and the Mop Up and Patrol Plans? If YES proceed with checklist below, if NO STOP.		

YES	NO	QUESTIONS
✓		Are ALL fire prescription elements met?
✓		Are ALL smoke management specifications met?
✓		Has ALL required current and projected fire weather forecast been obtained and are they favorable?
✓		Are ALL planned operations personnel and equipment on-site, available, and operational?
✓		Has the availability of ALL contingency resources been checked, and are they available?
✓		Have ALL personnel been briefed on the project objectives, their assignment, safety hazards, escape routes, and safety zones?
✓		Have all the pre-burn considerations identified in the Prescribed Fire Plan been completed or addressed?
✓		Have ALL the required notifications been made?
✓		Are ALL permits and clearances obtained?
✓		In your opinion, can the burn be carried out according to the Prescribed Fire Plan and will it meet the planned objective?

If all the questions were answered "YES" proceed with a test fire. Document the current conditions, location, and results

[redacted] 9/17/14

Burn Boss Date

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 3: COMPLEXITY ANALYSIS SUMMARY

SACRAMENTO NWR Broadcast RX			
ELEMENT	**RISK**	**POTENTIAL CONSEQUENCE**	**TECHNICAL DIFFICULTY**
1. Potential for escape	MODERATE	MODERATE	LOW
2. The number and dependence of activities	MODERATE	LOW	LOW
3. Off-site Values	LOW	LOW	MODERATE
4 On-Site Values	MODERATE	MODERATE	MODERATE
5. Fire Behavior	MODERATE	MODERATE	LOW
6. Management organization	MODERATE	LOW	MODERATE
7. Public and political interest	LOW	LOW	LOW
8. Fire Treatment objectives	LOW	LOW	LOW
9 Constraints	MODERATE	MODERATE	MODERATE
10 Safety	LOW	LOW	LOW
11. Ignition procedures/ methods	LOW	LOW	MODERATE
12. Interagency coordination	MODERATE	MODERATE	MODERATE
13. Project logistics	LOW	LOW	LOW
14 Smoke management	LOW	MODERATE	MODERATE

COMPLEXITY RATING SUMMARY	
	OVERALL RATING
RISK	MODERATE
CONSEQUENCES	LOW
TECHNICAL DIFFICULTY	MODERATE
SUMMARY COMPLEXITY DETERMINATION	MODERATE

RATIONALE: Projects are located within the Sacramento NWR which has identified T&E species and habitat. In order to minimize potential negative impacts, close coordination with refuge staff will be necessary. Access to some units could be hampered by various ditches, levees, and sensitive alkali meadow/vernal pool habitat. This could complicate holding and present potential smoke management issues as some project sizes could exceed usual allowed acreage. Soil disturbance issues within the project areas as well as in neighboring units could limit access, firing, holding, and potential suppression techniques. The size and scope of the overall plan suggests that most projects should be implemented within a type 2 organization at a minimum.

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 4: DESCRIPTION OF PRESCRIBED FIRE AREA

A. Physical Description

1. Location:

State	California
County	Glenn and Colusa
Nearest Town	Willows, CA
Latitude	Center Point of Refuge:
Longitude	39.4073° X 122.1624°
Section	
Township	T18N,R3W,Sec23
Range	
Quad Maps	USGS – Logandale, CA
Series	7.5"
Scale	1:24,000

Sacramento National Wildlife Refuge was established in 1937 by Executive Order No. 7562 and acquired with funds from the Emergency Conservation Fund Act of 1933 in order to alleviate crop depredation problems as well as provide wintering habitat for waterfowl. The Refuge is located in the Sacramento Valley of north central California, and is situated about 90 miles north of the metropolitan area of Sacramento and six miles south of the town of Willows. The Refuge comprises 10,819 acres located in both Glenn and Colusa Counties. No private lands are included in this plan.

See Appendix H. (pg. 50) for Coordinates of Individual Burn Units.

2. **Size:**
Approximately 75 percent of the Refuge's acreage consists of wetlands such as seasonally flooded marsh, water grass, permanent and summer ponds, and riparian habitat. The remainder consists of upland habitats. Fuel and vegetation types characteristic of the Refuge are:

The guide entitled "Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model" was used to determine fuel models and fire behavior. **See Appendix I (pg 54) for reference.**

Fuel Model GR1 and GR7: approximately 2,832 acres of uplands

Fuel Model GR8: approximately 7,583 acres of wetlands.

Fuel Model TL9: approximately 404 acres of riparian woodland.

Units range in size from ≈6 acres to ≈609 acres.

See Appendix G (pg 47) for information on fuel type and acreage by unit

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

3. **Topography:**

Flat.

4. **Project Boundary:**

All projects will occur within the boundaries of the Sacramento NWR and will be referred to as the "Project Area". **See Appendix G (pg. 47)**

B. Vegetation/Fuels Description:

1. On-site fuels data

Fuels within the project area(s) consist of tule (hardstem bulrush and common cattail), and a variety of upland grasses. Some areas of the refuge also include some riparian habitat, willow and eucalyptus trees, blackberry bushes, and arundo (giant reed).

See Appendix G (pg. 47) for fuel model by unit.

2. Adjacent fuels data

Some areas contain identical fuels to the project area (Wetlands, Uplands, and some Riparian) In addition, some adjacent areas contain agricultural (Fuel Model NB3) and, depending on time of year, bare earth (Fuel Model NB9).

C. Description of Unique Features:

See Appendix F (pg. 40) for unique features.

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 5: GOALS AND OBJECTIVES

A. Goals:

To remove or decrease hazardous fuels and aid in the reduction of hazardous fuels buildups in and near the Wildland Urban Interface (WUI). Hazard fuel reduction (mechanical removal or prescribed fire) should occur within or near Refuge development zones, sensitive natural resources, and boundary areas to reduce the risk from wildfire. To the greatest extent possible, hazard fuel burns should compliment resource management objectives. Goals of hazard fuel reduction prescribed burning include:

- Maintain fuel loadings within the natural ranges (determined by fuel type).
- Protect resources/habitat from wildland fire trespass.
- Establish defensible space around improvements and structures.

B. Objectives:

1. Resource objectives:

Resource management prescribed fire is used to restore/create/enhance/maintain a diversity and quality of habitats in order to restore and perpetuate native or desirable wildlife species and plant communities that meet goals of the Refuge. To achieve these goals, prescribed burns may be required as often as every 5-10 years in wetland units and every 1-5 years in upland units. Goals of resource management burns include:

- Control dense excessively emergent vegetation growth in wetlands.
- Enhance native upland species production.
- Aid in control of noxious weeds such as cockleburr, jointgrass, bermuda grass, and starthistle.
- Maintain/rejuvenate quality "green browse" for ducks and geese in upland areas.
- Maintain/rejuvenate perennial grasslands used for nesting/winter cover.

2. Prescribed fire objectives:

Primarily Hazardous Fuel Reduction with an emphasis on areas impacted by the Wildland Urban Interface (WUI). Additional RX objectives will be identified by refuge management and biological staff prior to implementation of prescribed fires within the project area. These are generally identified in the refuge Habitat Management Plan (HMP).

Primarily, the objective will be to reduce hazardous fuel loadings by 50% to 100%.

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 6: FUNDING:

A. Cost (Approx):

Costs are approximate and include all phases of planning and implementation.

	GS-4/1	GS-4/1	GS-3/1	GS-3/1	GS-6/4	GS-6/2	GS-8/1	GS-8/3	GS-11/1	GS-12/1
Planning							4		24	8
Site Prep	8	8	8	8	8	8	8	8		2
Implementation	8	8	8	8	8	8	8	8	8	8
Monitoring					2	2	2	2		
Total Hours	16	16	16	16	18	18	22	18	32	10
Cost Per Hour	$12.73	$12.73	$11.34	$11.34	$27.76	$22.43	$25.49	$32.26	$34.81	$45.09
Sub Total	$203.68	$203.68	$181.44	$181.44	$499.68	$403.74	$560.78	$580.68	$1,113.92	$811.90
Grand Total	**$4,379.94 + Fuel/ Refuge Staff Time ≤ $5500+ per project**									

B. Funding source:

The appropriate funding source will be identified prior to implementation of any prescribed fire within the project area. A project number will then be assigned through the Fire Management Information System (FMIS)

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 7: PRESCRIPTION

ELEMENT 7: PRESCRIPTION: ENVIRONMENTAL PARAMETERS	PROJECT NAME	Sacramento NWR Broadcast RX
	BURN UNIT NAME	Same
	IGNITION TYPE: (Blackline, main ignition, multiple fuel models , other	Main ignition
	FUEL MODEL	GR1, GR7, GR8, TL9
	PERCENT OF UNIT	Varied
	SEASON	January- December

ENVIRONMENTAL PARAMETERS NEEDED TO PRODUCE THE DESIRED FIRE BEHAVIOR: Fill in applicable environmental parameters for this fuel model. Separate environmental prescriptions may be needed for multiple fuel model conditions to address seasonal differences and/or types of ignition (black lining, main ignitions, multiple fuel models, aerial ignition, etc.*	Fuels Within the Project or Burn Unit Boundary		Fuels Outside of The Project or Burn Unit Boundary	
	Low	High	Low	High
Temperature	40	100	40	100
Relative Humidity	20	100	20	100
20' Wind Speed (forecast)	0	20	0	20
Mid-flame Wind Speed (40% of 20')	0	12	0	12
Cloud Cover (%)	0	100	0	100
Wind Direction (desired)	Any		Any	
1 Hour Fuel Moisture*	2	12	2	12
10 Hour FM (Riparian Areas)	3	13	3	13
100 Hour FM (Riparian Areas)	4	14	4	14
Woody Live FM	N/A	N/A	N/A	N/A
Herb. Live FM.	N/A	N/A	N/A	N/A
Energy Release Component	0	80	0	80

Environmental parameters discussion, or description of empirical evidence utilized:

*This burn has the flexibility to mix and match the weather parameters to generate the intensity and fire behavior to achieve the resource and prescribed fire objectives. Burning when all weather elements are at the high intensity level should be done with extreme caution and all holding forces and backup suppression forces should be available

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

PRESCRIPTION: FIRE BEHAVIOR PARAMETERS OUTPUTS	PROJECT NAME	Sacramento NWR Broadcast RX
	BURN UNIT NAME	Same
	IGNITION TYPE: (Blackline, main ignition, multiple fuel models , other	Main ignition
	FUEL MODEL	GR1- Joint and Bermuda Grass
	PERCENT OF UNIT	Varied
	SEASON	January- December

ENVIRONMENTAL PARAMETERS NEEDED TO PRODUCE THE DESIRED FIRE BEHAVIOR: Fill in applicable environmental parameters for this fuel model. Separate environmental prescriptions may be needed for multiple fuel model conditions to address seasonal differences and/or types of ignition (black lining, main ignitions, multiple fuel models, aerial ignition, etc.*	Fuels Within the Project or Burn Unit Boundary			Fuels Outside of The Project or Burn Unit Boundary		
	Head Fire	Flanking Fire	Backing Fire	Head Fire	Flanking Fire	Backing Fire
Rate of Spread (CH/HR)	0.5- 37.6	0.5- 3.6	0.5- 1.9	0.5- 37.6	0.5- 3.6	0.5- 1.9
Fireline Intensity (BTU/FT/S)	1 - 67	1 - 6	1 – 1.1	1 - 67	1 - 6	1 – 1.1
Flame Length (FT)	0.3- 3.1	0.3- 1.1	0.3- 0.8	0.3- 3.1	0.3- 1.1	0.3- 0.8
Probability of Ignition (%)	19-100	19-100	19-100	19-100	19-100	19-100

Environmental parameters discussion, or description of empirical evidence utilized:

* See appendix for BEHAVE runs

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

PRESCRIPTION: FIRE BEHAVIOR PARAMETERS OUTPUTS	PROJECT NAME	Sacramento NWR Broadcast RX				
	BURN UNIT NAME	Same				
	IGNITION TYPE: (Blackline, main ignition, multiple fuel models , other	Main ignition				
	FUEL MODEL	GR7- Upland Grasses				
	PERCENT OF UNIT	Varied				
	SEASON	January- December				
ENVIRONMENTAL PARAMETERS NEEDED TO PRODUCE THE DESIRED FIRE BEHAVIOR: Fill in applicable environmental parameters for this fuel model. Separate environmental prescriptions may be needed for multiple fuel model conditions to address seasonal differences and/or types of ignition (black lining, main ignitions, multiple fuel models, aerial ignition, etc.*	Fuels Within the Project or Burn Unit Boundary			Fuels Outside of The Project or Burn Unit Boundary		
	Head Fire	Flanking Fire	Backing Fire	Head Fire	Flanking Fire	Backing Fire
Rate of Spread (CH/HR)	4.3- 1618.8	4.3- 22.6	4.3- 11.4	4.3- 1618.8	4.3- 22.6	4.3- 11.4
Fireline Intensity (BTU/FT/S)	85- 58736	85- 822	85- 414	85- 58736	85- 822	85- 414
Flame Length (FT)	3.5- 70.3	3.5- 9.9	3.5- 7.2	3.5- 70.3	3.5- 9.9	3.5- 7.2
Probability of Ignition (%)	19-100	19-100	19-100	19-100	19-100	19-100
Environmental parameters discussion, or description of empirical evidence utilized:						
* See appendix for BEHAVE runs						

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

PRESCRIPTION: FIRE BEHAVIOR PARAMETERS OUTPUTS	PROJECT NAME	Sacramento NWR Broadcast RX				
	BURN UNIT NAME	Same				
	IGNITION TYPE: (Blackline, main ignition, multiple fuel models , other	Main ignition				
	FUEL MODEL	GR8- Tule (Cattails and Bulrush)				
	PERCENT OF UNIT	Varied				
	SEASON	January- December				
ENVIRONMENTAL PARAMETERS NEEDED TO PRODUCE THE DESIRED FIRE BEHAVIOR: Fill in applicable environmental parameters for this fuel model. Separate environmental prescriptions may be needed for multiple fuel model conditions to address seasonal differences and/or types of ignition (black lining, main ignitions, multiple fuel models, aerial ignition, etc.*	Fuels Within the Project or Burn Unit Boundary			Fuels Outside of The Project or Burn Unit Boundary		
	Head Fire	Flanking Fire	Backing Fire	Head Fire	Flanking Fire	Backing Fire
Rate of Spread (CH/HR)	5.0- 1190.5	5.0- 16.7	5.0- 8.4	5.0- 1190.5	5.0- 16.7	5.0- 8.4
Fireline Intensity (BTU/FT/S)	196- 71858	196- 1005	196- 506	196- 71858	196- 1005	196- 506
Flame Length (FT)	5.1- 77.1	5.1- 10.8	5.1-7.9	5.1- 77.1	5.1- 10.8	5.1-7.9
Probability of Ignition (%)	19-100	19-100	19-100	19-100	19-100	19-100
Environmental parameters discussion, or description of empirical evidence utilized:						
* See appendix for BEHAVE runs						

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

PRESCRIPTION: FIRE BEHAVIOR PARAMETERS OUTPUTS	PROJECT NAME			Sacramento NWR Broadcast RX			
	BURN UNIT NAME			Same			
	IGNITION TYPE: (Blackline, main ignition, multiple fuel models, other			Main ignition			
	FUEL MODEL			TL9- Riparian			
	PERCENT OF UNIT			Varied			
	SEASON			January- December			
ENVIRONMENTAL PARAMETERS NEEDED TO PRODUCE THE DESIRED FIRE BEHAVIOR: Fill in applicable environmental parameters for this fuel model. Separate environmental prescriptions may be needed for multiple fuel model conditions to address seasonal differences and/or types of ignition (black lining, main ignitions, multiple fuel models, aerial ignition, etc.*	Fuels Within the Project or Burn Unit Boundary			Fuels Outside of The Project or Burn Unit Boundary			
	Head Fire	Flanking Fire	Backing Fire	Head Fire	Flanking Fire	Backing Fire	
Rate of Spread (CH/HR)	0.7- 85.7	0.7-1.2	0.6- 0.7	0.7- 85.7	0.7-1.2	0.6- 0.7	
Fireline Intensity (BTU/FT/S)	12- 2065	12- 29	12- 15	12- 2065	12- 29	12- 15	
Flame Length (FT)	1.4- 15.1	1.4- 2.1	1.4- 1.5	1.4- 15.1	1.4- 2.1	1.4- 1.5	
Probability of Ignition (%)	19- 100	19- 100	19- 100	19- 100	19- 100	19- 100	
Environmental parameters discussion, or description of empirical evidence utilized:							
* See appendix for BEHAVE runs							

Fire Behavior Discussion Concerning Behave Runs:

Although our Behave runs would make it appear that a spot fire could not be suppressed during initial attack, the reality is that this project is being implemented in and amongst managed wetlands which are broken up into smaller units. The non-continuous fuels in the wetlands, often broken up by roads and levees, would make it difficult for a fire to spread more than a few hundred yards at most before encountering some sort of natural or man made barrier. In addition, both inside and outside the refuge, non burnable fuels exist. These are represented as Fuel Model NB3 (Agriculture) and Fuel Model NB9 (Bare Ground)

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 8: SCHEDULING

A. Ignition Time Frames/Season(s):

Prescribed fires within the project area will be implemented throughout the year as fuels and seasonality coincide with management objectives.

B. Projected Duration:

Projects could take several days to fully implement but will most likely take no more than two days

C. Constraints:

Constraints such as infrastructure, known hazards and additional endangered species mitigation are listed in **Appendix F (pg 40).** All attempts will be made to prevent or mitigate fire impacts to these identified areas.

The ditches and wetlands are known habitat for the giant garter snake (GGS), a listed species under the Endangered Species Act. Consultation with refuge management and biological staff will be initiated prior to any prescribed fire operation in the project area. The GGS are active from March through November. No foam will be used in wetland areas, as it may negatively impact the GGS or other species.

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 9: PRE-BURN CONSIDERATIONS

A. Considerations:

1. **On Site:**

   Prior to implementing any prescribed fire, a thorough evaluation will be conducted within the project area to identify potential negative impacts. These will include, but are not limited to:

   - Assessment of current fuel conditions within the unit to be burned.
   - Assessment of fuel conditions in adjoining and neighboring units.
   - Access and road conditions.
   - Consultation with refuge management and biological staff to determine if prescribed fire is in or near a prescribed fire unit with sensitive habitat or species of concern.

2. **Off Site:**

   Attempts will be made to contact adjacent landowners if it appears that potential negative impacts could occur (smoke, escape onto private lands, noise, increased traffic etc.).

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

B. Notifications:

BURN NOTIFICATION CHECKLIST:		
Name/Agency	Phone	Date/Initials
Glenn County Air Pollution Control District	(530) 934-6500	
Mendocino National Forest Emergency Command Center (MNFECC)	(530) 934-7758	
Refuge Project Leader	(530) 934-2801	
Refuge Manager	(530) 934-2801	
Front Desk	(530) 934-2801	
Refuge Public Use Specialist/ Refuge Biologist	(530) 934-2801	
Regional FMO [redacted]	(916) 414-6508	
Willows Fire Department	(530) 934-3323	
Glenn County Roads Department	(530) 934-6530	
Glenn-Colusa Irrigation District	(530) 934-8881	
Maxwell Rural Fire Department	(530) 438-2320	
(If potential impacts to I-5 and/or County Road 68) California Highway Patrol	(530) 934-5424	
(If potential impacts to I-5 and/or County Road 68) California Department of Transportation (PIO)	(530) 741- 4572	

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

Smoke Impacts to Roads :
Prior to any prescribed fire operation, a thorough evaluation will be conducted to determine if there could be potential smoke impacts to roads and highways. This will be accomplished by ensuring that the requested Spot Weather Forecast does not have predicted winds that could push smoke onto the interstate. If it is determined that the selected unit to be burned is either far enough away and/or the winds will not be a factor, the project will be initiated in a manner that will:

a. Allow for the ability to shut down burn operations if impacts occur
AND
b. Have a written plan in the IAP for if smoke impacts occur.

C. Method and Frequency for Obtaining Weather and Smoke Management Forecast(s):
Weather forecasts (general) will be observed 2-3 days prior to burning. A spot weather forecast will be obtained no later than the morning of the burn from the Sacramento NWS office via the internet or fax. http://spot.nws.noaa.gov/cgi-bin/spot/spotmon?site=sto. Observations will be made by either a handheld weather device or by utilizing the Sac NWR (NWRC1) RAWS. On site weather observations will be taken pre-burn, post-burn, or as conditions warrant.

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 10: BRIEFING

Briefing Checklist:

- ☐ Burn Organization
- ☐ Burn Objectives
- ☐ Description of Burn Area
- ☐ Expected Weather & Fire Behavior
- ☐ Communications
- ☐ Ignition plan
- ☐ Holding Plan
- ☐ Contingency Plan
- ☐ Wildfire Conversion
- ☐ Safety

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 11: ORGANIZATION AND EQUIPMENT

A. Positions:

Any prescribed fire within the project area will consist of a Burn Boss (RXB2) and 1 igniter as a minimum.

B. Equipment:

Minimum required equipment on any prescribed fire within the project area will be a Type VI engine, a weather monitoring device and cell phone.

C. Supplies:

EQUIPMENT	MINIMUM #	EQUIPMENT	MINIMUM #
Belt Weather Kit	**1**	Drip Torch	**1**
Cellular Phone	**1**	Drip Torch Fuel	**15 gallons min.**
IAP/Maps	**1 per module**	Portable Radio	**1 per module**

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 12: COMMUNICATION

A. Radio Frequencies

1. **Command Frequency(s):**

   Mendocino National Forest (MNF) Forest Net (169.975 TX, 169.175 RX) or alternate as requested by Mendocino National Forest Emergency Communication Center (MNFECC).

2. **Tactical Frequency(s):**

   National Interagency Fire Center (NIFC) Tac 3 or alternate as assigned by Burn Boss on day of implementation.

3. **Air Operations Frequency(s):**

   NA

B. Telephone Numbers:

SEE BURN NOTIFICATION CHECKLIST ON PAGE 15.

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 13: PUBLIC AND PERSONNEL SAFETY, MEDICAL

A. Safety Hazards:

Prior to implementing any prescribed fires within the project area, the following hazards will be assessed:

- Road Conditions and Access
- Power lines
- Boat safety (If over water prescribed burning)
- Thorough scouting of the unit to be burned for any materials that could cause damage or injury (old fences, fence posts, old cement pads, etc).
- If burning units near public roadways, look for potential hazardous materials such as plastics, rubber materials, and drug manufacturing chemicals (meth dumps)
- Potential for Unexploded Ordinance (UXO) in hunting areas.
- Ditches, canals, and potential wet spots.

B. Measures Taken to Reduce the Hazards:

A thorough briefing will be conducted prior to any operation which will cover all identified hazards that exist in and around the project area.

C. Emergency Medical Procedures:

Minor injuries will be handled at the scene. Major injuries will be handled by local medical facilities with a call to 911 from a cell phone. The MNFECC will then be notified. At least 1 first aid trained individual will be on scene during any prescribed fire within the project area. If an injury requires evacuation to a medical facility by helicopter, the burn boss will assume the position of IC and will coordinate with dispatch and the aviation asset assigned to the emergency. The following information may be utilized for a medivac operation:

Sacramento NWR- Potential Helispot Locations		
Location	**Latitude**	**Longitude**
Dam 1	39.4366°	-122.163°
Hunter Check Station	39.4041°	-122.174°
Gravel Area south of barracks	39.4309°	-122.184°
Gravel area to the west of Observation Deck	39.4221°	-122.147°

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

Coordination with incoming Medivac or Ground Ambulance will be done using the CALCORD frequency (156.0750)
CALCORD can be found on refuge fire BK Digital Radios (Handheld and Mobile) on Bank 2, Channel 15

Helispot location options will vary according to fuel and site conditions. Selection of alternate sites will be at burn boss discretion and may be discussed prior to implementing any prescribed fire within the project area.

D. Emergency Evacuation Methods:

Personnel with minor injuries that require transportation will be done by government vehicle. Personnel with more serious injuries will be transported by ambulance. See above for medivac procedures.
Enloe Ambulance- Willows (530)934-4556

E. Emergency facilities:

The nearest medical facility is located in Willows, CA, at Glenn Medical Center.
Ph. (530)934-1800.

The nearest burn facility is located in Davis, CA at UC Davis Medical Center.
Ph. (800)862-5433

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 14 TEST FIRE

A. Planned location:

The exact location of the test fire will be determined by the burn boss on the day of the burn. The most likely location will be a suitable, downwind location within the representative fuel identified within the prescribed fire site.

B. Test Fire Documentation:

1. **Weather conditions On-Site:**

   Prior to ignition of the test fire, the burn boss will determine if the conditions are within the prescription of the burn plan. A belt weather kit will be utilized to record temperature, wind, and relative humidity.

2. **Test Fire Results:**

   The results of the test fire will be recorded and placed in the project file. In the event that the burn boss determines that the fire behavior exhibited by the test fire will not meet the objectives within the burn plan, the test fire will be extinguished and the prescribed fire will not proceed.

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 15: IGNITION PLAN

A. Firing Methods:

Hand firing, ATV torch, Boat, or any combination thereof.

B. Devices:

Any combination and use of several types of hand held firing devices. These could include fusees, drip torches, or Quoin™ Gun or version thereof.

C. Techniques:

Any combination of strip head, flanking, backing, or spot firing may be used in order to achieve the goals and objectives of the burn.

D. Sequences:

The sequence will be determined by the burn boss and will be dependant on environmental conditions on the day of the burn.

E. Patterns:

The patterns to be used will be determined by the burn boss and will be dependant on the environmental conditions on the day of the burn. Patterns will be documented in the project file.

F. Ignition Staffing:

A minimum of one (1) igniter will be required but the number may be increased at burn boss discretion.

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 16: HOLDING PLAN

A. General Procedures for Holding:

Holding operations will be accessed prior to implementing any prescribed fire within the project area. Resources are generally placed to protect fire from spreading into areas outside the planned prescribed fire area. Holding resources will communicate with the burn boss and igniters and will control the speed of the firing operation.

WATER REFILL SOURCES: These areas will be identified prior to implementing any prescribed fire within the project area. These areas frequently change according to seasonality and habitat flood up conditions.

B. Critical Holding Points and Actions:

These areas will be identified in the pre-burn briefing. Critical holding points could include, but are not limited to, areas with heavy fuel loading and critical habitat bordering individual prescribed fire units.

C. Minimum Organization or Capabilities Needed:

Holding resources will be determined prior to implementing any prescribed fire within the project area. The following chart will be used by the Burn Boss as a guideline to aide in his/her decision making process. Holding needs may vary according to seasonality and fuel conditions.

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

Probability of Ignition Table

Shading (%)	Dry-bulb Temp. (F)	FINE DEAD FUEL MOISTURE (PERCENT)														
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Unshaded < 50%	110+	100	100	80	70	60	60	50	40	40	30	30	20	20	20	20	10
	100-109	100	90	80	70	60	60	50	40	40	30	30	20	20	20	10	10
	90-99	100	90	80	70	60	50	40	40	30	30	30	20	20	20	10	10
	80-89	100	90	80	70	60	50	40	40	30	30	20	20	20	10	10	10
	70-79	100	80	70	60	60	50	40	40	30	30	20	20	20	10	10	10
	60-69	90	80	70	60	50	50	40	30	30	20	20	20	20	10	10	10
	50-59	90	80	70	60	50	40	40	30	30	20	20	20	10	10	10	10
	40-49	90	80	70	60	50	40	40	30	30	20	20	20	10	10	10	10
	30-39	80	70	60	50	50	40	30	30	20	20	20	10	10	10	10	10
Shaded > 50%	110+	100	90	80	70	60	50	50	40	40	30	30	20	20	20	10	10
	100-109	100	90	80	70	60	50	50	40	30	30	30	20	20	20	10	10
	90-99	100	90	80	70	60	50	40	40	30	30	20	20	20	10	10	10
	80-89	100	80	70	60	60	50	40	40	30	30	20	20	20	10	10	10
	70-79	90	80	70	60	50	50	40	30	30	30	20	20	20	10	10	10
	60-69	90	80	70	60	50	40	40	30	30	20	20	20	10	10	10	10
	50-59	90	80	70	60	50	40	40	30	30	20	20	20	10	10	10	10
	40-49	90	80	60	50	50	40	30	30	30	20	20	20	10	10	10	10
	30-39	80	80	60	50	50	40	30	30	20	20	20	10	10	10	10	10

PI > 70% HIGH PROBABILITY OF SPOT FIRES

Recommended Minimum Holding Resources based on Probability of Ignition(PIG)		
Holding Level	**PIG**	**Recommended Resources**
Low	10%-30%	1 Type VI Engine
Med	31%-60%	1 Type VI Engine, 1 Type III Engine, Tractor w/Disc or Dozer* (Optional)
High	61%-100%	1 Type VI Engine, 2 Type III Engines, Water Tender, Tractor w/ Disc or Dozer*
* Dependant on habitat type and conditions		

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 17: CONTINGENCY PLAN

A. Trigger Points:

- The prescribed fire leaves Service lands or the planned ignition area onto private property.
- The fire behavior exceeds limits described in the prescribed fire plan and/or the fire is threatening to leave the planned unit boundary (fire behavior is not constrained).
- Smoke production must be reduced because of adverse air quality impacts (smoke impacts on roads).
- Local and/or geographic area fire activity escalates, contingency resources become committed, or holding forces are needed for re-assignment to other incidents.

B. Actions Needed:

The burn boss will order contingency resources through MNFECC. The burn boss may elect to have the contingency resources respond to either a staging area near the project or directly to the burn. The staging area will be at the refuge headquarters unless another location is specified by the burn boss and/or IC.

C. Additional Resources and Maximum Response Time(s):

The minimum offsite contingency will include:
One (1) Engine, any type, within 1 hour
One (1) Water Tender, any type, within 1 hour
One (1) Type III IC within 8 hours

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 18: WILDFIRE CONVERSION

A. Wildfire Declared By:

The burn boss will be responsible for declaring the project a wildfire. This may be done in consultation with the Regional Fire Management Coordinator, the Zone Fire Management Officer, the Agency Administrator or any combination thereof.

B. IC Assignment:

In the event that the burn is declared a wildfire, the Burn Boss will become the IC until he/she transitions with an equally or more qualified I.C.

C. Notifications:

	Main Contact Number	Alternate Phone Number
MNF Dispatch	(530)934-7758	(530) 934-1159
Glenn County AQMD	(530)934-6500	
If smoke impacts or potentially impacts Colusa County: Colusa County AQMD	(530)458-0590	
Project Leader	(530)934-2801	(530)510-6317
Fire Management, in order of preference.		
1. [redacted], RFMC	(916)414-6508	
2. [redacted], Deputy RFMC- Operations	(916)978-6181	(916)230-1730
3. [redacted], Deputy RFMC Fire Planner	(916)414-6483	(916)769-3918
Sacramento NWS (For Spot Forecast)	(916)979-3047	

D. Extended Attack Actions and Opportunities to Aid in Fire Suppression:

Depending on the time of year, much of the surrounding area may be in green up conditions or still in flooded condition. These natural and man made barriers can often be utilized to tie and anchor into.

WATER REFILL SOURCES: These areas will be identified prior to implementing any prescribed fire within the project area. These areas frequently change according to seasonality and habitat flood up conditions.

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 19: SMOKE MANAGEMENT AND AIR QUALITY

A. Compliance:

All regulatory compliance with current air quality standards will be adhered to. Requirements may be different depending on which Air Quality Management District (AQMD) is involved. The prescribed burn will be conducted only with approval from the AQMD. A call will be placed to the AQMD on the day of the burn to confirm the "Burn Day" status and to register the projected burn acres for the day.

B. Permits to be Obtained:

A smoke management plan (SMP) may be submitted to the local AQMD as per their requirements. Permit requirements may vary but a yearly permit is usually obtained.

C. Smoke Sensitive Areas/Receptors:

There are no identified receptors near the project area. All potential smoke sensitive areas are listed as potential impacted areas and are listed below.

D. Impacted Areas (Potential):

FEATURE: From Center Point of Refuge	DIRECTION	DISTANCE (Miles)
City of Willows	NW	≈ 7 miles
Interstate 5	W	≈ 1.5 miles
Road 60	N	≈ 3 miles
Road 68	S	≈ 1 mile
Hwy 99	W	≈ 1.25 miles

E. Mitigation Strategies and Techniques to Reduce Smoke Impacts:

The burn will be conducted on a confirmed and approved "Burn Day" as determined by and with permission from the local AQMD. All efforts will be made to utilize burning methods, burning techniques, and favorable environmental conditions to minimize smoke impacts.

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 20: MONITORING

A. Fuels Information (forecast and observed) Required and Procedures:

Fire behavior and post burn consumption will be visually accessed, recorded, and placed in the project file.

B. Weather Monitoring Required and Procedures:

A spot weather forecast will be requested prior to implementation of the burn. The current weather observation will be taken with a belt weather kit and recorded prior to the ignition of the test fire to determine if the project is in prescription. If the decision is made to proceed with the burn, weather observations will be taken pre-burn, post-burn or as conditions warrant.

C. Fire Behavior Monitoring Required and Procedures:

Photo documentation before, during, and after the project will be conducted as a minimum.

D. Monitoring Required To Ensure That Prescribed Fire Plan Objectives Are Met:

On site visual observations by the burn boss will determine if objectives are being met.

E. Smoke Dispersal Monitoring Required and Procedures:

Smoke dispersal will be monitored visually by the burn boss and burn personnel so as to determine direction and approximate speed and altitude (high or low). The burn boss will record this information on an as needed basis.

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

ELEMENT 21: POST-BURN ACTIVITIES

Post-burn Activities That Must be Completed:

Post burn activities will be determined by the burn boss at the completion of the burn. These activities may include mop up as necessary to meet air quality and smoke management requirements or to prevent fire from impacting areas as per the discretion of refuge management. Refuge manager will determine if rehab work is necessary.

Additional items that may need completing include:

- ☐ After Action Review (AAR) with personnel implementing the project.
- ☐ Recording acres burned with Glenn/ Colusa County AQMD.
- ☐ Recording acres burned with Mendocino ECC.
- ☐ Completion of any required post burn photography documentation.
- ☐ Recording of information for incident and personnel in the Incident Qualifications and Certification System (IQCS)
- ☐ Completion of U.S Fish and Wildlife Service Fire Management Information System (FMIS) reporting requirements.

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

APPENDICES

A. Maps: Vicinity and Project
B. Technical Review Checklist
C. Complexity Analysis
D. Job Hazard Analysis
E. Fire Behavior Modeling Documentation or Empirical Documentation (unless it is included in the fire behavior narrative in Element 7; Prescription)
F. Chart- Sacramento NWR Description of Unique Features
G. Chart- Sacramento Habitat by Fuel Type
H. Chart- Sacramento NWR List and Coordinates of Burn Units
I. Fuel Model Descriptions- Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model

Project Name: SACRAMENTO NWR BROADCAST RX

Unit Name: SACRAMENTO NWRC/ SACRAMENTO NWR

B: TECHNICAL REVIEWER CHECKLIST

PRESCRIBED FIRE PLAN ELEMENTS:	S /U	COMMENTS
C. Signature page	S	
D. GO/NO-GO Checklists	S	
E. Complexity Analysis Summary	S	
F. Description of the Prescribed Fire Area	S	
G. Goals and Objectives	S	
H. Funding	S	
I. Prescription	S	
J. Scheduling	S	
K. Pre-burn Considerations	S	
L. Briefing	S	
M. Organization and Equipment	S	
N. Communication	S	
O. Public and Personnel Safety, Medical	S	
P. Test Fire	S	
Q. Ignition Plan	S	
R. Holding Plan	S	
S. Contingency Plan	S	
T. Wildfire Conversion	S	
U. Smoke Management and Air Quality	S	
V. Monitoring	S	
W. Post-burn Activities	S	
Appendix A: Maps	S	
Appendix B: Complexity Analysis	S	
Appendix C: JHA	S	
Appendix D: Fire Prediction Modeling Runs	S	
Other		

S = Satisfactory U = Unsatisfactory

Recommended for Approval: Not Recommended for Approval:

[redacted] RxB1 6/19/08

Technical Reviewer Qualification and currency (Y/N) Date

☐ Approval is recommended subject to the completion of all requirements listed in the comments section, or on the Prescribed Fire Pl

Appendix D: Tract 17 Prescribed Fire Incident Action Plan, September 17, 2014.

INCIDENT ACTION PLAN

SAC T-17 RX

INCIDENT OBJECTIVE	1. Incident Name: Sacramento T-17 Upland	2. Date Prepared: 9/4/14	3. Time Prepared1400

4. Operational Period (Date/Time) 9/4/14-10/2014 1000 hrs

5. General Control Objectives for the Incident (Include Alternatives)

Objectives:

1) Provide for firefighter and public safety.
2) Maintain/rejuvenate quality "green browse" for ducks and geese in upland areas.
3) Reduce the hazard fuel loading.

Safety Considerations and Protection of Sensitive Features:

General:

1) Directly to the West is I-5
2) Highway 99w is to the East of the unit.
3) Road 68 is to the south of the unit
4) Driving on the roads could be hazardous.
5) There is a ditch that runs North and South along the East side
6) Watch your footing
7) Public could be traveling on the tour route to the North of the unit.

Public Safety: Public will be traveling I-5, County Road 68, and 99w.Minimize smoke impacts to the roads.

6. Weather Forecast for Operational Period: A spot weather and up to date general forecast will be available prior to ignition.

See Attached Document

7. General/Safety Message:

Safety is the NUMBER ONE PRIORITY! Watch for wind changes and spotting. Drivers watch ditches and soft ground.

8. Attachments (if attached)

- Organization List (ICS 203)
- Division Assignment Lists (ICS 204)
- Communications Plan (ICS 205)
- Medical Plan (ICS 206)
- Incident Map
- Traffic Plan

2 0 2	9. Prepared by [redacted]	10. Approved by (Incident Commander)

C:\DOCUMENTS\FORMS\MOBILE FORMS\ICS-202.MAS

U.S. Fish & Wildlife Service

Sacramento National Wildlife Refuge Complex *Tract 17*

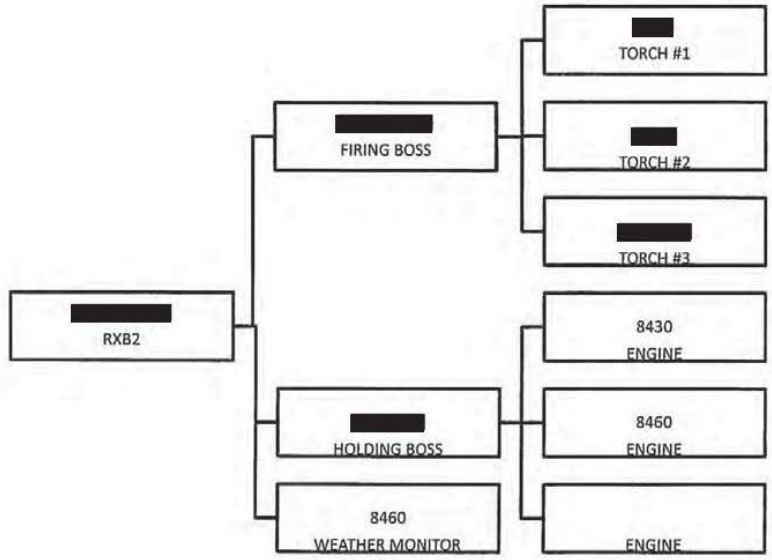
Sacramento Valley, California

Produced by Sacramento NWRC
Projection: UTM Zone 10N
Datum: NAD 84

0 0.1 0.2 0.4 Miles

N

PRESCRIBED FIRE ORGANIZATION



SACRAMENTO NATIONAL WILDLIFE REFUGE COMPLEX

MEDICAL PLAN	1. Incident Name	2. Date Prepared	3. Time Prepared	4. Operational Period
	SAC T17 Upland RX	9//4//2014	1100	DAY

8. Medical Emergency Procedures

Emergency Medical Procedures:

Minor injuries will be handled at the scene. Major injuries will be handled by local medical facilities with a call to 911 from a cell phone. The MNFECC will then be notified. At least 1 first aid trained individual will be on scene during any prescribed fire within the project area. If an injury requires evacuation to a medical facility by helicopter, the burn boss will assume the position of IC and will coordinate with dispatch and the aviation asset assigned to the emergency. The following information may be utilized for a medivac operation:

Sacramento NWR- Potential Helispot Locations

Location	Latitude	Longitude
Dam 1	39.4366°	-122.163°
Hunter Check Station	39.4041°	-122.174°
Gravel Area south of barracks	39.4309°	-122.184°
Gravel area to the west of Observation Deck	39.4221°	-122.147°

Coordination with incoming Medivac or Ground Ambulance will be done using the CALCORD frequency (156.0750)
CALCORD can be found on refuge fire BK Digital Radios (Handheld and Mobile) on Bank 2, Channel 15

Helispot location options will vary according to fuel and site conditions. Selection of alternate sites will be at burn boss discretion and may be discussed prior to implementing any prescribed fire within the project area.

Emergency Evacuation Methods:

Personnel with minor injuries that require transportation will be done by government vehicle. Personnel with more serious injuries will be transported by ambulance. See above for medivac procedures.
Enloe Ambulance- Willows (530)934-4556

Emergency facilities:

The nearest medical facility is located in Willows, CA, at Glenn Medical Center.
Ph. (530)934-1800.

The nearest burn facility is located in Davis, CA at UC Davis Medical Center.
Ph. (800)862-5433

Prepared by (Burn Boss)
[redacted]

ICS 206

National Weather Service Forecast Office
Sacramento, CA

Home News Organization FAQ Share Search • NWS ALL NOAA Go

Forecast by "City, St" or ZIP

Back to Main Page | Printer Friendly

Fire Weather Forecast for CAZ216

Go
RSS Feeds
Current Hazards
Watches / Warnings
Outlooks
Submit Report
Local Outlook
Current Conditions
Observations
Radar
Satellite
Precipitation
Soundings/Profilers
Other Observations
Forecasts
Forecast Discussion
Local Area
Activity Planner
Aviation Weather
Fire Weather
Marine Weather
Severe Weather
Hurricane Center
User Defined Area
Weather Tables
Hydrology
Rivers and Lakes
Other Hydro Info
Climate
Local
National
Drought
More...
Climate portal
Weather Safety
Preparedness
Weather Radio
SkyWarn™
StormReady
Weather Spotters
Additional Info
Items of Interest
Other Useful Links
Education Resources
COOP Observer
Our Office
Computer models
NWS News
Contact Us
Contact Info
Feedback
FAQ
USA.gov

FNUS56 KSTO 171200
FWFSTO

FIRE WEATHER PLANNING FORECAST FOR INTERIOR NORTHERN CALIFORNIA
NATIONAL WEATHER SERVICE SACRAMENTO CA
500 AM PDT WED SEP 17 2014

...LOCALLY GUSTY SOUTHERLY WINDS TODAY AND TONIGHT...

...SCATTERED SHOWERS AND ISOLATED THUNDERSTORMS THURSDAY...

.DISCUSSION...
APPROACHING WEATHER SYSTEM WILL SPREAD VARYING AMOUNTS OF CLOUDS ACROSS THE REGION TODAY ALONG WITH BRINGING LOCALLY GUSTY SOUTHERLY WINDS TO MUCH OF THE REGION. SHOWER CHANCES WILL INCREASE LATER TONIGHT AND THURSDAY AS THE WEATHER SYSTEM MOVES ONSHORE. SLIGHT CHANCE OF THUNDERSTORMS MAINLY THURSDAY AFTERNOON AND EARLY EVENING. WARMING AND DRYING WITH SOME NORTHERLY WINDS ARE POSSIBLE FRIDAY THROUGH THE WEEKEND AS WEATHER SYSTEM MOVES SOUTH AND HIGH PRESSURE REBUILDS.

CAZ216-180030-
CENTRAL SACRAMENTO VALLEY IN GLENN, COLUSA, YUBA, NORTHERN SUTTER, AND BUTTE COUNTY BELOW 1000 FT-
500 AM PDT WED SEP 17 2014

.TODAY...
* SKY/WEATHER.....MOSTLY SUNNY IN THE MORNING THEN BECOMING PARTLY CLOUDY.
* MAX TEMPERATURE.....85-90.
* 24 HR TREND.....LITTLE CHANGE.
* MIN HUMIDITY.....21-26 PERCENT.
* 24 HR TREND.....LITTLE CHANGE.
* 20-FOOT WINDS.....SOUTHEAST WINDS 6 TO 12 MPH.
* LAL.....1.
* CWR.....0 PERCENT.

.TONIGHT...
* SKY/WEATHER.....PARTLY CLOUDY WITH A SLIGHT CHANCE OF RAIN SHOWERS IN THE EVENING...THEN MOSTLY CLOUDY WITH A CHANCE OF RAIN SHOWERS AFTER MIDNIGHT.
* MIN TEMPERATURE.....61-66.
* 24 HR TREND.....LITTLE CHANGE.
* MAX HUMIDITY.....78-86 PERCENT.
* 24 HR TREND.....15 PERCENT UP.
* 20-FOOT WINDS.....SOUTH WINDS 7 TO 13 MPH. LOCAL GUSTS UP TO 25 MPH IN THE EVENING.
* LAL.....1.
* CWR.....20 PERCENT.

.THURSDAY...
* SKY/WEATHER.....MOSTLY CLOUDY. A CHANCE OF SHOWERS IN THE MORNING...THEN A CHANCE OF SHOWERS AND A SLIGHT CHANCE OF THUNDERSTORMS IN THE AFTERNOON.
* MAX TEMPERATURE.....76-81.
* MIN HUMIDITY.....49-64 PERCENT.
* 20-FOOT WINDS.....SOUTHEAST WINDS 4 TO 9 MPH.
* LAL.....1 INCREASING TO 2 IN THE AFTERNOON.
* CWR.....20 PERCENT.

.EXTENDED...

...SHASTA COUNTY MOUNTAINS AND COASTAL RANGE
.FRIDAY...A SLIGHT CHANCE OF SHOWERS AND THUNDERSTORMS. PARTLY CLOUDY. LOWS 49 TO 59. HIGHS 81 TO 91. NORTH WINDS UP TO 13 MPH.
.SATURDAY...MOSTLY CLEAR. LOWS 54 TO 64. HIGHS 83 TO 92. NORTHEAST WINDS UP TO 13 MPH.
.SUNDAY...MOSTLY CLEAR. LOWS 54 TO 64. HIGHS 83 TO 93. SOUTH WINDS UP TO 10 MPH.

...NORTHERN SIERRA AND LASSEN PARK
.FRIDAY...A SLIGHT CHANCE OF SHOWERS AND THUNDERSTORMS. PARTLY CLOUDY. LOWS 44 TO 54. HIGHS 72 TO 82. EAST WINDS 8 TO 18 MPH.
.SATURDAY...A SLIGHT CHANCE OF THUNDERSTORMS. MOSTLY CLEAR. LOWS 49 TO 59. HIGHS 75 TO 85. EAST WINDS 8 TO 18 MPH.
.SUNDAY...MOSTLY CLEAR. LOWS 49 TO 59. HIGHS 75 TO 85. NORTHEAST WINDS 5 TO 15 MPH.

...SIERRA NEVADA FOOTHILLS
.FRIDAY...A SLIGHT CHANCE OF THUNDERSTORMS. MOSTLY CLEAR. LOWS 56 TO 61. HIGHS 82 TO 90. WEST WINDS UP TO 10 MPH.
.SATURDAY...MOSTLY CLEAR. LOWS 60 TO 66. HIGHS 84 TO 90. SOUTH WINDS UP TO 13 MPH.
.SUNDAY...MOSTLY CLEAR. LOWS 61 TO 67. HIGHS 87 TO 92. SOUTHWEST WINDS UP TO 10 MPH.

...CENTRAL VALLEY AND DELTA
.FRIDAY...MOSTLY CLEAR. LOWS 59 TO 64. HIGHS 85 TO 93. WEST WINDS 8 TO 18 MPH.
.SATURDAY...MOSTLY CLEAR. LOWS 60 TO 66. HIGHS 87 TO 93. SOUTHWEST WINDS 8 TO 18 MPH.
.SUNDAY...MOSTLY CLEAR. LOWS 60 TO 66. HIGHS 90 TO 95. SOUTHWEST WINDS UP TO 13 MPH.

Webmaster
US Dept of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
Sacramento Weather Forecast Office
Sacramento, CA
Tel: (916) 979-3051

Disclaimer
Information Quality
Credits
Glossary
Organization

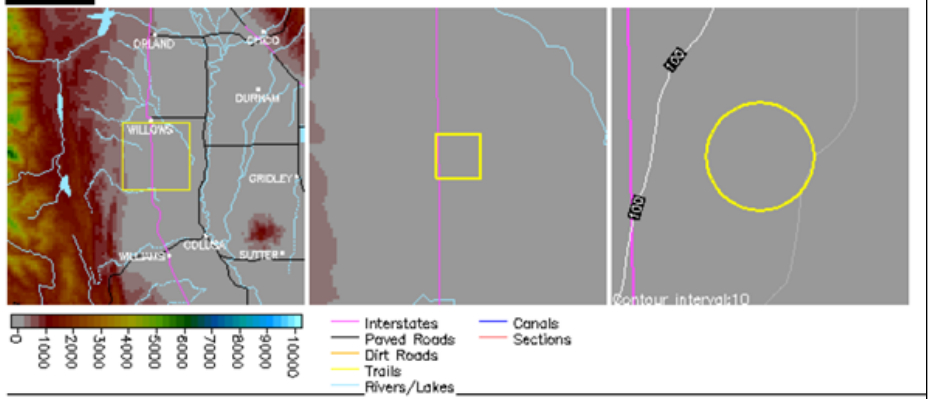
Privacy Policy
Freedom of Information Act
About Us
Career Opportunities

Appendix E: Spot weather forecast for Tract 17 prescribed burn, September 17, 2014.

T- 17 Upland Rx (Proposed ignition time: 1000 PDT 9/17/14) (Requested: 1533 PDT 9/14/14)

Forecast complete at 339 PDT 9/17/14

Requested by: US Fish and Wildlife Service Phone:(530) 510-6339 FAX:(530) 934-7814 Contact [redacted]



Location: Legal: Lat/Lon:39.42/122.18166 Quad:

Calculated:(39.42°N 122.18166°W)(LOGANDALE CA)

Elevation:150 Drainage:unknown Aspect:Flat Size:233

Fuel Type:Grass (Unsheltered)

Observations:

Place Elev Time Wind Temp Wetbulb RH Dewpt Remarks

Requested Parameters **Remarks**

XXX Sky / Weather
XXX Temperature
XXX Relative Humidity
XXX 20-ft Wind
... Ridge Top Wind
XXX Chance of Wetting Rain
XXX Lightning Activity Level
XXX Smoke Dispersion

Can you please use the SAc NWRC Raws. ID: NWRC1 NAME: SAC NWR LATITUDE: 39.417222 LONGITUDE: -122.1825 I would like to have this by 0800. Thank You!

FORECAST:

IF CONDITIONS BECOME UNREPRESENTATIVE,
CONTACT THE NATIONAL WEATHER SERVICE.

SPOT FORECAST FOR T- 17 UPLAND RX...US FISH AND WILDLIFE SERVICE
NATIONAL WEATHER SERVICE SACRAMENTO CA
339 AM PDT WED SEP 17 2014

FORECAST IS BASED ON IGNITION TIME OF 1000 PDT ON SEPTEMBER 17.
IF CONDITIONS BECOME UNREPRESENTATIVE...CONTACT THE NATIONAL WEATHER SERVICE.

.DISCUSSION...
AN UPPER LEVEL LOW PRESSURE SYSTEM WILL BE MOVING INLAND LATER TODAY AND CONTINUING TO IMPACT THE AREA THURSDAY BEFORE DROPPING SOUTHEASTWARD. THIS WILL BRING COOLER TEMPERATURES TODAY AND

ESPECIALLY TOMORROW AS THE COOLER AIR MASS WITH INCREASED ONSHORE FLOW MOVES OVER THE REGION. WINDS SHOULD INCREASE LATER THIS AFTERNOON AS THE SYSTEM MOVES INLAND, WITH SOUTHERLY GUSTS UP TO 25 TO 30 MPH OVER THE SPOT. IN ADDITION, HUMIDITY VALUES WILL INCREASE TONIGHT AND INTO THURSDAY WITH A POSSIBILITY OF SHOWERS AND THUNDERSTORMS OVER THE BURN AREA BEGINNING AS EARLY AS WEDNESDAY AFTERNOON WITH THE THREAT CONTINUING INTO THURSDAY AFTERNOON. BEST CHANCE FOR SHOWERS AND THUNDERSTORMS OVER THE BURN AREA WILL BE EARLY THURSDAY MORNING. WARMER TEMPERATURES AND LOWER HUMIDITIES ALONG WITH NORTHERLY WINDS ARE EXPECTED FRIDAY AND INTO THE WEEKEND AS THE LOW EXITS THE REGION.

.TODAY...

SKY/WEATHER.....MOSTLY SUNNY IN THE MORNING THEN BECOMING PARTLY CLOUDY.
MAX TEMPERATURE.....85-90.
MIN HUMIDITY.....23-27 PERCENT.
WIND (20 FT).....
SLOPE/VALLEY.....VARIABLE WINDS UP TO 6 MPH BECOMING SOUTHERLY 10 TO 15 MPH AFTER NOON. LOCAL GUSTS 25 TO 30 MPH POSSIBLE IN THE AFTERNOON.
CWR.....10 PERCENT.
LAL.....1.
MIXING HEIGHT.....INCREASING TO 5800 FT AGL EARLY IN THE AFTERNOON.
MIXING WINDS.....SOUTH 15 TO 20 MPH.

.TONIGHT...

SKY/WEATHER.....PARTLY CLOUDY WITH A SLIGHT CHANCE OF SHOWERS IN THE EVENING...THEN MOSTLY CLOUDY WITH A CHANCE OF SHOWERS AFTER MIDNIGHT.
MIN TEMPERATURE.....59-64.
MAX HUMIDITY.....90-95 PERCENT.
WIND (20 FT).....
SLOPE/VALLEY.....SOUTHEAST WINDS 7 TO 12 MPH. GUSTS UP TO 20 MPH IN THE EVENING.
CWR.....40 PERCENT.
LAL.....1.
MIXING HEIGHT.....DECREASING TO LESS THAN 100 FT AGL EARLY IN THE EVENING.
MIXING WINDS.....SOUTHEAST 10 TO 15 MPH.

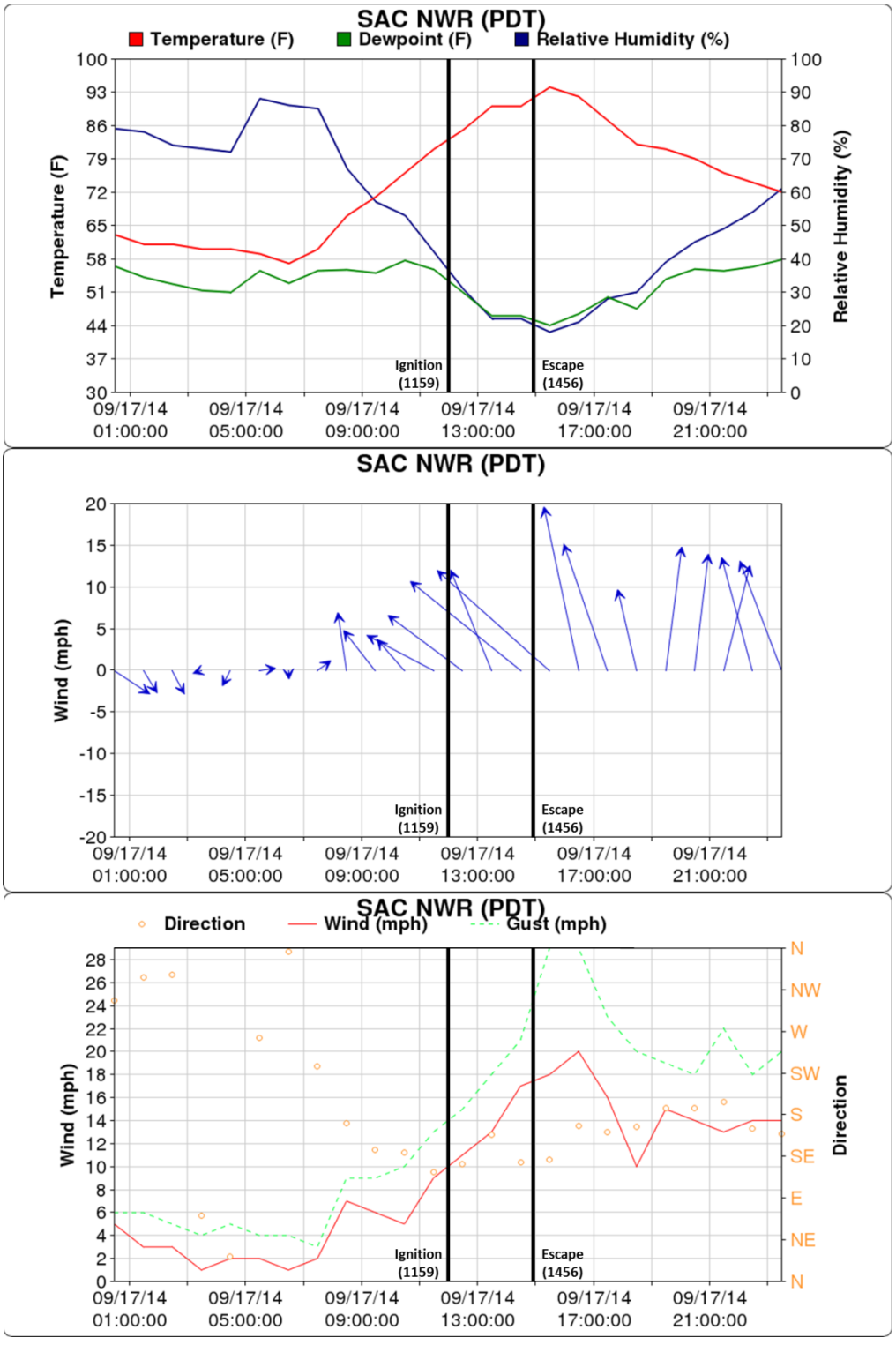
.THURSDAY...

SKY/WEATHER.....MOSTLY CLOUDY. A CHANCE OF SHOWERS.
MAX TEMPERATURE.....78-83.
MIN HUMIDITY.....53-58 PERCENT.
WIND (20 FT).....
SLOPE/VALLEY.....SOUTHEAST WINDS 7 TO 12 MPH BECOMING SOUTHERLY UP TO 6 MPH AFTER 1000.
CWR.....40 PERCENT.
LAL.....2.
MIXING HEIGHT.....INCREASING TO 6700 FT AGL.
MIXING WINDS.....SOUTHEAST 6 TO 11 MPH.

FORECASTER. [redacted]
REQUESTED BY. [redacted]
REASON FOR REQUEST...PRESCRIBED

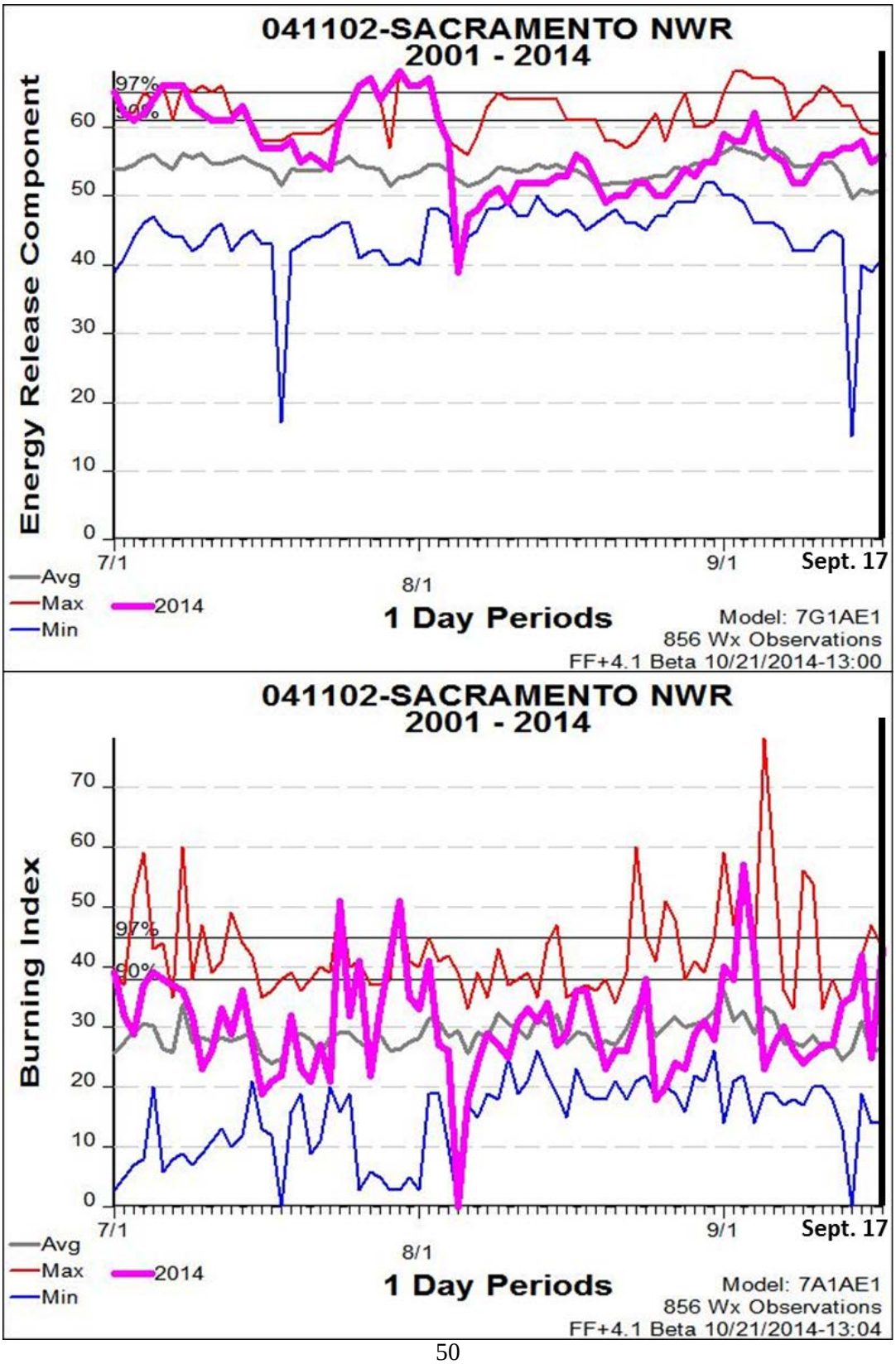
Appendix F: Sacramento NWR RAWS Data, September 17, 2014

Figure 5. Weather conditions on September 17, 2014 from the Sacramento NWR Remote Automated Weather Station (41102). Vertical black lines indicate the time of ignition and escape. The burn prescription called for air temperature 40-100°F, relative humidity 20-100%, mid-flame wind 0-12 mi/hr from any direction, and 20-ft wind 0-20 mi/hr from any direction.



Appendix G: Energy Release Component and Burning Index Charts

Figure 6. Energy Release Component and Burning Index from the Sacramento NWR Remote Automated Weather Station (41102).



Appendix H: Seasonal Weather Outlooks

Figure 7. U.S. Monthly Drought Outlook, September 2014.

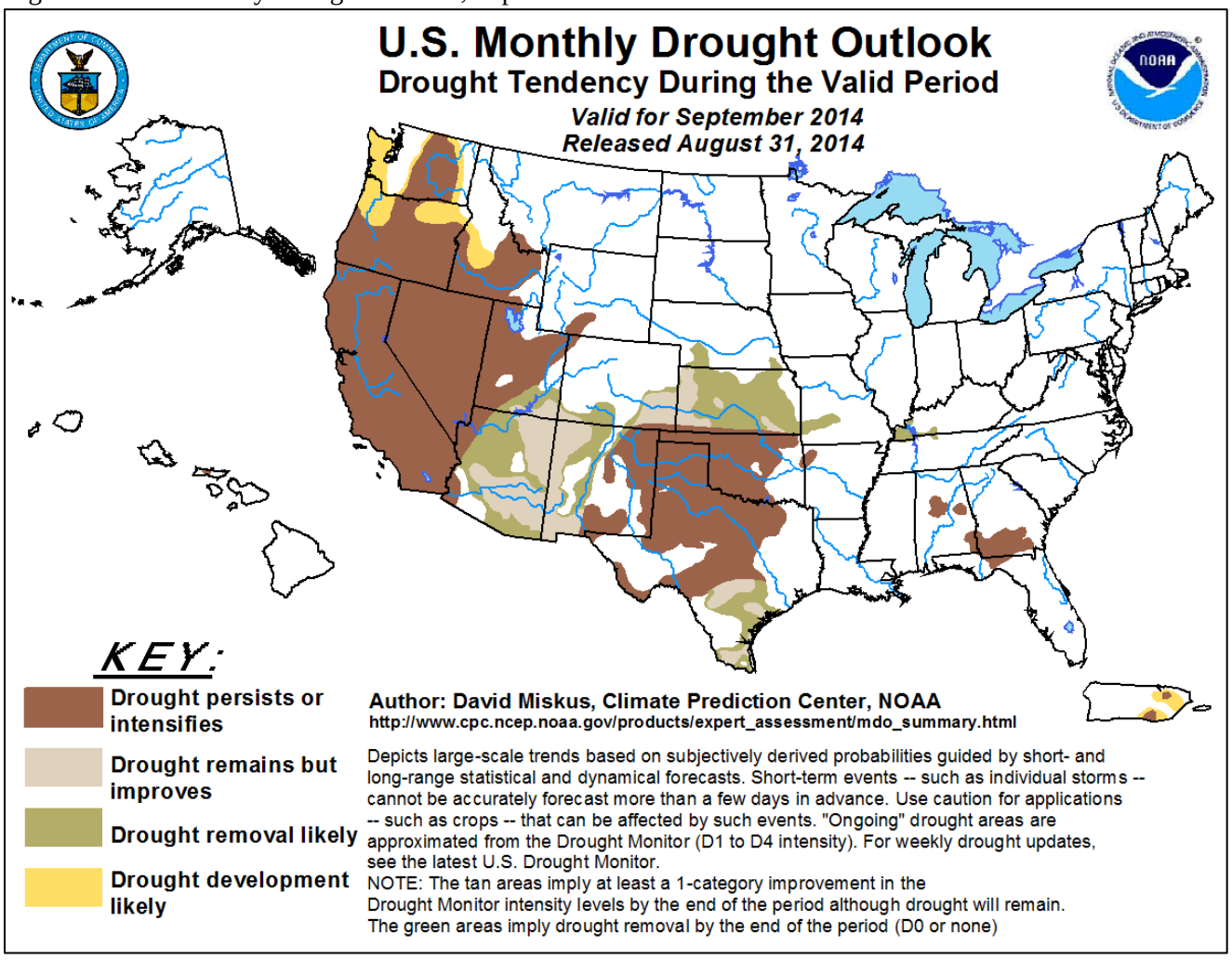


Figure 8. U.S. Drought Monitor for California, September 16, 2014.