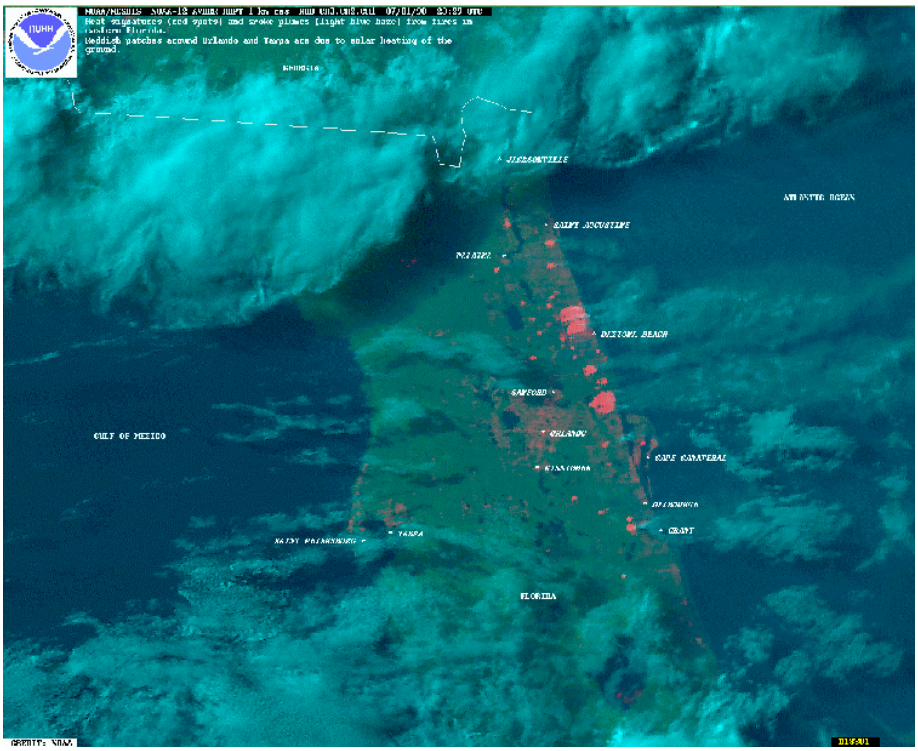

PROCESS OVERVIEW AND INSIGHTS

As the wildfires that ravished Florida in the late spring-early summer of 1998 were winding down in July, Sue Grace, an ecologist with the Biological Resources Division USGS and Dale Wade, a research forester with the Southern Research Station USFS were asked by the Joint Fire Science Board (JFSB) to put together a scientific study proposal to address some of the questions that surfaced in the aftermath of this catastrophe. Sideboards we were given included: 1) proposed studies had to incorporate good science, 2) a funding cap that precluded addressing all topics ranked as crucial and meant an in-depth study of any one topic would require additional readily available funding sources, 3) research projects must be time-sensitive and thus done ASAP (we included non-time sensitive projects as well, some of which the JFSB decided to fund) and, 4) study completion within 12 to 18 months which limited us to immediate post-fire results. We submitted a list of potential studies to the JFSB along with the estimated cost, lead scientist and cooperators for each topic in August 1998. After negotiations and changes to satisfy JFSB concerns, The Board notified us in September of their decision to fund nine of the topics proposed. Our researcher team and potential cooperators met in the heart of the wildfire area in October where several brief talks brought everyone up to speed, potential study sites were described and visited, and an overall study protocol including oversight and a timeframe for progress and final reports agreed upon.

We pushed as fast as we could because we wanted to be able to include the industrial forest management model in our research and recognized that time was of the essence. Plantations were being salvaged literally before the smoke had cleared. Even though the proposal and funding process for this study was exceedingly rapid, it was still more than three months before we began to install field plots in late October. Several questions could not be addressed because the window of opportunity had already closed. Examples of lost opportunities include all fire-related measurements such as fire behavior associated with various weather and fuel conditions,

effectiveness of suppression tactics, air quality impacts, and observations on factors that influenced structure involvement. In order to make such comparisons in this study we had to rely on written notes and the memory of those who were on the scene. Postburn examples included immediate transitory vegetative and wildlife responses such as the presence/flowering of some ephemerals, and interactions between displaced wildlife and those creatures already residing in the areas invaded by the refugees. Virtually all large industrial plantations had been salvaged within ninety days of the fires so our field plots on industrial lands had to be established on small tracts that had been skipped by the loggers.

At the beginning of the study, the PIs voiced the following six concerns - all of which proved to be of little consequence: 1) Having two Principal Investigators (PIs) meant that no one was in charge but it worked out well in this case because we developed a plan of action early-on so the workload was split and we were both knowledgeable about the intricacies of the overall study and thus able to answer questions, make decisions and discuss progress in the absence of the other. 2) The availability of researchers capable of quickly developing and implementing a study plan on an assigned topic and objective with minimal oversight, and with a track record of on-time analysis and write up of results; who were willing to defer other scheduled research; and able to work in a cooperative environment to share limited resources and staff was not a problem. The caliber of scientists we went after all realized that this was a rare opportunity and set aside the time, often doing much of the fieldwork themselves. 3) The team was able to ignore individual differences, preferences, and etcetera to work together in a supportive environment to efficiently achieve study objectives. 4) The PIs had virtually no leverage at their disposal to ensure individual studies were designed, implemented, analyzed, and written up in adherence to the assigned objectives, and agreed upon protocol and deadlines, but the PIs themselves turned out to be the bottleneck. 5) Some changes in individual study scope, lead researchers and cooperators was inevitable and did in fact take place, but with no apparent ill will and few repercussions that we are aware of. 6) We did not thoroughly research the proposed study topic objectives to ensure that they could, in fact, be accomplished before submitting the proposal; Yet the only individual study that did not meet its objective was the one that theoretically was a "sure thing" (the comparison of predicted fire behavior to observed fire behavior) because written guidelines already existed for collecting and archiving the data and all fire complexes had an individual assigned to specifically handle this task. Even though these comparisons could not be made, the results should be extremely useful because they dispel the commonly held misconception that observations and output from the BEHAVE model archived with fire reports can be used in comparative studies, and recommendations are given that should solve such problems in the future.

We don't know why things worked out so well in this study (it was besieged by the typical array of problems), and caution that this may be the exception rather than the rule. Some of the things we believe contributed to the success of this project include:

- Our initial proposal was crafted only after we had spent time with a large number of experts all of whom had some involvement in the fires. The proposal was thus the culmination of a broad in-depth approach rather than just hurried brainstorming by the PI's.
- Everyone involved recognized this was a rare opportunity to close some critical knowledge gaps.
- We decided to go after the best scientists rather than trying to balance agency representation, or looking for "low bidders" who said they had the time. This cost more but we think the results show it was money well spent.

- The PIs had a plan of action including a product schedule and oversight guidelines that all lead scientists agreed to up front.
- Study plans were required for each task and underwent peer review before substantial funding was released to lead scientists. Reviewers were selected by the PIs.
- Lead scientists were given full control of all funds allocated for their tasks.
- Funding was all funneled through USGS resulting in significant overhead savings.
- Jim Brenner, Florida Division of Forestry suggested posting the final report on a web site, thereby saving publication costs and still being able to create a visually appealing product.
- PIs worried about the above issues and kept up with individual task progress.

EXECUTIVE SUMMARY

Over 2,000 wildfires burned 500,000 acres of Florida real estate between June 1 and July 22, 1998. Although virtually every county was impacted, the fires were concentrated in the quadrant defined by boundaries extending north from Orlando to the GA line and east from Orlando to the ocean. The fires occurred during record-breaking drought, consumed vast amounts of accumulated fuel in normally wet depressions that rarely burn during more typical wildfire conditions, and crowned through pine plantations and subdivisions forcing the evacuation of an entire county. Such extreme fire behavior is unusual but not unprecedented in Florida. Property damage, economic ramifications such as airport closures and tourism losses, natural resource damage, and suppression costs are estimated between $620 and 890 million, ranking it as one of Florida's worst disasters. Air quality impacts including respiratory problems requiring medical treatment were not included in this estimate. The Joint Fire Science Board saw this as an opportunity to scientifically test some of the hypotheses raised in the wake of this catastrophe that resulted from the combination of two extreme events. The research team assembled was comprised of people from: US Forest Service, Southern Research Station, US Geologic Survey, Biological Research Division; Florida Division of Forestry, Fire Control and Forest Management Bureaus; Florida Natural Areas Inventory; St. Johns River Water Management District; Auburn University; Dynamac Corporation; GP The Tiber Company and; The Nature Conservancy. Study sites included a national forest, national wildlife refuge, several state forests, wildlife management areas, a state reserve, a water management district, and industrial woodlands. Topic titles, objectives and a synthesis of results are presented below by topic.

1) Topic: **Effects of Fuel Treatment on Overstory Mortality**
   Objective: Determine the effects of an array of prescribed fire frequencies on southern pine mortality after wildfire.
   Results: Prescribed burn history significantly affected mortality.
   Mortality greater in natural stands than in plantations (41 vs. 34%).
   Mortality lowest in stands prescribed burned 1.5 years before wildfire (<10%).
   Mortality highest in stands where prescription fire not used (89%).
   Mortality higher on normally wet areas than elsewhere (65 vs. 30%)
   Mortality took place over at least 2 years.
   Crown loss >70% was a good predictor of mortality.
2) Topic: **Predictors of Extreme Fire Behavior**
   Objective: Correlate daily fire behavior to the Atmospheric Dispersion Index (Lavdas Index) and the Lower Atmospheric Stability Index (Haines Index).
   Results: Both indexes preformed well in predicting large fires in 1998 but not in 1999.
   Lavdas Index had much larger number of false alarms (but easily fixed).

The ratio of the Lavdas stability component to the transport wind was best both years and had fewest false alarms.

3) Topic: **Short-term Response of Plant Species of Special Concern and Exotics.**
   Objectives: Assess the status and response of known populations of plant species of special concern.
   Identify and map new populations discovered during the course of the study.
   Determine the extent of exotic species introductions on burn areas and in adjacent control lines.
   Results: Known populations of species of special concern all appeared to benefit.
   New populations of several species were found and mapped.
   Benefits exemplified by the federally endangered Rugel's pawpaw which increased from 200 to 2000 individuals with increased flowering (80%).
   No exotics found on the burns but stable reproducing populations noted nearby.
4) Topic: **Performance of the BEHAVE Fire Prediction Model**
   Objective: Quantify BEHAVE model performance by comparing its predictions to observed fire behavior. Document how the BEHAVE model was used operationally.
   Results: First objective could not be met because copies of BEHAVE model runs were not found in archived Fire Behavior Analyst (FBA) written reports, nor was sufficient documentation provided to reproduce their BEHAVE runs.
   No single BEHAVE model worked so FBAs improvised to make predictions agree with observations.
   Problems in data collection procedures described and solutions suggested.
5) Topic: **Fragmentation at the Landscape Level**
   Objectives: Develop GIS-based maps showing fuel conditions useful in assessing fragmentation
   Determine effects of the fires on habitat suitability and population dynamics on a relatively isolated population of the federally listed Florida Scrub-Jay.
   Compare habitat suitability before extensive fire suppression (1943) with changes after 50 years of fire suppression.
   Look for differences between areas occupied by Florida Scrub-Jays and unoccupied areas regarding fire history and habitat quality.
   Evaluate the utility of fire and habitat maps for predicting and interpreting wildfire effects.
   Results: Florida Scrub-Jays cannot persist in habitat subjected to infrequent fire regimes.
   Atlantic coast populations need more frequent fire regime than previously believed because vegetation recovers faster on the coast.
   GIS maps of landcover and fire boundaries are probably too coarse to predict and interpret the effects of wildfires.
   Habitat mapping applications are generally too coarse to provide the information needed for management and predicting population responses.
   Forest barriers between occupied and restored habitat should be expeditiously eliminated where the forests are artifacts of human activities.
6) Topic: **Insect Responses**
   Objectives: Determine tree mortality, relative abundance of bark beetles and woodborers along a fire intensity gradient.
   Monitor insect infestation rates over time and correlate to tree mortality.
   Determine the prevalence of *Leptographium* species in live tree roots over time.

Results: Strip cruises in January 1999 showed tree mortality related to fire intensity ranged from 9% in low fire-intensity stands to 64% in high fire-intensity stands. Less than 2% of trees in the unburned controls were dead

The predicted substantial mortality increase during the summer of 1999 did not materialize

Permanent plot surveys of trees alive in October 1998 showed an additional 31% in high fire-intensity stands and 2% in low intensity stands had died by October 1999. Two percent of the unburned control trees died during this 1-year period.

Although the data is not presented in this report, very little additional mortality occurred between October 1999 and June 2000 (<3% in high intensity stands).

>75% of live trees in high-intensity stands had roots infected with *Leptographium* spp.

No trees in control plots were infected with *Leptographium* spp.

No healthy roots were found in high-intensity stands.

15-20% of sampled roots in moderate- and high-intensity stands had reproduction weevil larval galleries.

0-4% of sampled roots in controls and low-intensity stands had reproduction weevil larval galleries.

7) Topic: **Effects of Silvicultural Practices on Extreme Fire Behavior**

Objective: Determine potential fire behavior in pine flatwoods following partial timber harvest, prescription fire and understory herbicide application.

Results: For immediate reduction in potential wildfire behavior, prescription fire is best, but because of quick vegetative recovery, it must be reapplied at least every 5-years.

Partial harvest also provides immediate short-lived reduction in potential fire behavior, but time between harvests is probably too long to prevent redevelopment of hazardous fuel conditions.

Eradication of understory with herbicides has no immediate fire behavior reduction benefits because dead stems remain intact and standing. Beginning the 2nd year after treatment, however, potential fireline intensity decreased and remained low for at least 6 years.

Herbicides have little effect on forest floor buildup so although drought-season fires have lower potential fireline intensity, they will still be high severity and thus kill root systems, resulting in near-complete overstory mortality.

Combining fire and herbicide treatments untested, but should provide both immediate and long-term reduction in fire intensity and severity.

8) Topic: **Economic Impacts**

Objective: Evaluate the efficacy of fuel reduction treatment policies and programs for reducing the economic impacts of catastrophic forest fires.

Results: Estimate of total damages from these fires range from $622 to 888 million.

Forests at greatest risk under this severe drought were those coniferous stands in or near wetlands, especially bald cypress.

Fragmentation of the forest appeared to increase wildfire risk.

Reduced understory resulted in reduced wildfire risk.

Urbanization was positively correlated with area burned during 1998 in contrast to previous years.

The 1998 fires did not behave in the same fashion as fires in previous extreme fire years. In prior extreme years, the number of small fires increased with a relative reduction in large fires. In 1998, there was a preponderance of large fires relative to small fires.

This ecoprovince was accumulating a very large wildfire "deficit" in the nine years before 1998.

The 1998 wildfires more than consumed this deficit leaving the region with a wildfire "surplus". This has not happened in other ecoprovences.

Prescription fire had no affect on acres burned by wildfire in this study. Its affect on fire intensity was, however, not addressed.

9) Topic: **Home Protection Strategies**

Objective: Evaluate the utility of some commonly recommended home protection strategies.

Results: Use of metal soffits and amount of tree and brush clearance around a home were the best homeowner strategies to provide protection from wildfire.

Block construction (but not type of exterior), tile roof, lack of roof and yard debris, and defensible homeowner or fire department actions also all significantly increased the likelihood of home survival.

Wooden privacy fences increased the likelihood of a home sustaining fire damage.

Only 16% of 75 homeowners interviewed were aware of wildfire protection strategies and only 8% had actually implemented one or more protection measures.

Many of the interviewees were from a subdivision that had also lost several hundred homes to wildfire in 1985.

The use of prescription fire at the Urban Wildland Interface was very effective in protecting homes from subsequent wildfire. Only 1 of 32 was damaged.