



FIRESCIENCE

DIGEST *Research Supporting Sound Decisions*

ISSUE 18

APRIL 2014

Graduate Research Innovation Awards Encourage Young Scientists to Ask Bold Questions

The Joint Fire Science Program (JFSP), in partnership with the Association for Fire Ecology, offers Graduate Research Innovation (GRIN) awards yearly to a handful of top-quality graduate students conducting research in fire science. GRIN awards are intended to nurture the next generation of fire and fuels scientists and managers, enhance their professional development, help them become engaged with their community of peers, and equip them to tackle the fire and fuels management challenges of today and tomorrow.

To earn a GRIN award, master's and doctoral students are invited to submit succinct four-page proposals for original research in fire ecology, management, science, or human dimensions of wildfire, including climate. The award is intended to augment already-funded thesis or dissertation research. Since the program began in 2010, 21 graduate students have received GRIN awards for up to \$25,000; these recipients were selected from a total of 103 applicants.

The 2014 call yielded 38 proposals, of which 7 were selected for funding.

The GRIN program has received kudos from across the fire science community. GRIN funding helps fire science students dig deeper into their thesis or dissertation research, but it does more than that. It gives them a leg up into the professional community. It gives them experience in developing proposals for competitive grants. It helps them become more competent scientists. It allows them to contribute valuable work at a young age. It plugs them into ongoing research and management networks. It increases students' professional exposure, paving the way to presentation, publishing, and funding opportunities and making young scientists and future managers more competitive in the job market.



Pushing the Science Harder

When mainlanders think about Hawaii, wildfire may not be the first thing that comes to mind. “Fire is not on most people’s radar screens in Hawaii,” acknowledges Creighton Litton, a fire ecologist at the University of Hawaii at Manoa. Yet, wildfires have become an urgent public concern on the islands and across the tropical Pacific, threatening remnant native species and ecosystems, as well as human lives and property.

Two centuries of intensive land use and development have radically altered Hawaii’s historic pattern of infrequent fires. Nonnative grasses that came in with European migrants have spread throughout the islands, providing blankets of contiguous, highly flammable fuel. Ignitions, once rare (volcanoes are a main source, since Hawaii receives few dry lightning strikes) now come from human activities: arson, prescribed burns, and cigarettes flicked from car windows. Last fall, during managed explosions of shells on an Oahu military base, a burning piece of shrapnel flew into a canyon of dry grass and touched off a fire that lasted more than a month and triggered the state’s most expensive fire suppression effort ever.



Field technician Angela Stevens in a field of guinea grass in Oahu, Hawaii. This grass species grows dense and tall, making it a major fuel hazard on the islands.



Bryson Luke, an undergraduate field assistant, lays out a transect for collecting vegetation samples for fuel moisture analysis.

Because fire regimes in Hawaii are still not well understood, Litton says, “we’re still in the Pleistocene as far as fire management is concerned.” Part of the problem is that models and other predictive tools developed on the mainland don’t lend themselves to Hawaii’s distinctive tropical ecosystem.

Litton’s former doctoral student, Lisa Ellsworth, used her GRIN award to test a method for capturing fuel moisture measurements from remotely sensed images, potentially making it easier to predict fire hazard in tropical landscapes dominated by invasive grasses. Her work is a good example of how GRIN helps young scientists push beyond their dissertation question and tackle thorny management issues. “She would have had a really nice dissertation in any case,” says Litton. “But without the GRIN funding, she wouldn’t have been able to address one of the most applied, management-oriented products that came out of her doctoral work.”

The “I” in GRIN

The previous example is the sort of innovative research the Joint Fire Science Program (JFSP) and the Association for Fire Ecology (AFE) had in mind when the JFSP awarded the first GRIN grants in 2011. “The

students who apply for these awards are big thinkers,” says Morgan Varner, forestry professor and fuels management expert at Mississippi State University and one of the initiators of the program. “Their proposals are bold—bolder than conventional research proposals generally are.” The experimental design of a GRIN application may not be highly sophisticated, he says, and the applicant may not be familiar with the standard practices of proposal writing (including the more self-serving practices, like heavily referencing your own work and citing everybody who’s likely to peer review the proposal). “But the ideas are there.”

The idea for GRIN arose from a sense among fire science academics that the JFSP could do more for the rising generation of scientists and managers. Varner and the AFE education committee members approached JFSP Director John Cissel in 2010. “We pitched the idea over lunch,” says Varner, “and he was very receptive. He turned it back on us—asked us to put our money where our mouth was and develop a proposal.”

Says Penny Morgan, University of Idaho fire ecologist and another co-developer, “We saw this as a way to help students strengthen and add innovation to their ongoing thesis or dissertation research.” The AFE also recommended a grant program to fund student travel to professional conferences. This proposal found fruition as the Travel, Research, and Educational Experience (TREE) grant program (please

see sidebar). The JFSP governing board funded both proposals. “Our board quickly realized that this was a low-cost, high-payoff opportunity and was eager to try it out,” says Cissel.

Standards are high, says Morgan. “A successful proposal has to be clearly and concisely written, because it has to cover everything in four pages. Students have to propose innovative research and justify its value.” Many students are rising to the challenge, making the GRIN awards highly competitive. “Our panels have a hard time choosing because so many students are submitting great proposals,” Morgan says. “The JFSP’s governing board has been really impressed with their quality.” Reviews are coordinated by the AFE education committee. Last year’s and this year’s review panels also include previous GRIN recipients.

All applicants receive detailed and supportive feedback on their proposals. “We don’t just say, ‘Oh, that’s excellent,’ or ‘That’s below par,’” says Varner. “We make concrete suggestions, such as, ‘You need to better develop your outreach component.’” Reviewing research proposals can be tedious work, he adds, “but our panelists come away really excited about the field. We’re seeing the future of fire science: students who will one day be our leading researchers and managers. It’s really exciting to see them asking these big questions.”

TREE Program

Another grant program funded by the Joint Fire Science Program called TREE (Travel, Research, and Educational Experience) empowers promising student scientists, including undergraduates, to attend and present their work at professional conferences, symposia, and workshops or to travel to conduct laboratory research in fire science.

Like GRIN, the TREE program is highly competitive. “We typically have many more requests than we can fulfill,” says Timothy Ingalsbee, co-director of the Association for Fire Ecology, which administers the TREE grants. “So we have to be really selective.”

The grants cover transportation, lodging, conference registration fees, and cost of preparing presentation materials. Individual sums are not large; they range from about \$650 to \$1,200, but they can make the difference for students who might otherwise miss the opportunity to interact with peers and get to know the leaders in their fields.

In 2012, a total of 45 students received TREE grants to attend fire conferences in Santa Fe, New Mexico; Portland, Oregon; and Edmonton, Canada. They represented 21 different universities from 11 states and 5 countries. Eleven students were undergraduates, 16 were in master’s programs, and 18 were in doctoral programs. One was Lisa Ellsworth, who received TREE funding to present her results on fuel moisture in Hawaii at the International Fire Ecology and Management Congress in December 2013.

“TREE is really a wonderful opportunity,” says Ingalsbee. “These grants enable students to attend what may be their first professional event; to give their first presentation; to network with peers and with researchers, managers, and other fire professionals. These students are the researchers and managers and educators of tomorrow, and the TREE grants help to introduce them to their professional community.”

Remote Sensing of Fuel Moisture on Oahu

The U.S. Army Garrison-Hawaii had thoroughly assessed fire danger on the base before conducting their firing exercises. The problem was that the tool available—the National Fire Danger Rating System—doesn't work well in Hawaii because it uses measurements based on fuel moisture in a temperate climate. "The predictive tools used on the mainland to quantify fuel moisture," says Ellsworth, "assume that the ecosystem goes through freeze-thaw cycles. When you apply these to the islands, with their year-round growing season, they don't work well. We needed a better way to get at real-time fuel moisture."

Ellsworth's dissertation research, funded partly by the Department of Defense, consisted of extensively sampling the vegetation on the base and analyzing its fuel characteristics, including moisture. When she landed her GRIN research award in 2011, she expanded her study to investigate the use of remote sensing to predict fuel moisture. "I thought, we know moisture content is reflected in various bands of satellite imagery. Why can't we use this information to get a measure of time-specific, site-specific fuel moisture for Hawaii's vegetation?"

Satellite images can be used to derive various vegetation indices using the red, blue, and infrared bands to quantify the "greenness" of the vegetation, which is a clue to its moisture content. Ellsworth compared vegetation indices derived from the satellite images with her fuel moisture samples from the field. She found that the remotely sensed data captured fuel moisture pretty well in live grass, although not so well in dead grass. Even so, the remotely sensed data far outperformed the National Fire Danger Rating System predictions, as well as those of the Keech-Byram Drought Index, another predictive tool.

The findings are preliminary, Ellsworth cautions. "But we're at a point where someone could pick it up and turn it into a tool," she says. "We've talked with the folks at the Pacific Fire Exchange [the JFSP's knowledge exchange consortium for Hawaii and the larger tropical Pacific] about making some sort of interactive web tool, making it a really interactive, plug-and-play tool for managers. That's the next step."

The remote sensing component, she says, turned her original project into something much more useful. "When the military initially funded this project, we knew we couldn't give them a good product until we sorted out the problems with fuel moisture prediction. The GRIN money made that possible."

Soil Carbon Fluxes in Southern Pine Flatwoods

David Godwin applied for GRIN funding in 2010, when he was in his second year of a doctoral program at the University of Florida, studying with Leda Kobziar. "When the first call for proposals came out, I saw it as a really great opportunity to fund and expand my project, to take it to a new study area," he says.

Godwin was looking at how prescribed fire affects the flux of carbon dioxide within a forest's soil. Forest soils play a critical, although poorly understood, role in the global carbon budget, releasing CO₂ into the atmosphere from living roots and aerobic microbes that break down organic matter. "In most forests, the majority of carbon lies within the soils," says Godwin, "and soil respiration makes up a significant portion of total ecosystem carbon budgets—often 50 to 60 percent."

Fuels treatments, both fire and mechanical brush removal, are known to affect the rate of CO₂ production from the soil. However, most of the research on this relationship has been in forests in the Western United States. Godwin wanted to see how such fuels treatments affect soil carbon flux in southern pine flatwoods. These forests are a mix of longleaf and slash pine with an understory dominated by saw palmetto—the most common natural forest type in Florida.

Godwin started his dissertation work on two research sites, one in a long-term prescribed-fire study area near Tallahassee and the other in the Austin Cary Memorial Forest, the University of Florida's



Burning flatwoods forest in Florida.



Green flatwoods forest in Florida.

research forest outside Gainesville. The GRIN award enabled him to expand the study to a site in the Osceola National Forest and to look at the effects of mechanical fuel-mastication treatments. It also allowed him to join University of Florida scientist Alan Long, U.S. Forest Service research forester Wayne Zipperer, and fellow University of Florida doctoral student Jesse Kreye in their ongoing study of the effects of fuels treatments on fire behavior and vegetative response in pine flatwoods (JFSP Project No. 10-1-01-16).

“The GRIN funding enabled me to contribute the soils carbon component, which they wouldn’t otherwise have been able to do,” Godwin says. “I was able to add about a year of monthly measurements at that site, which came out to almost 3,000 individual measurements of soil temperature, moisture, and



Flatwoods forest in Florida where fuels have been masticated.

respiration rates. And it added a whole new chapter to my dissertation.”

Godwin found that fuels treatments—both mechanical and fire—did not significantly alter monthly mean carbon flux rates, but they did increase soil temperature, which could drive changes in decomposition rates and ultimately lead to alterations in carbon flux rates. While these findings are not yet conclusive, additional research in this area could help policymakers shape future carbon-sequestration strategies.

Soon after Godwin finished his doctorate in 2012, he was hired as the outreach coordinator for the Southern Fire Exchange, one of the JFSP’s 14 regional knowledge exchange consortia. He’s now roaming the Southern Fire Exchange’s territory, conducting workshops and field tours and spreading research and management findings to all kinds of forest landowners, from private individuals and families, to nonprofits like The Nature Conservancy, to agencies like the U.S. Forest Service and the Department of Defense.

GRIN is “a fantastic program,” he says. “It provided a great opportunity to expand my research into a new area and to support an ongoing JFSP-funded project. It’s a really valuable tool for funding fire science research at the graduate level. I haven’t seen anything else quite like it.”

Bridging Boundaries and Forming Opinions on Climate Change Science

Outreach is a critical component of fire science, but it’s not always obvious which communication techniques work best, and why. “A lot of times people will hold workshops, and then they’ll ask the participants if they liked it,” says Jarod Blades. “And they’ll say, ‘Oh, yeah, it was great.’ But that doesn’t tell you much about which aspects of the workshop and which specific messages are effective.”

Blades has recently finished his doctoral program at the University of Idaho, where he studied with Troy Hall and Jo Ellen Force. For his dissertation research, he investigated how exposure to research findings affected the knowledge and attitudes of land managers and community members. Blades and others on an interdisciplinary research team developed interactive workshops to present recent scientific findings on how climate change might affect wildland fire and water resources. Workshop participants were invited to discuss the findings among themselves and with an expert panel. Blades conducted his project in the



Jarod Blades (left) leads Boise workshop participants in a small group discussion, as part of his doctoral research.



As part of Jarod Blades' doctoral studies, individuals participate in Missoula, Montana, at a workshop on climate change effects.

northern Rockies, where wildfire effects have been particularly dramatic.

Blades' 2011 GRIN award allowed him to tie in his doctoral work with two studies he was already working on: a JFSP-funded study on public tolerance of smoke in urban and wildland-urban interface communities in the western and south-central regions of the United States (JFSP Project No. 10-1-03-2) and a National Science Foundation (NSF)-funded, interdisciplinary study on effectively communicating climate change research in the northern Rockies. Blades served as the interdisciplinary team's social scientist under a grant from the NSF's Integrative Graduate Education and Research Traineeship (IGERT) program.

To discover what approaches worked best in conveying complex climate change information, the team started—logically enough—by asking the managers what they needed. “We learned that these managers felt they needed to understand climate change effects from a practical management perspective and at local scales,” Blades says. These preworkshop conversations had the added benefit of building a community of interested participants.

At one workshop in Montana and three workshops in Idaho, the team presented recent findings about

climate change effects at three different scales—global, regional, and local—and interspersed the presentations with facilitated peer-group discussion. Team members synthesized and presented the science in an interdisciplinary fashion and in a way that emphasized the practical implications of climate change. Presentations were packaged in a graphics-heavy format, with animated visuals conveying modeled trends at each scale.

Some tentative conclusions have emerged from before-and-after surveys and interviews, Blades says. For one, participants went into the workshops expressing a need to predict local effects more confidently—“they wanted to be able to tell their constituents what’s going to happen within the forests they manage and be able to adapt appropriately.” Afterward, he says, participants felt more comfortable with drawing appropriate conclusions from modeling output at all scales, having become better acquainted with the strengths and uncertainties of each. This suggests that the workshop made them feel generally more competent to use cutting-edge climate change science in their management and to interpret it for their stakeholders.

Another thing: the facilitated small group discussions proved to be a rich learning environment. “We’d start the conversation with, ‘How useful to you is the information you just heard?’” Blades says. “This encouraged people not only to talk about how it applied to their specific job but also to listen to others about how it applied to theirs. The participants were exposed to others’ perspectives and were able to learn from them.”

The GRIN funding was vital in making these workshops happen. “It was a traveling research road show, a huge logistical effort, and the GRIN funding allowed us to be mobile on the ground.” The award money covered travel expenses, presentation costs, and take-away outreach materials such as summary handouts, citations, and a website. “And—this is a big underlying theme—it supported interdisciplinary field research involving multiple stakeholders that wouldn’t have been possible otherwise,” Blades says.

Discovering Past Fire Severity in Charcoal Deposits

Fire ecologists typically look for fingerprints of historical fires in one of two places: tree rings, with their records of seasonal growth and periodic disturbance, and sediment deposits in lakes and rivers, their layers rich with hints of ancient landscape history.



Erica Bigio holding a tree cookie while conducting research for her Ph.D.



Erica Bigio (left) and field assistant Sarah Jorgenson in an alluvial sediment bed.

What if you have both kinds of evidence on the same plot of ground? How might their stories complement or contrast with each other?

That was what Erica Bigio wanted to know. Bigio has recently finished her Ph.D. work at the University of Arizona, studying with fire ecologist Tom Swetnam. For her dissertation, she compared fire evidence from tree-ring records and alluvial sediment deposits on three river basins in the western San Juan Mountains of Colorado.

By analyzing the layers of charcoal in these deposits, Bigio developed a timeline of fire events over the past 3,000 years. Then she paired this timeline with tree-ring samples she gathered from the same basins. “This kind of comparison has been done on a regional scale,” she says, “but I learned that no one has compared these two methods before on the same study area in any systematic way.”

Although she found only three sediment deposits that overlapped with tree-ring records, the two record types told pretty much the same story—suggesting that, where it’s feasible to use them together, the methods may yield a richer set of information than either alone. The two methods are useful at different spatial and temporal scales, says Bigio. Tree rings give a finer scale picture of events, but they’re not very informative beyond about 500 years in the past. Sediment deposits contain a much longer record of events—3,000 to 4,000 years—but at a much coarser temporal resolution. A 300-year-old debris flow may contain evidence of a past fire, but its chronology can be determined only to within 200-300 years.

Bigio used her GRIN award to look into a way to get sediment samples to yield more precise information about past fires. She investigated a technique for measuring the light reflected, at particular wavelengths, from charcoal samples isolated from sediment deposits. From this reflectance signature, she says, it’s possible to infer the temperature of the fire that created that bit of charcoal. “This method had been used in archaeology,” she says, “but not yet on wildfire samples.”

The GRIN funding financed her study at the London laboratory of the scientist who developed the charcoal reflectance method. There, Bigio learned the technique and analyzed some of her samples. Because of constraints on both her and the scientist’s time, Bigio wasn’t able to analyze all the samples, which included some taken from two 2011 fires, the Horseshoe II fire in southern Arizona and the Las Conchas fire in northern New Mexico. She’d gathered these samples with the aim of comparing their spectral signatures with those from the ancient deposits.

“So I wasn’t able to do everything I’d planned,” she says, “but the method could definitely be valuable in the future, although it needs more calibration work.” A reliable way to interpret charcoal reflectance could help wildfire researchers extend their gaze further into the past, gaining a better idea of the severity of ancient fires that occurred beyond the historical reach of tree-ring data.

Bigio’s study in England put her in touch with another U.S. scientist interested in refining the reflectance method, and the two of them are working up a funding proposal. “So the GRIN award fostered a new collaboration,” she says. “But the main thing was that it let me complete my dissertation—it allowed me to pursue my own ideas.”

Edge Effects in Florida Cypress Wetlands

Like Godwin, Adam Watts found that his GRIN award helped open the door to his first job after earning his Ph.D. Watts, who also studied under Leda Kobziar at the University of Florida, did his dissertation project on seasonal flooding and wildfire in cypress-dominated wetlands and, in particular, how these disturbances affect ecosystem edge effects. “I’d applied for JFSP grants twice before and hadn’t been successful,” he says. “So I was in the third year of my program and looking for supplemental funding sources. GRIN looked like a good one—it seemed less of a long shot.”

The GRIN funding extended his doctoral work into an interesting related sideline—carbon loss from smoldering fires in the peaty soils of swamps dominated by pond cypress (*Taxodium distichum* var. *imbricarium*). And then one thing led to another. A fortuitous fire that struck his study site in April 2013 extended the peat-smoldering work and helped him win another grant from the NSF. It also gave him material for a peer-reviewed paper in the journal *Forest Ecology and Management*. Then he was able to bring the peat-smoldering study and the NSF money with him when he joined the Desert Research Institute



Adam Watts conducting research in the Florida wetlands for his doctoral work.



Florida cypress wetlands.

in Reno, Nevada, in the summer of 2013. “GRIN positioned me well to be in the right place at the right time,” he says.

The influences of wildfire in South Florida’s cypress wetlands are still a puzzle. “I found there’s been fairly little work done in this ecosystem,” says Watts, “possibly because it’s a drag to spend your summers wading around in a swamp. And so it seemed like an area of creative ignorance to go into.”

Watts’ study target is the portion of Big Cypress National Preserve that consists of small islands, called domes, of pond cypress, a deciduous conifer, amid a sea of grassy prairie. The prairie floods periodically during the summertime wet season, leaving swampy patches in the low-lying areas when the water subsides in winter. The layperson might wonder whether fire plays any role in this damp land. Indeed it does, says Watts. The end of the dry season in May brings thunderstorms, and the lightning touches off numerous and sometimes severe fires.

Watts was interested in how the fire and flooding influence ecological edge effects in the cypress domes. The term “edge effects” describes the gradient of change in microclimate conditions—such as temperature, moisture, and vegetation structure—stretching between the edges of a vegetated patch and its interior. Commonly, edge effects consist of the moderating of the extremes of temperature and moisture in the more open areas outside the patch.

Edge effects have been well documented in other forest ecosystems, but no one had yet looked for them



Florida cypress domes during the wet season, which Adam Watts studied to determine the influence of fire and flooding on the ecological edge effects of cypress domes.



Florida cypress domes during the dry season.

in cypress swamps. Watts was also curious whether the seasonal flooding and the frequent fires would overrule edge effects in shaping the microclimate within the cypress domes. He found that cypress domes do show edge effects similar to those in other forest systems. The influence of seasonal flooding, however, was less conclusive. When standing water was present, says Watts, the gradient of shifting microclimate conditions between edge and interior became less pronounced, but a gradient was still detectable—suggesting that flooding does not pose a “hydrologic switch” that overwhelms the edge effects.

As for the influence of fire, his findings surprised him. Comparing recently burned cypress domes with those that had not experienced fire for a decade or more, Watts expected that the recently burned domes would have sparser vegetation and, hence, would be hotter and drier inside—in other words, that they would show reduced edge effects. “But I found the opposite,” he says. “The domes that had experienced fire [more recently] were cooler and moister in the

interior.” He attributes this to the flush of vegetation that followed the fires: “This lush new growth was creating more shade and transpiring more moisture into these patches. So in the short term, this may be a negative influence on severity of future fires. Of course, we need to measure what happens down the road, because conditions change.”

Watts’ findings promise to shed light on how patchy wetland landscapes might respond to a warming climate. “If you look at the ratio of edge to area of a cypress dome,” he says, “you see that a smaller patch has proportionately more edge. So the smallest of these domes are going to have a less moderated microclimate than the larger ones—they’ll swing back and forth more on temperature and humidity. If the future climate proves to be warmer and drier, these smaller patches might serve as living minilabs to assess what climate change might do on a larger scale.”

Changing Spatial Patterns of Fire Severity?

Brian Harvey’s doctoral research also promises to contribute to the growing body of climate change findings. Harvey, now a fourth-year doctoral student at the University of Wisconsin, began his Ph.D. work with his advisor Monica Turner, researching interactions between bark beetle outbreaks and wildfire in the Greater Yellowstone Ecosystem. His GRIN award allowed him to explore an angle that no one had yet examined: are the spatial patterns of burn severity changing with the increasing number of fires hitting the northern Rockies?

“Monica’s work following the 1988 Yellowstone fires showed the importance of spatial patterns of burns within the perimeter of a wildfire,” says Harvey. “You often see burned areas portrayed in the media as uniform blackened moonscapes, but they’re really quite variable across space. You’ll typically see unburned patches mixed in with severely burned ones. So heterogeneity is built into the fire mosaic.” This heterogeneity is important to understand, he says, because the resiliency of a forested landscape—its ability to recover from a disturbance like a big fire—depends greatly on how the effects of the disturbance are spatially distributed.

Harvey is curious whether the patchwork of fire severity might be changing in response to more severe fires. For example, might there be a trend toward a higher concentration of larger burned patches within the mosaic? He is using satellite records from 733



Brian Harvey measures a burned tree as part of his doctoral research.

large fires that burned across the northern Rockies between 1984 and 2010. He gathered field data on burn-severity patterns from recent (2011) fires. Then he used a model to map burn-severity patterns for every fire in the study period, calibrating the model's output against his field data.

So far he hasn't found as much evidence of pattern change as he expected, he says. "We're still finalizing some of the analyses, and the findings haven't yet been peer reviewed. But so far, the broader-scale patterns of heterogeneity haven't been changing as fast as we expected." This is not a disappointment; rather, it's



Forest in the northern Rockies where Brian Harvey studied burn-severity patterns.

useful information for probing deeper. A weak signal of changing patterns might be partly due to the very heterogeneity being examined—burn severity is highly variable to start with, and pattern changes might be expected to be subtle and hard to detect.

"Some of the small but significant changes in some measures of wildfire heterogeneity may be the start of big changes on the horizon," he says. On the other hand, "the stability in other measures is a reminder of inherent variability in these ecosystems that may take much longer to qualitatively change. Sometimes we can be surprised by how resilient ecosystems can be if we give them a chance."

Professional Development

Besides opening a research avenue for Harvey, the GRIN opportunity prompted him to hone his grant-writing skills. "Brian got wonderful experience in generating another competitive proposal, in addition to what he had to write for his Ph.D. work," says Turner. Doctoral students, she adds, are expected to be fully functioning scientists when they graduate. It's fundamental to the profession to write solid proposals that will pass peer review, "but that doesn't come easy to most students."

Says Harvey, "It was my first experience at writing a big proposal, and it forced me to do the difficult work of pushing the research question, honing and tuning it. Because if you don't think it through, you could go down a dead-end pathway. You ask yourself, 'Are spatial patterns of fires changing?' And you might think it's a small, specific question, but it's a big, broad question. You have to frame it in a way that captures what you need to know. And then you have to translate that into an executable proposal that's going to give you the answers you need. There's a high level of thinking, revising, and critiquing of ideas that goes into a proposal that looks pretty simple in the end. It really takes practice, and I feel fortunate that GRIN gave me some of that practice."

The GRIN awards foster additional professional development by putting a young scientist fully in charge of a research project—responsible for managing the budget, hiring staff, arranging for data collection and laboratory time, and producing the promised deliverables. GRIN funding opens incidental opportunities, too, such as hiring undergraduate students to help with the research. Of the five technicians Godwin hired to collect data in his Florida flatwoods study, three were students. "We were able to train them on research instruments (for example,

a \$10,000 LI-COR soil CO₂ efflux measurer), which they wouldn't otherwise have had access to," he says.

It's not out of the question that some of these student technicians might be inspired to continue with a fire science degree and become the *next* next generation of fire professionals—an unmeasurable but possibly significant fringe benefit of GRIN.

Current and past GRIN awardees continue to hone their skills by serving as peer reviewers for the new crop of proposals, as Watts, for one, has done. "It's a huge honor to be a reviewer," says Varner. "It brings the students onto the panel as peers." Watts agrees: "Getting a successful JFSP grant—finally—has allowed me, when my colleagues approach me and ask for insights on how to position their proposal, to be of help to them."

Expanding the Discipline

The GRIN program is one way the JFSP is extending the domain of fire science to embrace disciplines that haven't been traditionally in the fold. To JFSP Director John Cissel, this is one more piece of evidence that GRIN is exceeding expectations. "The challenges we face today in the fire management and science communities demand broad-based thinking and cross-disciplinary investigation," he says.

Proposals for innovative and relevant research are coming from institutions other than what Varner calls "the usual suspects"—the half-dozen or so universities and departments with strong fire science programs. Students at these other schools may not initially think of themselves as being in the fire science business. "For example," Varner says, "we've received several proposals to study animal responses to fuels treatments. Some of these may come from a student in a typical university biology program, where the advisor may be, let's say, a herpetologist, and the student wants to work on the response of reptiles to various fuels treatments. This is very cool, because this pushes the strong fire universities and agencies to look at questions like this from a different slant."

For Further Reading

Aman, D. 2012. Fighting fire with nature: How homeowner attachment to "natural" landscapes can be used to promote wildfire mitigation in the wildland-urban interface. Penn State University, State College, PA. <http://destinyaman.files.wordpress.com/2012/12/stakeholderreportfinal-2.pdf>.

Hall, T.E., and J. Blades. Forthcoming. Exploring how deliberation on scientific information shapes stakeholder perceptions of smoke and forest management. JFSP Project No. 11-3-1-33¹. University of Idaho, Moscow, ID.

Kobziar, L.N., and A. Watts. 2013. Will climate change alter wildfire behavior and effects in seasonally-dry wetlands? JFSP Project No. 11-3-1-22. University of Florida, Gainesville, FL.

Kobziar, L.N., and D. Godwin. 2013. The influence of prescribed fire and understory fuels mastication on soil carbon respiration rates in flatwoods forests. JFSP Project No. 11-3-1-21. University of Florida, Gainesville, FL.

Litton, C.M., and L.M. Ellsworth. 2013. Improved wildfire prediction using remote sensing technology on guinea grasslands in Hawaii. JFSP Project No. 11-3-1-12. University of Hawaii at Manoa, Manoa, HI.

Smith, A.M.S., and N.W. Brewer. 2012. Masticated fuels and carbon storage: Effects of particle size and fuel moisture on black carbon production. JFSP Project No. 11-3-1-30. University of Idaho, Moscow, ID.

Swetnam, T.W., and E.R. Bigio. 2013. Reconstruction of fire history using tree-ring and alluvial sediment records in the western San Juan Mountains, Colorado. JFSP Project No. 11-3-1-27. University of Arizona, Tucson, AZ.

Turner, M.G., and B.J. Harvey. 2013. Is spatial heterogeneity of burn severity changing with warming climate and increasing wildfire? JFSP Project No. 12-3-01-3. University of Wisconsin-Madison, Madison, WI.

Watts, A.C. 2013. Organic soil combustion in cypress swamps: Moisture effects and landscape implications for carbon release. *Forest Ecology and Management* 294: 178-187.

Wright, M., and D. Aman. 2012. Affecting risk: Improving hazard communication in the wildland-urban interface. JFSP Project No. 11-3-1-29. Penn State University, State College, PA.

¹ This and other Joint Fire Science Program reports may be found on the JFSP website, www.firescience.gov. Also, see the Integrative Graduate and Research Traineeship website at <http://www.igert.org>.

National Interagency Fire Center
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FIRE SCIENCE DIGEST

ISSUE 18

APRIL 2014

JFSP Fire Science Digest
is published several times a year.
Our goal is to help managers
find and use the best available
fire science information.

Credits

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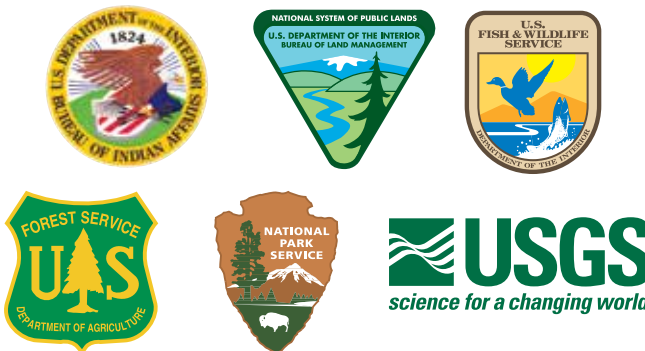
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