

Texas Parks and Wildlife Prescribed Fire Program Recommendations and Confirmations - 02/24/2022

At the request of the Executive Director of Texas Parks & Wildlife Department (TPWD), Texas A&M Forest Service assembled a team of professionals from cooperator states to conduct a Facilitated Learning Analysis (FLA) relative to an escaped prescribed fire that occurred on January 18, 2022 at Bastrop State Park. During the in-briefing of the FLA team, the Executive Director of TPWD provided the initial background and objectives, encouraging the team to take a thorough look into the escaped prescribed fire as well as the agency's prescribed fire program as a whole. The specific objectives provided to the FLA team were to:

- *Conduct a thorough and independent review of the preparation, planning, and execution of the prescribed fire at Bastrop State Park to assess compliance with relevant NWCG standards and conformance to the protocols set out in the Burn Plan itself;*
- *Evaluate the sufficiency of the level of staff, equipment, and safety resources dedicated to the implementation of the prescribed fire;*
- *Assess what factors may have led to the spotting and ultimate escape of the fire outside of the prescribed burn unit;*
- *Assess the response of the Prescribed Burn team once the fire spread beyond the boundaries of the burn unit;*
- *Identify any deficiencies, strengths, lessons learned and areas of improvement that the Team identified through its review process;*
- *Develop and issue corresponding recommendations to TPWD leadership for any improvements in training, education, preparedness, planning, safety, operations, and any other factors that may be useful in enhancing the agency's prescribed fire efforts going forward;*
- *Contemplate and identify any unique, site- specific recommendations that may be particularly germane to future prescribed burning operations at Bastrop and Buescher State Parks.*

The FLA team assembled at Bastrop State Park on January 28. During their stay on site, the FLA team evaluated burn units 14 and 20 from which the resultant wildfire occurred, conducted interviews with personnel involved in the planning and execution of the prescribed burn and evaluated the planning, preparation and execution of the prescribed fire. The FLA team used information collected during the site visit and interviews, along with prescribed burn plans, TXDPW procedures and policies, and other documentation provided to identify strengths, potential deficiencies, and other items that may be considered for incorporation into the TPWD prescribed fire program moving forward. The information included in this document is intended to meet the objectives that were delivered to the FLA team during the in-brief.

Background

In the fall of 2011, several separate wildfires ignited in Bastrop County, and were collectively called the Bastrop County Complex. This series of fires burned approximately 32,400 acres and destroyed more than 1,600 homes and resulted in two fatalities. In addition to the tragic loss of lives and homes during this wildfire, fuels in Bastrop State Park were significantly altered. Since the 2011 wildfire, TPWD has increased the number of personnel dedicated to prescribed fire, taken advantage of training opportunities, and has been implementing prescribed burns at Bastrop State Park and other properties with increasing frequency. The intensity of the 2011 wildfire resulted in significant accumulation of both downed and dead trees and a heavy component of brush fuels containing oaks, yaupon, loblolly pine and other species, especially on private lands surrounding Bastrop State Park that have not been managed with prescribed fire or mechanical control.

Early in 2022, strong north winds and dry vegetation resulted in an a very receptive fire environment and subsequent increase in wildfire activity, with the Texas Forest Service responding to 97 wildfires across the state between January 14 and January 18. The Texas Forest Service issued a press release on January 18 to inform the public that fire danger was elevated in some specific areas, including Plainview, Wichita Falls, Weatherford, Lampasas, and San Angelo. It was noted by the FLA team that this press release did not identify the area in and around Bastrop. TFS also issued a follow up tweet on the same day, indicating that additional resources were being prepositioned across areas of concern as identified in their previous release. No burn bans were in place in Bastrop County on January 18.

Personnel from TPWD had evaluated burn units 14 and 20, determined the need for a prescribed fire to accomplish resource objectives, and completed prescribed fire plans in October 2021. The primary objectives for the burns in both units, consistent with the broader resource management plan for Bastrop State Park and other parks managed by TPWD were to reintroduce fire as a natural component of the ecosystem and to reduce hazardous fuel loads to minimize impacts from wildfires. In other words, the goal in utilizing prescribed fire was to encourage a more resilient native ecosystem while also reducing fuel loading to reduce the potential for a catastrophic wildfire akin to those experienced in 2011. Burn unit 14 contained 83.42 acres and burn unit 20 contained 185.51 acres, for a total of 268.93 acres.

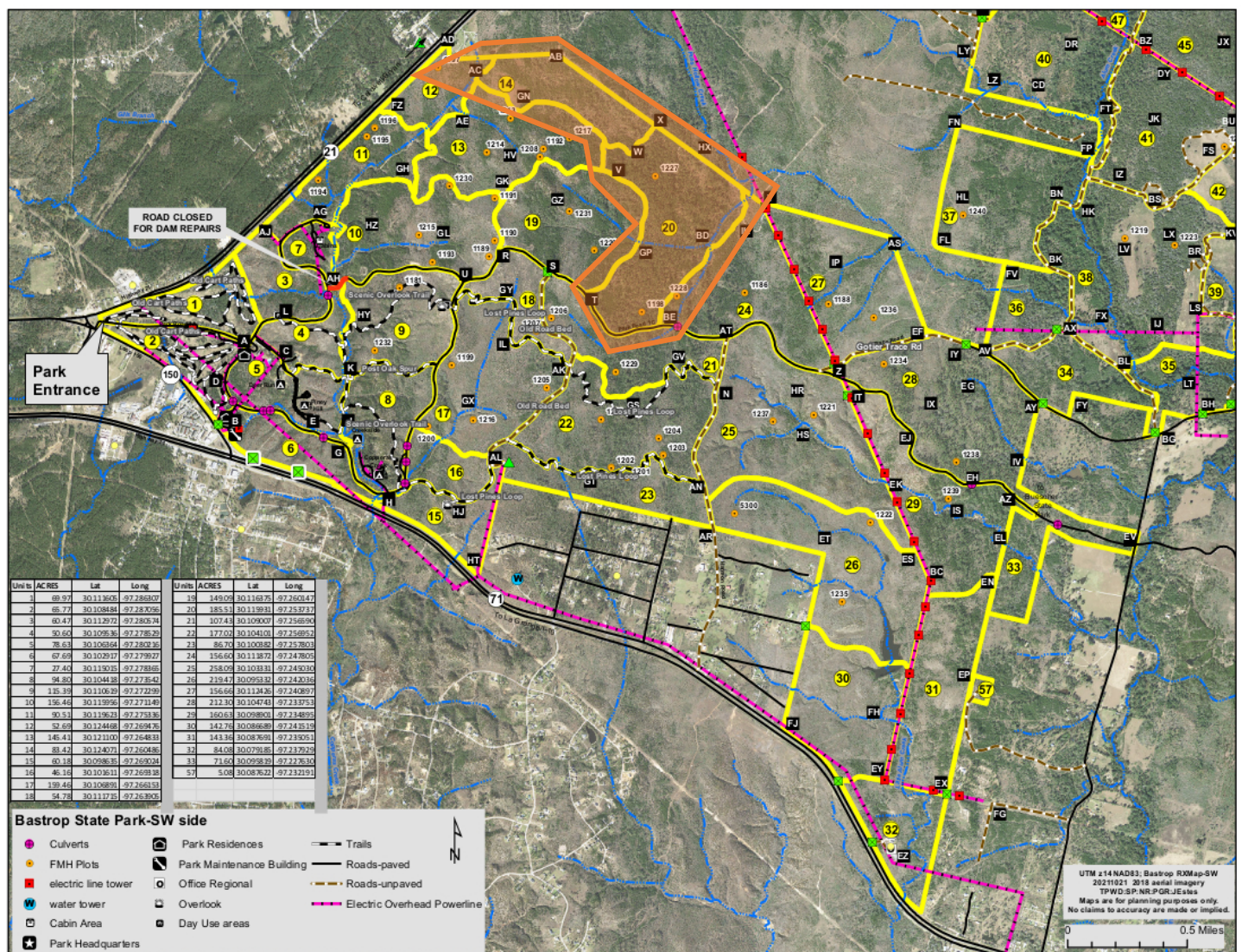


Figure 1: Map of Bastrop State Park burn units, with Units 14 and 20 identified in orange.

Bastrop State Park leadership and managers of the TPWD prescribed fire program evaluated weather forecasts during the week of January 11 and determined that conditions would likely be suitable to conduct this burn early in the following week. Based on this assessment, TPWD personnel from other areas traveled to Bastrop State Park on January

17 and checked firebreaks and equipment in preparation for the burn alongside local park staff. Early on January 18, the daily fire weather planning forecast was evaluated, and it was determined to be consistent with the prescription developed for the burn units and that the prescribed fire plan would be implemented. TPDW staff began making notifications to local officials, fire departments, adjacent landowners, and nearby residents, following established protocols.

A briefing was held shortly after 9:00 AM with all on-site prescribed burn personnel and Bastrop State Park Leadership. During this briefing, the specifics of the burn plan were reviewed and assignments for the day were made. After the initial briefing, all personnel directly involved with ignition and holding operations traveled to designated areas to ignite test fires, conducted to allow the burn boss to validate that on-site conditions reflected those in the fire weather planning forecast.

Fire weather forecasts, data from a nearby fire weather station, and observations taken on site with a belt weather kit and a Kestrel weather meter confirm that fire weather elements were within acceptable ranges as outlined with the plan between 10:00 AM and 2:00 PM. Those elements include relative humidity, temperature, mid-flame wind speed, and 20 foot wind speed. Spot forecast information, provided by the National Weather Service, is detailed in hourly increments, and the Bastrop RAWs (a dedicated fire weather station located on Camp Swift) also records weather observations hourly. During the initial stages of the prescribed fire, a Kestrel weather meter was placed on-site to record observations and burn crew members used a belt weather kit to take on-site weather observations that were recorded and broadcast to other crew members via radio.

The following charts illustrate the forecasted and observed values for key weather elements on January 18, 2022, overlaid within the Acceptable and Target ranges for each element as defined in the prescribed fire plans for Units 14 & 20.

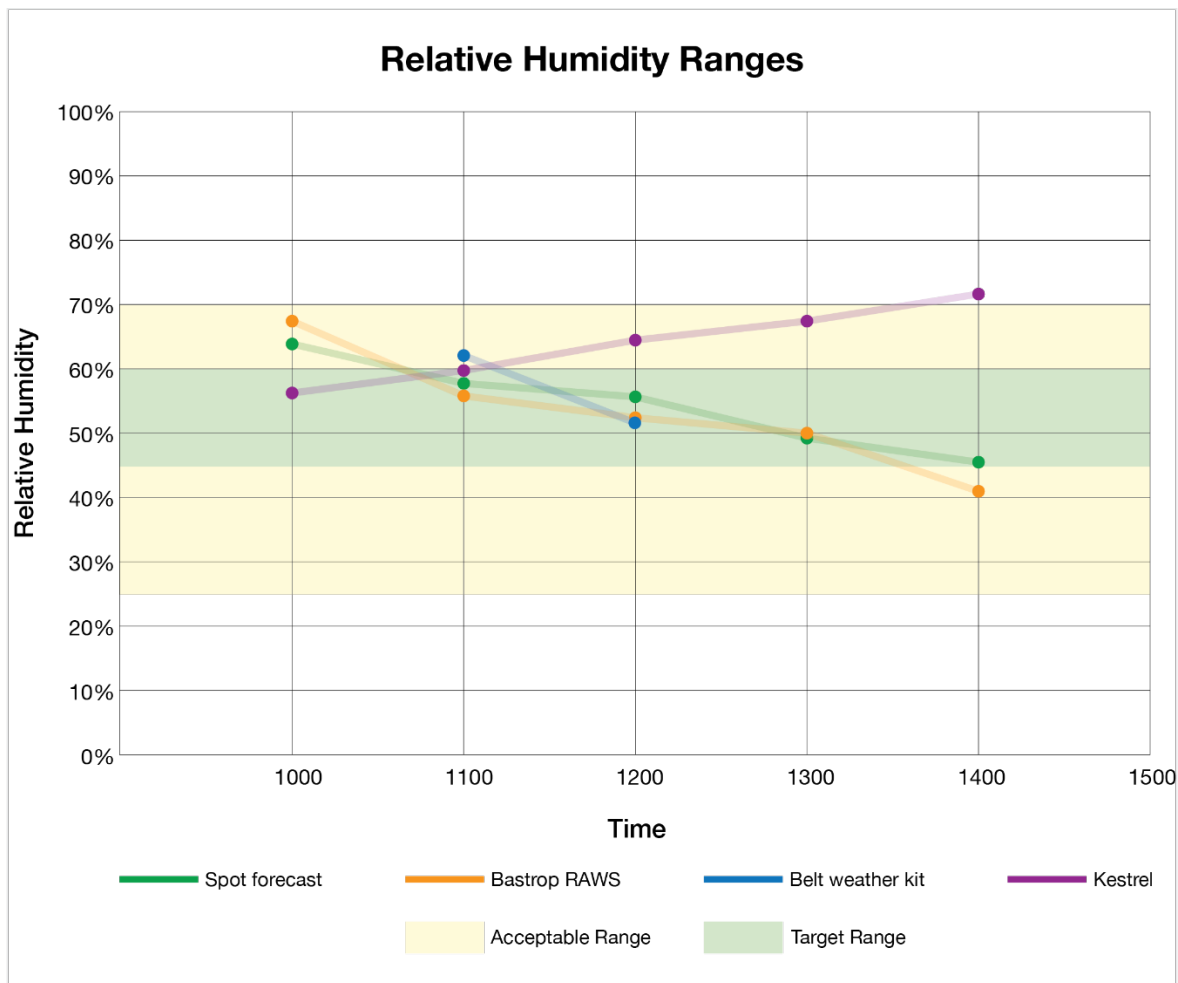


Figure 2: Graph of Relative Humidity forecasts and on-site observations from January 18. It should be noted that the relative humidity values provided by the Kestrel weather meter that was deployed during the burn were recognized as being incorrect by burn managers due to a calibration issue.

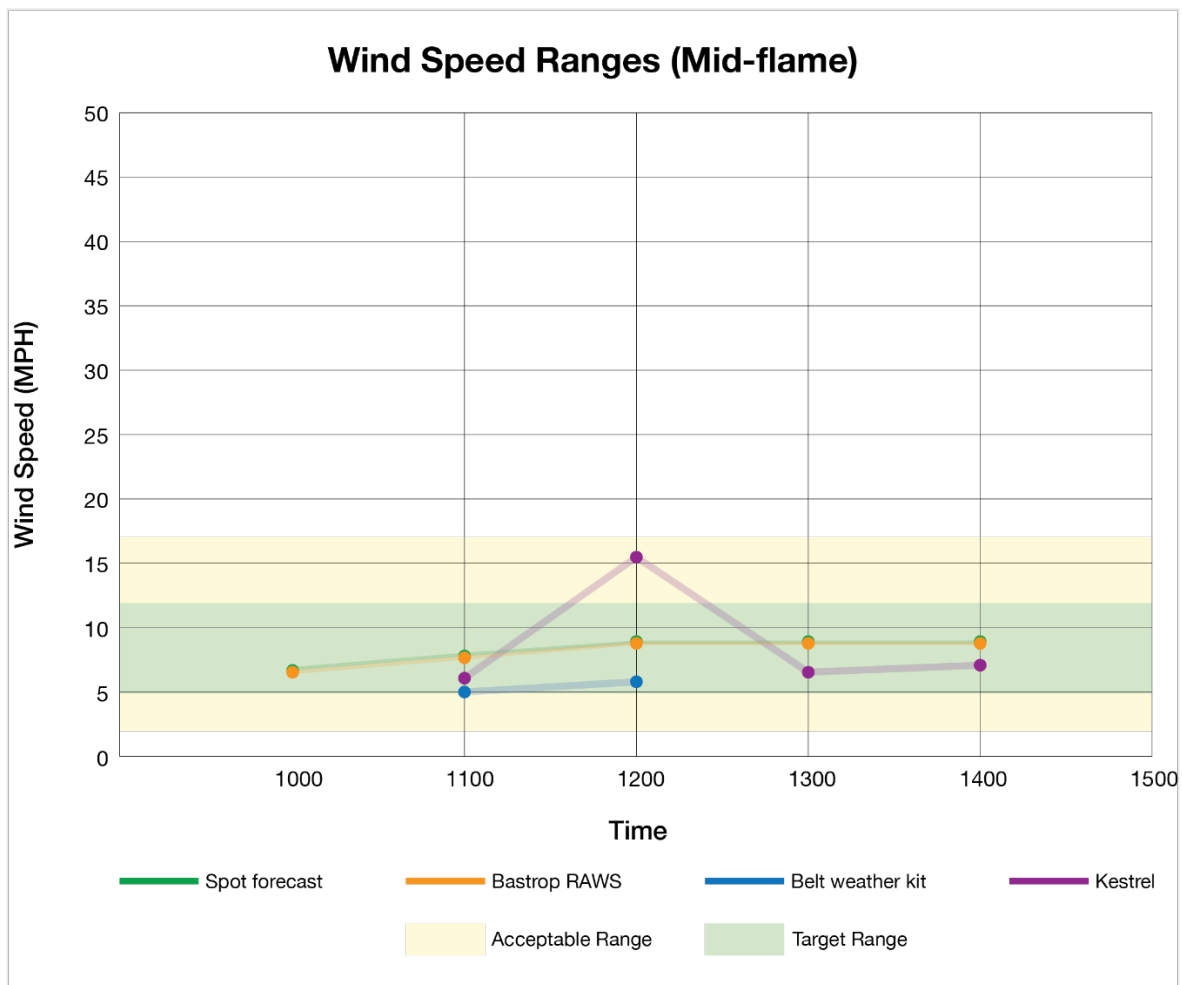


Figure 3: Graph of Mid-flame wind speed forecasts and on-site observations from January 18.

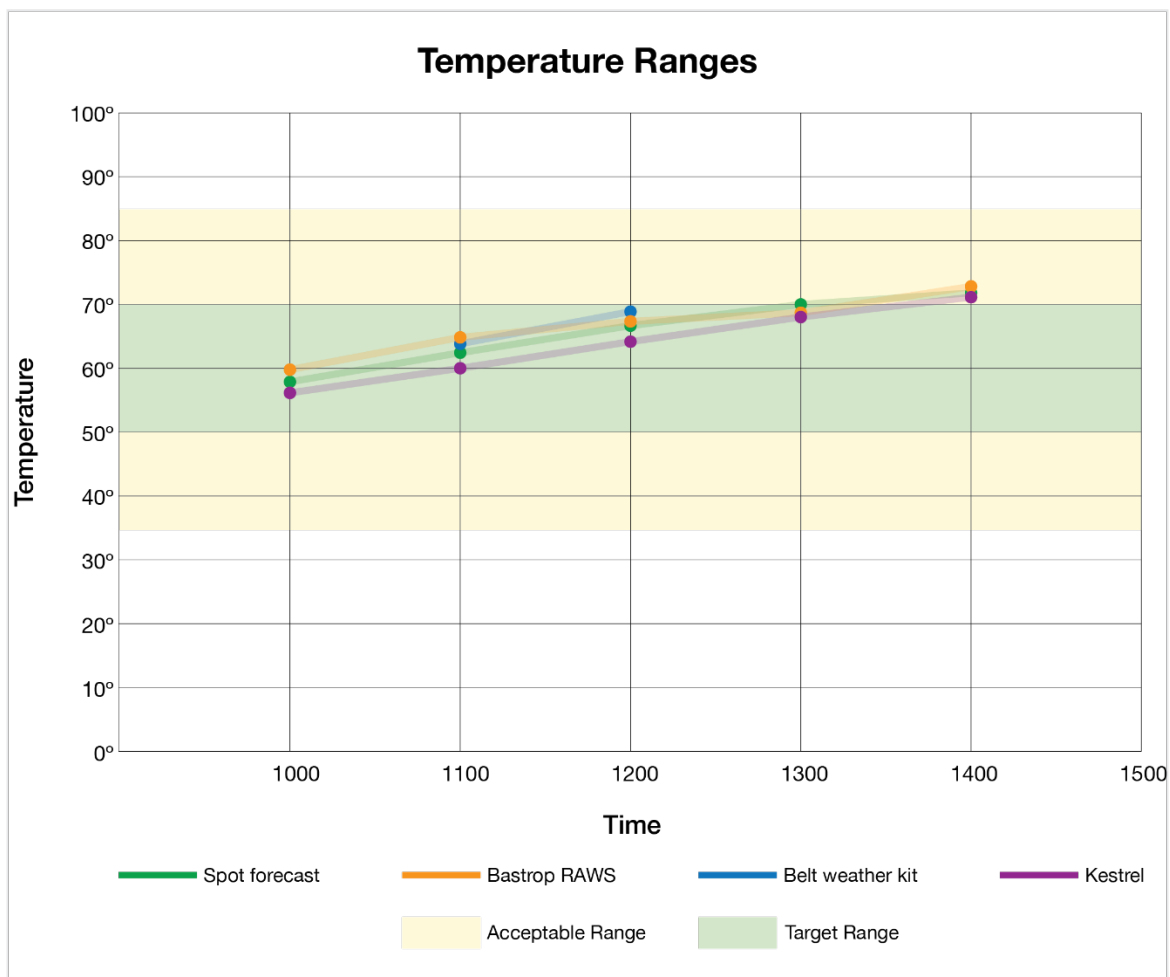


Figure 4: Graph of temperature forecasts and on-site observations from January 18.

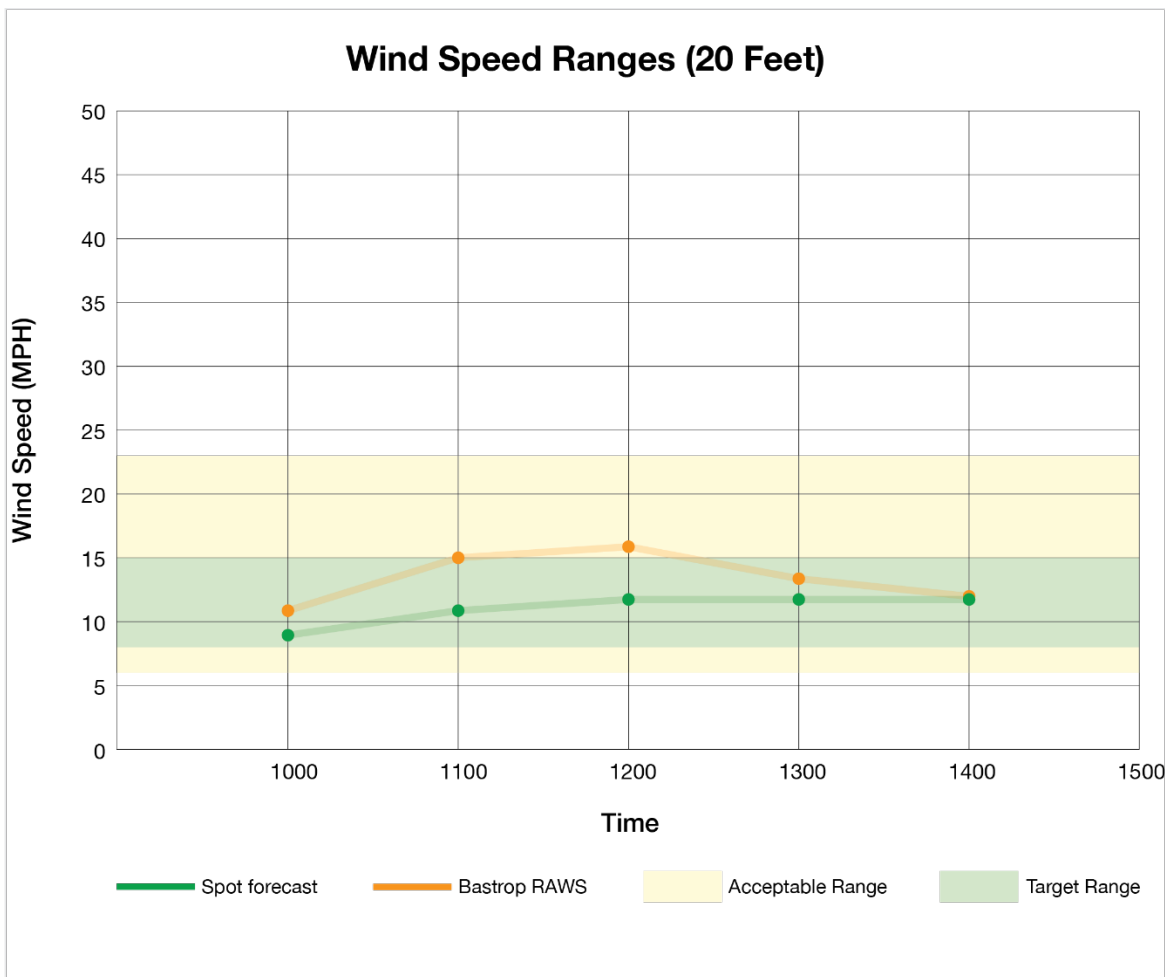


Figure 5: Graph of 20-foot wind speed forecasts and observations from January 18. It should be noted that 20-foot wind speeds are provided in the Spot Forecast provided by the National Weather Service, and hourly observations were provided by the Bastrop RAWs. 20-foot wind speeds cannot be taken on site during prescribed burns.

After initiating test fires just after 1030 am in both Unit 20 and Unit 14, the ignition group initiated backing fires along the dirt road that is established on the northern boundary of Bastrop State Park. Ignition operations progressed until the first spot fire was detected outside of the firebreaks at approximately 11:47 AM. After the initial attempts were made to suppress the spot fire, and when additional spot fires were identified during patrols along the firebreak, the burn boss declared the fire as an escape at approximately 12:25 PM and began requesting assistance from the Texas Forest Service and local fire departments.

The escaped prescribed burn, subsequently named the Rolling Pines Fire, triggered evacuation orders, shutdowns of utilities, and resulted in a direct threat to a significant number of homes. After a multi-day coordinated effort that involved TPWD personnel, the Texas A&M Forest Service, and fire departments, first responders and emergency management agencies from across Bastrop County and surrounding areas, the fire was contained on January 24 at 812 acres with no reported injuries or loss of residences.

The following points are organized into three groups that identify 1) strengths that were consistently noted by the FLA Team during the interviews and investigation, 2) potential deficiencies that may require near term or immediate action, and 3) items or practices that may be considered for incorporation into the TPWD prescribed fire program.

Strengths Identified

- Both burn units (Units 14 & 20) ignited on January 18, 2022 had very detailed prescribed burn plans adhering to the National Wildfire Coordinating Group (NWCG) PMS-484 publication. Plans included site information, fuel types, weather parameters, and supporting information.
 - Those in leadership positions (RXB2 & DIVS) on the burn had significant experience in planning and executing prescribed burns as well as familiarity with the site and fuel conditions in the area.
 - All burn crew members expressed understanding of the burn plans and were confident with leadership.
- Site preparation prior to executing the burn plan was very well done. Control line construction including dozer line and utilization of existing infrastructure, fuels thinning/manipulation adjacent to control lines, and removal of dead-standing trees in close proximity to control lines were completed well in advance of the day of the burn.
- By all accounts, the pre-burn briefing was thorough and covered the essential information identified in the briefing checklist referenced in the plan.
- At Bastrop State Park, and other parks that utilize prescribed fire, 10-hour fuel sticks are maintained daily during burning season to monitor fuel moisture. During the burn on 1/18, fuel sticks were checked, a belt weather kit was utilized, and a Kestrel was set up to provide fire weather observations on site. This data was recorded and transmitted to burn participants.
- Bastrop State Park has developed a thorough notification system to inform adjacent landowners, elected officials, cooperators, and others when burns are planned or being implemented.
- An Incident Action Plan (IAP) was prepared for this burn reflecting detailed information for the operational period. This document was referenced by multiple burn participants as a valuable resource.
- While a dozer was not listed as a required resource in the prescribed fire plan, the RXB2 (burn boss) made the decision to request one as a contingency resource.
- The RXB2 leading the prescribed burn did not hesitate to declare the burn as an “escaped fire” and immediately began directing resources to cease additional ignition of the prescribed burn, assigning resources to wildfire suppression, requesting additional assistance from other agencies (TFS and local), and notifying TPWD leadership. This decision was made very rapidly and relied heavily on his assessment of their ability to contain the spot fires and based on input from other TPWD personnel on the burn. It is the collective opinion of the FLA Team, that this rapid assessment and decision likely served to prevent further negative outcomes that could have been associated with the escaped fire.
- The existing relationships between park staff and emergency response agencies in the surrounding community have been built through years of cooperation and dedication. During response to the escaped prescribed fire, those relationships proved to be essential, and all responding agencies were able to work together effectively while a rapidly moving wildfire threatened homes. The subsequent response illustrates the value of those relationships.
- When a Type 3 IC was requested, the Texas Forest Service mobilized an Incident Commander Type 3 (ICT3) and additional support positions. The incoming IC commented that there was “a very coordinated suppression effort” in place when he arrived, noting that there was a detailed list of assigned and incoming resources available. He further noted that he was able to integrate on-scene TPWD resources into the suppression organization, indicating that the fire history and previous experience in the area helped everyone come together for a seamless transition.
- Detailed post-burn reports are compiled that include weather conditions, burn effects, crew members present, unit logs, and other information. This documentation provides information utilized in the evaluation of the burn relevant to objectives and establishes a foundation for evaluating firing techniques, staffing, difficulties encountered and many other associated aspects, facilitating a learning culture.
- TPWD has developed a burn exchange program that allows agency employees with an interest in prescribed fire to receive training and sign up to assist with burns well ahead of time. This provides burn bosses and managers with streamlined access to personnel and allows burning teams to be identified easily.

- The FLA process was enhanced due to the substantial notes and documentation maintained by burn crew members.

Deficiencies Identified

- Burning both burn units (14 and 20) at the same time, with two concurrent test fires followed by backing fires in each burn unit stretched resources over a long, linear area. The combined length of the property line road feature on the north side of these units was approximately 5,100 feet long. As resources were committed to controlling spot fires, fewer personnel were left to continue ignition or to conduct patrols and gridding operations to look for additional spot fires.
 - Prescribed fire plans were developed separately for Unit 14 and Unit 20. During review of these plans, it was noted that a minimum of 15 personnel were required for unit 14 and a minimum of 15 personnel were required for Unit 20. Only twenty-two (22) total TPWD personnel were assigned on the prescribed burn January 18, 2022. Going forward, if prescribed fire is planned across multiple burn units, minimum personnel needs for leadership positions, firing operations, holding operations, and contingency resources should be re-evaluated, based on the totality of the planned burn and complexity analysis. Any deviation from the number of personnel present from the number that was identified in the plan need to be documented.
- Each burn unit was rated with a complexity analysis individually. When the decision was made to ignite two burn units at once, a collective assessment of the complexity and resource needs for the larger footprint was not conducted. The FLA team suggests that if/when multiple burn units are ignited at the same time going forward, a complexity analysis is conducted for the totality of the acreage burned, including an assessment of resource needs.
 - The complexity analysis currently in use is subjective and lacking data-driven metrics to guide assessment of the burn unit, surrounding area and other contributing factors. With appropriate research and data analysis based on conditions present during prior burns, climatological and local weather data, and post-burn evaluations; personnel can work toward developing additional tools to provide an objective analysis of complexity. The FLA team suggests that TPWD consider using days since wetting rain, 1000-hour fuel moisture, dispersion index, soil moisture, and other variables to build an objective analysis tool supporting an accurate assessment for Burn Boss review.
- The prescribed burn plans developed for these units included an objective to “Consume 30-50% of the 1,000-hour fuels”. As defined in documentation for the National Fire Danger Rating System, 1,000-hour fuels are fuels from 3-8” in diameter. 1,000-hour fuel moistures are computed from a 7-day average composed of day length, hours of rain, and daily temperature/humidity ranges.
 - While the long-term goal of removing these fuels is valid and should be incorporated into the prescribed burn plan, choosing conditions that would truly consume and remove this high percentage of heavy fuels in a single prescribed burn will generally result in an intense fire that could result in inordinate control problems. The desire to remove 30-50% of the 1,000-hour fuels over multiple, successive burns is more appropriate as a long-term goal for Bastrop State Park.
 - It should also be noted that while a stated objective of consuming 1,000-hour fuels is in the prescribed burn plans, the target, and acceptable ranges for 1,000-hour fuel moisture were not included. Developing and including acceptable ranges for the 1,000-hour fuel moisture would allow burn managers to make informed decisions about fuel conditions, consumption, and spotting potential during future prescribed burns.
 - Additionally, 1,000-hour fuel moisture has correlation to both resistance to control and personnel required for mop-up efforts both during and after ignitions. The number of holding resources engaged in the prescribed burn operation should be commensurate to the anticipated mop-up requirements.

- Due to ongoing wildfire activity in the local Texas A&M Forest Service unit, the dozer that was assigned to the burn was dispatched from another TFS unit with an estimated arrival time of 1100-1115. Test fires in the burn units were ignited between 1035 and 1040, prior to the dozer unit arriving and receiving a briefing.
 - The unavailability of local TFS units due to ongoing wildfire activity is a proxy indicator of fuel conditions in the region as well as a direct indicator of off-site resource availability. With adjacent fuel loading consisting of thick brush, dead/downed woody debris and significant regeneration resulting from the 2011 wildfire, the FLA team feels strongly that the burn should not have proceeded until the dozer was on scene and fully briefed.
- The TFS dozer was provided with instructions to stage at drop point Z (DP Z) upon arrival. The RXB2 in charge of this prescribed burn considered the TFS unit as a contingency resource, staged near the burn area.
 - The FLA team recommends that for future burns adjacent to heavy fuels, similar to those present north of these burn units, that at least one TFS dozer is included in the Holding Group and assigned to the firebreak or posted in the adjacent fuels rather than staged off-site as a contingency resource to ensure rapid response to slop-overs or spots.
- As previously noted, units 14 and 20 were ignited from the two-track road along the northern boundary starting at two separate locations (just northwest of DP IK and at DP X on the Bastrop State Park Burn Unit map). These ignitions began with test fires, ignited at 1035 and 1040 respectively. Upon evaluating the test fires, the RXB2 and Division Supervisors notified ignition crew members to proceed with firing operations, and backing fires were lit utilizing drip torches with the goal of creating solid black (areas where surface fuels were burned, thereby extending and increasing the effectiveness of the adjacent firebreaks). Once backing fire ignitions were completed, the backing fire extended for approximately .97 miles along the park boundary.
 - With the significant accumulation of fuel present on the adjacent private property and the length of the burn units that were ignited simultaneously, the FLA team feels that a second TFS dozer unit should have been requested and staged at DP AB (western end of ignition along the park boundary) to ensure that appropriate capacity to respond to spot fires or slop-overs was in place.
- Around 2005, TPWD began training their fire personnel subscribing to National Wildfire Coordinating Group (NWCG) standards to reach RXB2, FFT2, FFT1, and single resource boss (primarily Engine Boss and Firing Boss) qualifications. Significant progress has been made training TPWD employees and working to complete Position Task Books. Those task books, however, have primarily been completed during prescribed fire operations.
 - Several burn participants interviewed noted that they had little or no meaningful wildfire suppression experience. NWCG Position Task Books identify individual tasks that can be completed on prescribed fire, all hazard incidents, through exercise, and some that must be completed on a wildfire. For example, in the Firefighter 1 (FFT1) position task book, 23% of the tasks (14 out of 60) require position performance on a wildfire designated with a “W” in the task book. While some state park personnel have limited wildfire experience, many tasks appear to have been completed on only prescribed fire incidents. The FLA team suggests TPWD review processes to ensure that both the NWCG 310-1 and NWCG 901-1 requirements are met, including making a concerted effort to allow agency firefighters to gain wildfire suppression experience. A review of IQS records provided by TPWD illustrated that while the tasks were completed, they may not have been completed in the full spirit of the ‘W’ or wildfire requirement.

Improvement Considerations

- The FLA team recommends that TPWD staff utilize sand table exercises, tabletop scenarios, or other tools incorporated into annual training to ensure that prescribed fire leadership (RXB/RXM) are well-versed in the process and to clarify their responsibilities during transition to a wildfire. Since escaped prescribed burns are a rare event, exercises will provide current and prospective prescribed fire leaders with valuable learning opportunities.

- When the transition from RXB2 to IC of a declared wildfire occurs, the IC will likely need to identify another TPWD representative to assist with requesting, tracking, and assigning additional incoming resources (akin to a Staging Area Manager). While this may not always be possible due to staffing, delegating responsibility for some tasks will allow the IC to maintain situational awareness for the emerging incident.
 - Once the decision is made to declare the escape as wildfire, the RXB2 should make sure that all assigned resources are aware of the transition. Additionally, when there is a division of duties between the wildfire IC and the RXB2 that assumes management of the prescribed fire, the distribution of duties needs to be communicated. The transition to a wildfire and the assignment of the wildfire IC and RXB2 should be broadcast to all resources on scene.
- Continue and enhance strategies to improve radio communications interoperability by either sharing of radio technologies or assigning a communications liaison.
- Coordinate annual cooperators meeting to enhance relationships and investment in outcomes.
 - Develop emergency fire plan, sharing detailed maps of park, pre-identified rendezvous points, ICP location, structure protection areas, and unified command process for multi-jurisdictions (plan should include the park property and adjoining properties).
 - At Bastrop State Park, prescribed fire has been successfully used to manage fuels and to maintain ecological function, including habitat for the Houston Toad. Surrounding properties have had varying degrees of fuels and habitat management since the 2011 Bastrop Complex, and in many areas, significant accumulations of tree litter, brush, and dead/downed trees have occurred. The privately owned tract immediately across the park boundary from Units 14 & 20, where the initial spot fires during the January 18 prescribed burn occurred is one example of this fuel condition. The landowners have cleared a 30-50' area between the boundary fence and the woodland for most of the length of the shared boundary. The FLA team and TPDW prescribed fire leadership recognize that this break in fuels can provide for long term prescribed fire at Bastrop State Park. The FLA team suggests that TPWD identify funding and develop the appropriate agreements to allow for the extension and maintenance of this fuel break(s). TPWD should also consider working alongside TFS, non-profits, private foundations, and other stakeholders to identify ways to maintain similar fuel breaks adjacent to prescribed burn units in Bastrop State Park and other parks where prescribed fire is used as a habitat and fuels management tool.
 - Leverage federal and private grant funds to support prescribed burning program to compliment Houston Toad and creating agreements alongside cooperating agencies and with neighboring property owners to develop a fire resilient buffer.
 - Create new hands-on opportunities for introducing stakeholders, cooperators, and local community to prescribed fire.
- While TPWD and TFS have an interagency MOU, this agreement may need to be revisited increasing opportunities for training, wildfire assignments permitting TPWD personnel opportunity to complete relevant position task books, and cooperation to facilitate fuels management on properties adjacent to State Parks.
 - Evaluate and consider local area wildfire occurrence within 3-4-day period immediately prior to implementing prescribe fire.
 - Utilize IQS to fully and accurately capture trainee experience, task book cover/certification pages, and training certificates. Also establish a standardized hazard typing classification within IQS.
- The FLA team recommends that burn plans include the designation of pre-identified decision points (trigger points) that would lead to the declaration of wildfire and that, if reached, would require the request for additional personnel, equipment, or other resources. These decision points should be communicated to all personnel during briefings before the initiation of the burn.
- Additional metrics that could be developed and incorporated into burn plans to aid in go/no-go and complexity analysis decisions should be considered.

- Examples include the use of the Energy Release Component (ERC) as indicator of the resistance to control if a prescribed fire escapes, and the development of a Suppression Difficulty Index that rates the relative difficulty of performing fire control work. The inclusion of these metrics would provide burn managers and burn plan reviewers with additional information to consider when evaluating staffing levels.
 - Prescribed fire plans should incorporate the number of days since last wetting rain as a factor when determining if fuel conditions are suitable to conduct a burn that will accomplish resource management objectives, while minimizing the risk of fire escapes or high spotting potential. A detailed review of previous burns may be needed to correlate the acceptable range of days since last wetting rain that is acceptable in any given area.
- The FLA team recommends that TPWD considers instituting a process to provide an additional level of review for prescribed fire plans for complex burn units, units with higher acreage or high fuel loads, and burn units adjacent to adverse property. This review should include a detailed analysis of fuel conditions, weather, and staffing on the day preceding and/or day of the proposed burn. The reviewer should be a qualified RXB2 with significant experience with burn planning, execution, fire behavior, fire weather, and fuel conditions in the area, and should ensure that planning, available personnel, equipment, and expected weather are all considered and in place before the burn is initiated.

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