

---

# **SANFORD PRESCRIBED FIRE REVIEW**

---

---

**MARCH 14, 2003**

---

# CONTENTS

*“The greatest percentage of the Sanford Fire burn area was in country that needed to burn. Now, new growth will come in and flourish there. I don’t blame the Forest Service for anything. Sure, the fire got away, but—due to excessive fuel accumulation up there—one lightning strike could have done the same thing. That’s why I encourage prescribed burning—you have so much more control over it.”*

Wallace Ott  
Tropic Resident  
At the Feb. 24, 2003 Sanford Fire Review  
Public Town Hall Meeting

---

<b>I Executive Summary</b>	<b>3</b>
<b>II Introduction</b>	
Leadership in Introducing Landscape-Scale Prescribed Fires	5
Intermountain Region Requests Sanford Prescribed Fire Review	6
Review Team Process	6
<b>III Issues</b>	
Findings, Lessons Learned, Recommendations and Commendations	8
<b>IV Conclusion</b>	<b>21</b>
<b>V Team Members</b>	<b>23</b>
<b>VI Appendices</b>	
Appendix I – Sanford Prescribed Fire Chronology	24
Appendix II – Enterprise Energy Release Component Analysis	29

---

# I EXECUTIVE SUMMARY

## Lessons Learned

- Burn plans need to incorporate a drought indicator to signal when natural fuel breaks—such as moisture differentials—will no longer work.
- Landscape-level burning requires a delicate balance between sufficient detail to adapt to changing situations over time, while still allowing sufficient flexibility for the Burn Boss and Line Officer to manage the project effectively to meet the resource objectives within the prescription parameters.
- All requirements, limitations, objectives, mitigation measures and written expectations constitute “the prescription.” If any of these requirements are not met at any time between the period of ignition and when the fire is officially declared out, the project is considered “out of prescription”—triggering contingency actions and the 48-hour policy.
- The Wildland Fire Situation Analysis process works and should continue to be followed to take the appropriate suppression strategy that ensures firefighter and public safety with the least cost and damage to resources.
- The Dixie National Forest has done an excellent job implementing the Utah Fire Amendment. The Dixie’s Fire Management Plan is well done and meets all requirements. Burn plans need to specifically incorporate requirements and mitigation measures from the Environmental Assessment and Decision Notice.
- A comprehensive communication plan is essential.
- Landscape level, long duration prescribed fires should require daily revalidation of the “Go/No-Go” checklist by the assigned Burn Boss until the fire is declared out.

## Commendations

The Dixie National Forest is commended for:

- Its efforts during 2002 to ensure firefighter and public safety.
- Operating a long-term successful prescribed fire program.

The individuals in the Forest’s prescribed fire program are recognized locally and regionally for their expertise and professionalism. Many individuals and organizations who were critical of the Sanford Fire still recognized the good work of the Dixie over the years. These people openly encourage the Forest to continue its active prescribed fire program.

- An ongoing, in-depth examination of its prescribed fire program in the aftermath of the Sanford Prescribed Fire escape. The Forest has already initiated numerous improvements to an already top-notch prescribed fire program.

- Its successful utilization of the Wildland Fire Situation Analysis process.

The Forest should continue to follow appropriate suppression strategies that ensure firefighter and public safety with the least cost and damage to resources.

- An excellent job implementing the Utah Fire Amendment.

The Dixie's Fire Management Plan is well done and meets all requirements.

The Sanford Prescribed Fire Review Team would also like to offer special commendation to the Dixie National Forest for its hospitality and willingness to have open and frank discussions during the entire review process. The Forest provided the Review Team with all information that was requested.

The Review Team especially thanks Fire Management Officer Brett Fay.

## II INTRODUCTION

*“There are, of course, many important lessons to be learned from this experience. It is your team’s assignment to unearth those ‘lessons learned’ so we can improve our prescribed burning expertise and performance.”*

**Jack Troyer, Regional Forester  
Intermountain Region**

*“Our prescribed burn program is critical to the Dixie National Forest. We are hopeful this review will look at ‘lessons learned’ and that it will be as critical as possible to help us improve our burn program. We are hopeful it will also extract from the public and our cooperators, what went wrong. We have already taken in lots of lessons learned. But there’s still more to do.”*

**Steve Robertson, Acting Forest Supervisor  
Dixie National Forest**

### **Leadership in Introducing Landscape-Scale Prescribed Fires**

The Dixie National Forest has a long-standing history of successfully implementing prescribed fire and suppression programs. The Forest’s safety record has been exemplary. The Forest is known Region-wide for its aggressive and innovative prescribed fire program. In particular, the Dixie National Forest is recognized for its leadership in introducing landscape-scale prescribed fires.

On April 22, 2002, the planned 1,500-acre Sanford Prescribed Fire was ignited on the Dixie National Forest’s Powell Ranger District. On May 13, eleven miles southeast of the Sanford prescribed fire project, the planned 2,000-acre Adams Head prescribed fire was ignited.

By June, these two prescribed fires escape their containment boundaries and become the 78,000-acre Sanford Wildland Fire. \$6 million is spent suppressing this wildfire. Impacts include mortality to a Bonneville cutthroat trout fishery and to a highly valued recreation fishery in the East Fork Sevier River. A total of \$160,000 is invested in burned area emergency rehabilitation efforts.

This extreme fire activity is uncharacteristic of past fire behavior here. Fire records for this area dating from 1970 indicate the largest wildfire on the Powell District previous to 2002 was only 100 acres in size.

*“We would like to hear from you on what you think worked, what you think didn’t work, and—most importantly for us—can you identify things you would like to have seen done differently. This way, in the future, we can avoid any errors that might have been made during the Sanford burn.”*

**Scott Conroy, Review Team Leader  
Speaking to local area residents at the  
Sanford Fire Review Town Hall Public Meeting**

---

### **Intermountain Region Requests Sanford Prescribed Fire Review**

To ensure its longstanding, successful prescribed fire program continues to move forward, the Dixie National Forest requests an “outside” review of this prescribed fire. On January 29, 2003, Jack Troyer, Intermountain Regional Forester, authorizes the Sanford Prescribed Fire Review Team to determine “lessons learned” from this event.

Specifically, the Review Team is asked to:

- Target its report findings for Regional as well as National application.
- Key its review objectives to before and during the Sanford Prescribed Fire, as well as after this prescribed fire escaped and transitioned to a wildfire.
- Answer four crucial questions:
  1. What did the Dixie National Forest set out to do with this prescribed burn?
  2. What actually happened?
  3. Why did it happen?
  4. If we could do this prescribed fire over again, what would we do differently?

### **Sanford Prescribed Fire Review Team Process**

The Review Team spent the week of Feb. 24-28 on the Dixie National Forest interviewing key personnel, researching, examining decision-making processes, and reviewing all materials relevant to the Sanford Prescribed Fire.

This review process included:

- Dixie National Forest and Regional Office Briefing.

*Steve Robertson, Acting Forest Supervisor; Dave Thomas, Fuels Specialist, Regional Office Fire, Aviation, and Air Management; Brett Fay, Forest Fire Management Officer; Kim Soper, East Zone Fire Management Officer and Sanford Prescribed Fire Burn Boss; Frances Reynolds, Forest Public Affairs Officer; Priscilla Summers, Acting Powell District Ranger.*

- Interviewing Key Cooperators.

*Ron Larsen, Area Forester, Utah Division of Forestry, Fire, State Lands; Bruce Bonebrake, Mike Ottenbacher, and Adam Bronson, Utah Division of Wildlife Resources; Chris Simonson, Fire Management Officer, Cedar City District, Bureau of Land Management; Paul Briggs, Fuels Group Manager, Cedar City District, Bureau of Land Management.*

- Attending Sanford Fire Review Town Hall Public Meeting.

*Twenty area residents expressed comments and concerns regarding the Sanford Prescribed Fire—both pro and con—to the Review Team.*

- Personal interviews with key individuals involved in the planning and execution of the Sanford Prescribed Fire project as well as fire suppression activities.
-

### **III ISSUES**

## **FINDINGS, LESSONS LEARNED, RECOMMENDATIONS AND COMMENDATIONS**

#### **Issue**

**Was planning for the Sanford Prescribed Fire adequate and within the scope of the Dixie National Forest's Land Management Plan?**

**Was the Environmental Assessment properly prepared and followed?**

**Was mitigation identified in the Environmental Assessment carried forward into the Prescribed Burn Plan?**

#### **Findings**

The Utah Fire Amendment Project Decision Notice amended the Dixie National Forest's Land Management Plan (LMP) on May 7, 2001. This amendment provides management direction that addresses suppression of unwanted wildland fire and identifies where prescribed fire and wildland fire use are authorized.

The amendment considers the potential risk of fire use and smoke impacts to communities. It promises close coordination with communities impacted by fire and smoke and close coordination with State and Federal managers. It also recognizes that not implementing treatments could eventually result in uncharacteristically large wildland fires with smoke impacts and lost resource values far worse than planned fuel reduction project effects.

The Dixie National Forest's Fire Management Plan (FMP) was updated in 2002 to implement the decisions in the LMP amendment. The Fire Management Plan identifies information and mitigation required by law, regulation, policy, and the LMP—including for threatened and endangered species, cultural resources, air quality, and water quality. The Fire Management Plan is the guiding document for planning and implementing prescribed burns.

The Forest Supervisor approved the Sanford and Adams Head/Mount Dutton Decision Notices for the Sevier Plateau Fire Management Project in 1999 and 2001, respectively. These decisions allowed management-ignited fire within the Sanford Fire Management Area for 15,100 acres and within the Adams Head/Mount Dutton Fire Management Areas for 26,500 acres.

These Environmental Assessments have mitigation measures prohibiting prescribed fires in riparian areas, limiting the extent of acres burned in watersheds, limiting the size of burned patches to 200 acres, requiring unburned buffers along drainages, and requiring a mosaic of burned and unburned vegetation. The Environment Assessments also require a public information plan



to notify people of burning, and the monitoring of smoke impacts on sensitive zones during project implementation.

Additionally, while these documents recognize the presence of the Bonneville Cutthroat trout in Deep Creek within the Fire Management Unit, they predict “no impact” from prescribed fire activities. This is because there was no plan to burn Deep Creek and no expectation that the fire would burn that far to the north.

The Environmental Assessments were developed by interdisciplinary teams and generally did a good job of addressing the issues and effects of the proposed burns and meeting the requirements of the Dixie Fire Management Plan. They did not address weather and fire behavior monitoring as required by the Fire Management Plan.

The Burn Plans *did not* incorporate most of the mitigation measures from the Environmental Assessments. Implementation of the mitigation measures depended on the burn crews’ knowledge of the Environmental Assessments that were approved from one to three years before project implementation.

With one exception, the District did not consult members of the planning Interdisciplinary Team or their successors before or during the prescribed burning operations. The District Wildlife Biologist, who had been on the District for four months was consulted.

The following were violated during the prescribed burning operations: mitigation measures in the Environmental Assessments relating to drainage buffers, protection of riparian areas, and patch size.

### **Commendation**

- The Dixie National Forest has done an excellent job implementing the Utah Fire Amendment. The Dixie’s Fire Management Plan is well done and meets all requirements. The interdisciplinary planning process is working well on the forest.

### **Recommendation**

- Burn plans should specifically incorporate requirements and mitigation measures from the Environmental Assessment and Decision Notice.
- The resource specialists from the Interdisciplinary Team should review the burn plan to ensure it adequately incorporates the Environmental Assessment’s requirements.
- The Interdisciplinary Team should be consulted during prescribed burn implementation to evaluate whether or not the burn is meeting resource objectives—a key consideration in deciding whether the burn is in prescription. This is particularly important on long duration, large landscape burns that have the potential for significant changes in conditions (such as weather) during the duration of the burn.

## Issue

**Did the Environmental Analysis account for the potentially adverse effects of smoke on tourism as well as human health?**

## Finding

The Environmental Analysis for both the Sanford and Adams Head prescribed fires addressed air quality. Both documents stated that potential health effects were expected to be limited to discomfort from the prescribed burns' smoke. They also said the prescribed burns were not expected to result in serious health concerns to citizens in surrounding communities.

While tourism was not explicitly addressed in either Environmental Assessment, local and regional use (i.e., recreation, scenic viewing) was discussed as a popular activity that would be negatively impacted by the prescribed burn.

The primary impact was identified as temporary impairment of visibility, predicted to be slight and short term. Neither Environmental Assessment limited the timing of prescribed burning (e.g., fires could be lit during spring, summer, and fall).

The Review Team found that while analysis of smoke impacts was adequately addressed in these environmental analysis documents, monitoring or mitigation tasks identified in each were not implemented. Specific examples:

1. *“Proposed fire management activities should not be implemented during periods when air quality in area is being impacted by other activities such as wildland fires or adjacent management ignited burns.”*

This statement implies that the Forest Service communicated directly with other agencies regarding potential burning activities occurring during this same time. This, however, did not occur. Dixie Forest fire staff assumed that this step was adequately completed by having their smoke burning permit granted by the state.

2. *“Other sites adjacent to the analysis area will be considered smoke sensitive zones where the impacts of smoke on air quality will be monitored during implementation of fire management activities. These smoke sensitive zones are of concern related to public health and safety.”*

Smoke monitors were not placed out at the six sensitive areas and no data was collected during the prescribed burn. On June 17, well after the fire was declared an escaped prescribed fire, four smoke monitors were placed at Teasedale, Tropic, and Antimony. Data, collected for approximately one month, did not show a violation of the national ambient air quality standards (Clean Air Act).

## Recommendation

- Develop a smoke monitoring plan specific to each burn plan that incorporates the analysis of smoke impacts in the environmental analysis.

---

## Issue

**Are there techniques available that could have helped evaluate the probability of the high wind events that occurred in the spring of 2002?**

## Finding

Data is available to describe historical weather patterns for the Region but was not consulted by the District prior to igniting the prescribed burns. Historical seasonal weather data (i.e., temperature, wind speed, etc.) is available for the Dixie National Forest through Kansas City FAST (Fire Analysis Software), and regionally through similar FAST data centers. In the case of windspeed, both daily (i.e., one reading taken at approximately the same time) and hourly readings are available for the past 5-15 years (depending upon the weather station).

The unusual wind events that occurred in June 2002 exceeded the previous maximum wind speeds recorded from 1997-2001. While existing data can be helpful to evaluate the probability of high wind events, new maximum limits can be established.

The Review Team, however, did not have adequate time to visually assess the maximum hourly wind speeds. Thus, at this time, it is not known if more detailed information would have provided insight to spring wind patterns. At the writing of this review, the Forest had acquired the hourly weather observations data and was beginning to analyze it.

## Commendation

- The Dixie National Forest Fire Management Officer has identified acquisition of historical seasonal weather data as a need. In addition, he has been in contact with the Desert Research Institute in Reno regarding modeling the probability of wind events (i.e., winds greater than 15 mph generated by weather systems) within a given time frame.

## Recommendation

- The Regional Office should provide additional guidance to the Forests for conducting high wind event probability analysis.

---

## Issue

**Is the existing process for technical review and coordination with resource specialists in developing and implementing Prescribed Burn Plans adequate?**

## Finding

While the Forest does have a Prescribed Burn Plan review process, the process for reviewing Intermediate Complexity Prescribed Burn Plans is lacking.

There is confusion about the roles and responsibilities of Forest-level personnel for ensuring the technical adequacy of Prescribed Burn Plans, as well as compliance with Forest, Regional, and National policy.

### **Recommendation**

- Prior to their approval, the Dixie National Forest Headquarters should consider reviewing all prescribed burn plans for technical adequacy.

### **Finding**

Some resource specialists feel excluded from evaluating the achievement of resource objectives in the prescribed burns and were not involved in determining whether or not the prescribed burns were within prescription.

### **Recommendation**

- Resource specialists should be involved in evaluating the success of the burn in achieving resource management objectives.
- These specialists should also be consulted during the fire when it involves long-duration, landscape-level prescribed burns.

---

### **Issue**

**Was public involvement and flow of information from initial NEPA planning through implementation adequate and consistent?**

### **Finding**

While the public was notified and involved during the scoping process (via letters to individuals, public meetings, etc.), very little notification apparently took place prior to and during implementation of the burn. Inconsistent involvement created a perception among members of the local publics that their opinions and input were not valued.

Public meetings were also held after the burn was declared escaped. In addition, key contacts were established in local communities. Notices were distributed to the news media.

Currently, the Forest allows Ranger Districts to manage public information locally without close oversight from the Forest Public Affairs Officer. The District Ranger in place at the time of the Sanford Prescribed Fire practiced a management style that did not include involving the public. Rather, when implementation of the project began, this individual preferred a “keep-the-lid-on-it” approach.

The Forest Public Affairs Office was not involved until the Sanford Prescribed Fire was declared escaped. Information gathered during interviews suggests that the Forest underestimated the need and importance of public involvement during this incident.

At the Feb. 24, 2003 public meeting, residents voiced concerns about lack of notification of implementation as well as the duration of smoke created by the burn. Many also expressed concerns over loss of tourism in an area that relies on visual quality as an attraction.

Some of these complaints may have been exaggerated based on a significant decrease in visitor use to the area (trend), as well as local observations of businesses that were busy even though they claimed they had no business.

Prescribed fire notices were placed in communities when burning began. This contact, however, was minimal. Further, an opportunity was not given to local business or Forest users to know what to expect regarding potential smoke impacts.

The Forest did not have a clear information policy (Public Information or Communication Plan) in place that would have helped define roles at all levels. Such a policy may have addressed most concerns relative to the public involvement issue.

## **Recommendation**

- Mitigation Measure #16 from the Environmental Assessment: *“A public information plan will be developed to notify people when burning is occurring.”* To mitigate the negative consequences discussed in the findings above, ensure such a comprehensive plan is in place.
- In the future, to keep local publics better informed, make key contacts in local communities prior to actual ignition. The Forest should facilitate this for future projects. [The Forest has acknowledged this learned lesson need and, thus, indicated it will play a more key role in making public contacts—including Forest Supervisor involvement.]

## **Commendation**

- Coordination with cooperators and partners was evident throughout the Sanford Prescribed Fire and its subsequent escape. This effort enhances the agency’s credibility and buttresses trust in each other’s working relationships.
- The Forest is also acknowledged for its current work on a Communication Plan that will also address the requirements outlined in the National Fire Plan Communication Plan.

## Issue

**Do the Sevier Fire Management Unit burn plans for landscape-level long-duration prescribed fire projects contain sufficient detail to provide specific direction in critical sections of the plan?**

## Policy

*FSM 5142.2 – Prepare a site-specific Prescribed Fire Burn Plan for each prescribed fire in advance of the ignition.*

*FSM 5142.1.2.b – Develop a prescribed fire prescription and test it against prescribed fire objectives using the best technology available at the local level.*

## Finding

The approved Prescribed Burn Plan is the document that gives authority to conduct the prescribed fire. It is the Delegation of Authority from the approving Line Officer and the Burn Boss. It establishes the conditions and situations that must exist—and be expected to continue—to conduct the burn. However successful they may or may not have been in the past, standard Burn Plan prescription development procedures and format using best available technology could prevent many of the problems associated with using a variety of formats and procedures.

There were individual burn plans used for both incidents included in this review. The Sanford Prescribed Burn Plan was developed in 1999 using an older format. The most important deficiencies were in the contingency, holding, mop-up and patrol plans. The Adams Head Burn Plan utilized an updated format, but also lacked sufficient detail within these same sections.

The Dixie National Forest utilizes a group of programmatic burn plans developed to apply to specific vegetative communities within a Fire Management Unit (FMU), divided into Fire Management Areas (FMAs). For example, in the Sanford burn plan, the total Fire Management Area perimeter is 55,480 acres. Within this area, the total treatment area is 19,874 acres. This prescribed burn plan was to treat approximately 7,000 acres within the pinyon-juniper/sagebrush vegetation community—with only 1,500 acres planned to be burned in 2002.

When a block is selected to be burned, the Burn Boss has the flexibility to select a site that he/she feels will burn to meet the vegetation management objectives and stay within the prescriptive criteria outlined in the programmatic plan for that vegetation type. This process does not include the development of a contingency, holding, mop-up, or patrol plan specific to the site being burned.

Therefore, insufficient preplanning is put into holding and mopping-up the prescribed fire on that specific site. Additionally, inadequate consideration is given to the escape contingency plan as it relates to the site being ignited.

## Lessons Learned

- On landscape-scale burns there is a lack of understanding and agreement within the agency regarding what constitutes sufficient detail to meet the “site-specific” policy requirement in the longer duration incidents—while still allowing sufficient flexibility to the Line Officer to manage the project effectively within objectives and prescription parameters.

## Recommendation

- Programmatic burn plans are acceptable if the maps, holding plan, mop-up plan, patrol plan and contingency plan are made specific to the sites being burned. This update or amendment to the plans should include the detail necessary for the Burn Boss and holding forces to have clear and precise direction specific to the site being ignited regarding:
  - what constitutes an escape;
  - specific mop-up and patrol standards;
  - detailed maps which display planned ignition areas, location of holding forces and critical holding points, location of sensitive areas and/or resource values, and human safety considerations.
- These site-specific updates are approved by the Line Officer and could be done during the annual review approval process—or any time prior to ignition.

## Finding

Interviews highlighted a concern that current training programs are not providing the basic skills needed to develop quality burn plans. Specifically, as currently presented, the NWCG Burn Boss Course RX300 is not meeting this need.

The Region is considering developing a burn plan preparation course and peer review process to ensure high quality, technically accurate burn plans consistent with current policy. Other regions and agencies are developing similar courses to meet this training deficiency.

## Recommendation

- National leadership is needed in coordinating these efforts to develop this burn plan preparation course and peer review process.

---

## Issue

**What is the “burn prescription”? When is a burn “out of prescription”?**

## Policy

*FSM 5105 - Prescription. Measurable criteria that define conditions under which a prescribed fire may be ignited, guide selection of appropriate management responses and*

*indicate other required actions. Prescription criteria may include safety, economic, public health, environmental, geographic, administrative, social, or legal considerations.*

*FSM 5140.31.8. Approval of an Prescribed Burn Plan or a Wildland Fire Implementation Plan (WFIP) constitutes firm limits on the prescription to be applied and the objectives to be achieved. Deviation from these limits requires prior written approval by a Line Officer at the same or higher level of authority as approved the initial plan (FSM 5140.42, para. 2 and 3).*

*FSM 5140.31.6 - If fire use exceeds or is anticipated to exceed planned limits, a Wildland Fire Situation Analysis (WFSA) must be prepared to determine the appropriate suppression response if the Fire Use Manager (FUMA) or Burn Boss determines that the fire use cannot be returned to planned limits with available resources within 48 hours.*

## **Situation**

On May 18-19, the Adams Head Prescribed Fire made an unexpected 4,400-acre run in a large, continuous pattern while staying well within the contingency line. An objective in the Adams Head Prescribed Fire Burn Plan was to limit fire spread to individual blocks of 200 acres or less—with a tolerable deviation of up to 300 acres in decadent sage.

This total 4,400-acre run exceeded that requirement.

In addition, mitigation requirements in the Environmental Assessment to not burn sensitive riparian habitat areas and drainage buffers were not implemented. An overflight was conducted with the Forest Ecosystem Staff Officer, Fire Management Officer, and District Wildlife Biologist.

After the overflight, because the contingency line was not threatened and fire effects were determined to be tolerable, the fire was determined to be “in prescription.” A decision was made to contain the northeast corner of the Adams Head Prescribed Burn.

## **Finding**

Technically, because the run exceeded the 300-acre block limit defined in the Prescribed Burn Plan objectives, and the mitigation requirements in the Environmental Assessment were violated, the project was out of prescription. This event, therefore, should have triggered a decision to declare the project out of prescription—prompting the 48-hour policy to return the project within Prescribed Burn Plan limitations.

Furthermore, this event should have caused additional concern about the consequences of having potentially active fires in an environment of rapidly increasing fire danger in a record drought year. When the Sanford Prescribed Fire became active once again later in May—and the fire danger increased to record levels—this event should have had great influence on the decisions to continue to manage the Sanford project as an active prescribed fire.



## Recommendation

- All requirements, limitations, objectives, mitigation measures, and written expectations constitute “the prescription.” If any of these requirements are not met at any time between the period of ignition and when the fire is officially declared out, the project should be considered “out of prescription”—therefore triggering contingency actions and the 48-hour policy.
- 

## Issue

### Should we conduct prescribed burning during a severe drought?

## Finding

The Southern Utah area was experiencing record drought prior to igniting the Sanford Prescribed Fire. A strategy of this project was to use natural barriers and geographic fuel moisture gradients—including typically less flammable vegetation—to contain fire spread.

As fire danger indices approached record levels, this strategy was not effective. In times of severe drought, even under moderate burning conditions, all fuel becomes available to support fire spread.

Additionally, the fire was not going out after a few days as is typical in the Mt. Dutton Fire Management Unit during normal years. In fact, it continued to smolder in larger fuels and duff for a month—extending the period of exposure to adverse weather conditions (such as high wind events).

## Recommendation

- When the prescribed fire strategy relies on changes in vegetation type or fuel moisture gradient (for live or dead fuels) to contain fire spread, the fire prescription should include a measurable drought indicator—such as Energy Release Component (ERC) or 1000-hour fuel moisture—to indicate when fuel moisture conditions (live and dead) are such that this technique is no longer effective.
- The Region should consider issuing guidance on developing an appropriate drought indicator (e.g. ERC, Keetch-Byram Drought Index (KBDI), 1000-hour fuel moisture, live fuel moisture) and incorporating this indicator into burn plans.

## Finding

The Enterprise fuel model G Energy Release Component is highly correlated to large fire occurrence on the Dixie National Forest. (See Appendix II.)

All past large fires have occurred when the ERC is above the 90th percentile. The ERC is used to generate the fire danger rating pocket cards and is an element for determining the planning levels in the Color Country Dispatch area.

The major fire run during June 7-9 had ERC at record levels, a Haines Index of five and six, and the passage of a cold front with strong winds.

The Color Country planning levels that incorporate the results of the Fire Danger Rating Plan were not implemented until July 2002. Under the old system, Color Country was at Planning Level 1 at the time the Sanford prescribed fire was ignited. Under the new system, they would have been at Planning Level 5.

### **Commendation**

- The Color Country Fire Management Area National Fire Danger Rating Plan provides an excellent analysis of fire danger.

### **Lessons Learned**

- Given the coalescence of long-term drought (indicated by ERC), atmospheric instability (indicated by the high Haines Index), and strong winds (forecast frontal passage), fire behavior similar to the events of June 7-9 should not be unexpected.

### **Recommendation**

- The Dixie National Forest should strongly consider the incorporation of the 90<sup>th</sup> percentile ERC into their burn plans. For example, when the ERC reaches 74, do not allow ignition and implement Category 1 mop-up standard. [Using this threshold in 2002 would have meant that Adams Head would not have been ignited. The Sanford prescribed fire would have had increased mop-up beginning in early May.]

---

### **Issue**

**Should long duration prescribed burns have a process to periodically revalidate the decision to continue?**

### **Finding**

Once the prescribed fire is ignited, there are no additional formal requirements to revalidate the decision to continue burning—regardless of the burn’s duration.

Burns lasting several weeks to months can experience a significant change in environment conditions, fire effects, social and political concerns, and resource availability. Many of these changes can lead to violations in meeting burn plan requirements.

### **Recommendation**

- Until the fire is declared out, the Forest should require daily revalidation of the “GO/NO GO” checklist by the assigned Burn Boss.

## Issue

### Was the Wildland Fire Situation Analysis properly prepared?

## Policy

*FSM 5131.1 - Wildland Fire Situation Analysis. The Wildland Fire Situation Analysis (NWCG-WFSA, revised February, 1998) documents the decision making process for determining the appropriate suppression action and estimated cost of an incident which is expected to, or has exceeded, the action planned for in the fire management plan.*

## Finding

The Wildland Fire Situation Analysis (WFSA) was properly prepared.

In accordance with policy, the WFSA process was initiated in a timely manner and updated as the situation changed. Firefighter and public safety was identified as the number one priority and actions taken were consistent with that priority.

Concerns about the Bonneville trout fishery in Deep, Deer, and Pine creeks were not identified in WFSA #1 and #2 because the fire was not anticipated to threaten that area under the worst-case scenario. WFSA #3 did address the fishery concerns related to the above drainages.

The economic impact of the fire on timber, range, fisheries, and recreation/tourism resources was considered in all of the WFSAs.

## Recommendation

- The WFSA process works and should continue to be followed to ensure firefighter and public safety.

## Finding

The WFSA can be a difficult and complex process. There may be a temptation to use the computer program to simply generate a product.

## Recommendation

- Information in the Forest's Fire Management Unit descriptions can be used to pre-load the WFSA.

## **Issue**

**Was the selection of Incident Management Teams consistent with the level of complexity?**

**Was the assignment of a Wildland Fire Use Team to a suppression incident appropriate?**

## **Finding**

Based on available information, the selection of Incident Management Team level at various stages of the prescribed fire escape appropriately considered the incident's complexity.

Branching can be an effective incident management strategy. However, the branching of the Type I Incident Management Team toward the end of its 21-day assignment to manage both the Big Wash and Sanford fires was not effective.

## **Lessons Learned**

- Under the conditions and circumstances that existed on the Sanford and Big Wash fires, branching the Type 1 Incident Management Team was not effective.

## **Finding**

The assignment of a Wildland Fire Use Team (WFUT) to the escaped Sanford Prescribed Fire was an appropriate use of this type of team. However, assigning the Wildland Fire Use Team did generate some confusion and misinterpretation of management's intent—related to a suppression incident—both internally and externally.

## **Recommendation**

- When a Wildland Fire Use Team is assigned to a suppression incident, the rationale for this assignment should be clearly outlined in the ICS209 and communicated to the Geographic Area Coordination Center and local dispatch centers and cooperating partners.
- The National Office and National Wildfire Coordinating Group (NWCG) should consider renaming these teams to reflect the dual roles that can be performed on both suppression response and wildland fire use incidents.

## IV CONCLUSION

### **Dixie National Forest Has Leading Prescribed Fire Program**

The Dixie National Forest has a history of a professional, safe, aggressive prescribed fire program. The Forest has one of the leading prescribed fire programs in the Region. Being on the cutting edge entails risk.

The use of prescribed fire is inherently risky. The restoration of pinyon-juniper and aspen ecosystems requires high intensity fires. This also entails risk. The restoration of these ecosystems also requires landscape level burns, adding another element of risk. By conducting a review of the Sanford escaped fire, we hope to help minimize the risk of future prescribed fires escaping control.

In April of 2002, the Dixie National Forest started its prescribed burning program following well-tested procedures based on past experience. A month and a half later, they would encounter the coalescence of conditions that were beyond their range of experience.

On April 22 and 23, the Sanford Prescribed Fire was ignited. The Adams Head Prescribed Fire was ignited May 13-17. On May 18-19, the Adams Head prescribed fire experienced an unexpected run of 4,400 acres. The Sanford Prescribed Fire went out of prescription on May 31. An appropriate suppression response was initiated.

A dry cold front passed over the area from June 7 to June 9, bringing strong, gusty winds. With the Energy Release Component (indicator of drought) at record levels and the Haines Index (indicator of atmospheric stability and “blow-up” conditions) at 5 and 6, the Sanford and Adams Head fires both experienced explosive growth and burned together. What had started out as a prescribed fire to help prevent future catastrophic fires had turned into a catastrophic fire with the destruction of important fisheries and undesirable smoke impacts.

### **Well-Trained, Experienced, and Highly Qualified**

While it may be tempting to play armchair quarterback and second-guess those who were involved in managing these fires, such actions have little utility. Those involved were well-trained, experienced, and highly qualified. Those people who sit on the sidelines and find fault with others are, in essence, advocating an overly cautious approach to prescribed burning that, in the long run, may be equally counterproductive.

The Sanford and Adams Head fires were managed with the best of intentions. While many things went right, ultimately things went wrong. While we cannot undo the events of the past, we can learn from the actions taken—and not taken—to minimize the chance that future prescribed fires will escape.

### **Some of the Lessons Learned:**

- Burn plans need to incorporate a drought indicator to signal when natural fuel breaks—such as moisture differentials—will no longer work. The Energy Release Component for Enterprise is an excellent drought indicator for the Dixie National Forest that is highly correlated to large fire occurrence. When the Energy Release Component exceeds the 90<sup>th</sup> percentile, ignitions should not be allowed and Mop-Up Category 1 put in place for on-going prescribed fires.
- Landscape-level burning requires a delicate balance between sufficient detail to adapt to changing situations over time, while still allowing sufficient flexibility for the Burn Boss and Line Officer to manage the project effectively to meet the resource objectives within the prescription parameters. Programmatic burn plans are acceptable if the maps, holding plan, mop-up plan, and contingency plan are made specific to the sites being burned. This update or amendment to the plans should include the detail necessary for the Burn Boss and holding forces to have clear and specific direction regarding what constitutes an escape, specific mop-up standards, location of holding forces and critical holding points, location of sensitive areas, and resource values and human safety considerations.
- All requirements, limitations, objectives, mitigation measures and written expectations constitute “the prescription.” If any of these requirements are not met at any time between the period of ignition and when the fire is officially declared out, the project is considered “out of prescription”—triggering contingency actions and the 48-hour policy.
- The Wildland Fire Situation Analysis process works and should continue to be followed to take the appropriate suppression strategy that ensures firefighter and public safety with the least cost and damage to resources. The Dixie National Forest is to be commended for the efforts they made to ensure firefighter and public safety.
- The Dixie National Forest has done an excellent job implementing the Utah Fire Amendment. The Dixie’s Fire management Plan is well done and meets all requirements. Burn plans need to specifically incorporate requirements and mitigation measures from the Environmental Assessment and Decision Notice.
- A comprehensive communication plan is essential.
- Landscape level, long duration prescribed fires should require daily revalidation of the “Go/No-Go” checklist by the assigned Burn Boss until the fire is declared out.

### **Minimizing the Chance of Future Escapes**

Prescribed fire is an essential tool for managing fire-dependent landscapes. We must do everything in our power to ensure that the prescribed fires that are lit to prevent future catastrophic fires do not themselves become catastrophic fires. We hope the lessons to be learned from the Sanford and Adams Head escaped fires will minimize the chance of future escapes.

## V TEAM MEMBERS

**Scott Conroy, Team Leader**

Forest Supervisor, Rogue River and Siskiyou National Forests  
Pacific Northwest Region

**Jim Saveland, PhD, Team Co-Leader**

Assistant Station Director, Rocky Mountain Research Station  
Fort Collins, Colorado

**Mark Beighley**

Applied Fire Ecologist, Fire and Aviation Management  
Washington Office

**John Shive**

Fire and Fuels Management Specialist, Utah State Office  
U. S. Department of Interior, Bureau of Land Management

**Joni Ward, PhD**

Ecologist and Director of Science  
Wyoming Chapter of The Nature Conservancy

**Marcus Trujillo**

Fire Management Officer, Carson National Forest  
Southwest Region

**Paul Keller**

Writer-Editor

## VI APPENDICES

### Appendix I – Sanford Prescribed Fire Chronology

May 7, 1998

- Sanford Prescribed Fire scoping letter is mailed to 86 interested citizens, organizations, and agencies.

April 21, 1999

- The Decision Notice for the Sanford Prescribed Fire Project on the Powell Ranger District is signed by the Dixie National Forest Supervisor.

June 15, 2001

- The Decision Notice for the Adams Head/Mt. Dutton Prescribed Fire Project is signed by the Forest Supervisor.

April 1, 2002

- A 180-acre wildfire that requires aerial retardant ignites on Bureau of Land Management lands 70 miles west of the Sanford Prescribed Fire project area.

April 15, 2002

- Fire restrictions go into effect in Beaver, Garfield, Washington, Iron, and Kane counties.

April 22, 2002

- The Sanford Prescribed Fire is ignited.
- The burn's goal is to treat 1,500 acres of pinyon/juniper and sage to meet the Forest's Resource Management Plan's goals: reduce fuels; prevent pinyon/juniper from intruding farther into sagebrush/grasslands; create up to 200-acre mosaic openings in the decadent sage; maintain vegetation at different ages; stimulate aspen suckering; return fire to its role in the ecosystem.

May 9, 2002

- 1,042 acres have been treated within the Sanford Burn Plan's prescribed parameters.

May 13-17, 2002

- The planned 2,000-acre Adams Head Prescribed Fire is ignited 11 miles southeast of the Sanford Prescribed fire.



May 18, 2002

Temperature	RH	Winds	Sky	Haines Index	Severity Matrix Points
Mid 80s	Single Digits	10 S/SW Gusts 25	Clear	5	86

- A hot, dry, high wind event moves across the fire area. It produces a 240-acre fire run in an area that had been burned 25 days earlier on the Sanford Prescribed Fire.
- The Burn Boss determines the fire is still burning within prescription parameters and is not a threat to firefighter safety. The District Ranger and Forest Fire Management Officer concur.
- On the nearby Adams Head Prescribed Fire this same extreme weather event triggers a 2,200-acre fire run. Because the fire perimeter is well within the burn plan's contingency boundary, the fire is considered within prescription and no suppression action is taken.

May 19, 2002

Temperature	RH	Winds	Sky	10 Hr Sticks	Severity Matrix Points
Mid 70s	High Teens	10 E Gusts 25	50-80% Cloud Cover	4%	70-72

- The Adams Head Prescribed Fire experiences another 2,200-acre run.
- The Adams Head Burn Boss and District Ranger decide to employ holding forces to prevent the fire from spreading further up the East Hunt drainage. Two spot fires that cross a contingency road are aggressively suppressed. By nightfall, this line (road) is secured.

May 20-25, 2002

- Both the Sanford and Adams Head prescribed fires remain inactive.

May 27-28, 2002

- Hot, dry weather conditions increase fire activity.
- Because fire is perceived to still be burning within prescription parameters, it is allowed to continue.

May 29, 2002

- The Sanford Prescribe Fire moves to within one-half mile of Burn Plan's contingency line.
- Burn Boss and East Zone Fuels Specialist determine holding actions are necessary—and are implemented—to keep the fire inside the contingency boundary.

May 30, 2002

- On the Sanford prescribed fire, a 10-acre wind-driven spot fire ignites on the other side of the contingency line.

May 31, 2002

- More resources are brought in to attempt to contain the Sanford slop-over. At 1200 hours, with hot, dry conditions continuing to increase fire activity, it is apparent the slop-over will not be contained within the 48-hour period allowed under prescribed fire escape guidelines.
- The Burn Boss briefs the District Ranger and District Resource staff. It is determined to declare the fire a wildfire, as it is burning on the other side of the previously identified containment line, the Mt. Dutton/Cottonwood Road.
- A Type III Overhead Team and suppression resources are ordered.
- The Sanford WFSA #1 is developed.
- The Adams Head Prescribed Fire is determined to still be within prescription.

June 1, 2002

- The Type III Incident Management Team is assigned to the Sanford fire.

June 4, 2002

- Due to increased fire acreage and the decision to contain the fire in a larger strategy area, the WFSA is updated (Sanford WFSA #2).
- Direction from the Supervisors Office, Regional Office, and County Commissioners to select a containment suppression strategy is based on:
  - Providing firefighter safety.
  - Keeping costs commensurate with values-at-risk.
  - Protecting: commercial timber values; Mt. Dutton radio repeater; Sanford Ranch; Cottonwood Guard Station.
- A small holding crew is dispatched on the Adams Head Fire to suppress a 20-30-acre isolated flare-up in a Douglas fir stand.

June 6, 2002

- Initial attack of the Big Wash fire. 175 summer cabins are in the head of the drainage.

June 7, 2002 – Red Flag Warning

Temperature	RH	Winds	Sky	Haines Index	Severity Matrix Points
Low 80s	Low 20s	20-30 SW Gusts 40	Clear	5	79

- A major wind event pushes the fire to the north. All suppression resources are pulled from fire. Fire is monitored by air.
- The Type III IC follows the WFSA strategy and continues to monitor the fire.

June 8, 2002

Temperature	RH	Winds	Sky	Haines Index	Severity Matrix Points
Mid 80s	High Teens	20-30 SW Gusts 40	Clear	6	78

- Extremely hot, dry, and windy weather conditions push the Adams Head burn into the Sanford burn. Approximately 30,000 acres burn within these two fire units.
- This major fire run destroys a Bonneville cutthroat trout fishery.

June 9, 2002

Temperature	RH	Winds	Sky	Haines Index	Severity Matrix Points
High 60s Low 70s	High Teens	20-30 SW Gusts 40	Partly Cloudy	5	77

- The decision is made to order a Fire Use Team.
- The Sanford fire and Adams Head fire are defined as one fire—the Sanford Fire.

June 12, 2002

- The Fire Use Team is assigned to the fire.

June 15, 2002

- Smoke monitoring devices are installed in three communities (Tropic, Antimony, Teasdale) located near the fire.
- First of a series of public meetings facilitated by the Forest's Public Affairs Officer is held in adjacent communities. Participants include: Acting Forest Supervisor, Powell District Ranger, Forest's Fire Management Officer, the Incident Commander, and the Forest Service's National Fire Use Program Manager.

June 17, 2002

- The fire moves outside the WFSA #2 strategy boundaries. A new WFSA (#3) is developed to better address current conditions.
- A containment strategy is still adopted—determined to be more cost effective and still meet objectives.

June 18, 2002

- The Type I Incident Management Team that is managing the Big Wash Fire just south of the Sanford Fire is also requested to manage this fire.

June 21, 2002

- The Type I Team has “timed-out” on its 14-day limit and demobs. Forest administrators believe the complexity of the fire warrants a Type II Team.
- A Type II Team takes over the fire and continues to operate under the WFSA #3 containment strategy.

June 28, 2002

- Burned Area Emergency Rehabilitation (BAER) Team begins work. \$160,000 is eventually spent on BAER activities.

July 1, 2002

- The elements of the Wildand Fire Situation Analysis are met.
- The Sanford Fire is declared contained.

Sept. 20, 2002

- The Sanford Fire is declared out.

Sept. 26, 2002

- The first of three Dixie National Forest-hosted public field trips is held to illustrate and discuss the various fire effects.
-

## Appendix II – Enterprise Energy Release Component Analysis

