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| Section | Comment | Response | Assignment |
| Objective | The heading and subheadings of this section could be clearer. Suggest calling the whole section "Introduction" and splitting into "Context" and "Objectives" subsections. |  | Brian |
| Part 1: Technical Approach | Overall, the experimental design and associated sampling design are well structured and succinctly described. |  | Brian |
| Part 1: Technical Approach | However, given Obj. #1 (effects of climate), I expected to see climate variables featured explicitly in the description of sites \*and\* in the results. However, there does not appear to be any explicit quantification of such variables. | Added Climate Data section to Technical Approach:  “*We selected installations to span a climate gradient to provide us with a range of climate conditions for modeling relationships between climate factors and tick-borne disease risk under current and future climate change. To characterize this climate gradient, we retrieved daily climate data (1980-present) for each installation from the Daymet weather product (Thornton et al. 2016), which provides daily values for maximum and minimum temperature, precipitation, solar radiation, vapor pressure, and day length at a 1 km x 1 km resolution. Values were extracted to each plot using the R package ‘daymetr’ and then summarized to annual averages to illustrate the climatic variation and gradient of the study region. We are exploring which of these climate factors are affecting tick abundance, tick host abundance, vegetation, and prescribed fire management. This exploration includes testing variables aggregated in different ways, e.g., annual or seasonal averages, days above or below threshold values.*”  Added a figure to “Installation and plot visits” Results and Discussion illustrating temperature, rainfall, and vapor pressure at each installation over the past 30 years based on Daymet data; and added text describing these data at the installation level: “*Annual averages of climate variables at the selected installations illustrate the climate gradient we wished to sample (Figure XX). Climate values some interannual variation within installations across factors, though limited for precipitation. The spatial resolution of Daymet data results in small or no difference in values between plots at the same installation, so these data do not capture the “local” microclimate conditions that are influenced by vegetation cover and more directly affect tick survival (see section 2B). Temperature followed an expected latitudinal gradient with the highest maximum temperatures at Avon Park AFR, the farthest south installation, with increasing temperatures along increasing latitudes to the northernmost installations in Georgia (Fort Gordon) and South Carolina (Fort Jackson). We did not find an effect of these climate variables on prescribed fire management thus far at these installations. The temporal scale may be too long and is a mismatch with more contemporary factors driving prescribed fire management decisions. Our current results indicate that fire management (i.e. fire frequency) is primarily determined by characteristics of the installation, which would include factors that aren’t climate or weather related, such as preferred management methods, personnel for prescribed fire, and budgetary differences. We are exploring other ways of aggregating these data (e.g. seasonally and using threshold values) that may reveal how environmental conditions have affected fire management.*” | Whalen with help from Mike & Tess? |
| Part 1: Results and Discussion | Glad to see iNaturalist was leveraged.  However, assuming that this was a 'collateral' or opportunistic product of the work (based on the iNaturalist description and methods not appearing in the "Technical Approach section) with no formal relationship with the stated objectives:  1. It would add clarity to state/explain this 'collateral' role more explicitly.  2. strange to have it sandwiched between other sections reporting formal results of the study.  Also: Minor issue (typo?) "Research grade" observations are described but then the term "research grade" seems to be applied to statistics about a species count rather than observations. Some minor changes could add clarity here. | 1. We have added clarifications regarding the role of the iNaturalist project.  “In order to improve confidence and consistency in plant identifications, we created an iNaturalist [project](https://www.inaturalist.org/projects/serdp-species) that enabled easy reference in the field for identifying species that were not flowering and would have required a taxonomic key (Figure 15).”  2. We have moved this section in to the methods section following “ground cover and litter data collection” where we talk about understory species identification.  Minor issue: We have clarified the sections that refer to research grade:  “Observations may be tagged as “Research Grade” in iNaturalist when it was in the wild, includes a relatively accurate location and date, and the identification is supported by at least two members of the community. During our field surveys, we identified over 270 species and currently 50% of these observations have become “Research Grade.” In the cases of rare species, such as pitcher plants, we either excluded coordinates or included coordinates that were imprecise (fuzzed approximately 1500 m) using functionality built into the iNaturalist application. These “Research Grade” observations are accessible by other databases such as GBIF, which is commonly used for analyzing species distributions, so a collateral result of this project was small contribution to the scientific community writ large.” | Luke, Whalen, Drew & Steven |
| Part 1: Results and Discussion | This section doesn't include much interpretation or discussion--perhaps the plan is to work this up only for the final report?  Additional (even if cursory) data interpretation and discussion comments would help the reader understand what the PIs feel are important conclusions from the various results shared. | Yes, our plan is to provide most interpretation and discussion in the final report when we are confident of our results. We made revisions to provide interpretation and highlight some of the results we expect to be most important.  “Host abundances” section: “*All of these hosts may influence tick abundances and the risk of exposure to tick-borne diseases, but they are not all equal in their effect. White-tailed deer and rabbits are typical hosts for adult and nymph life-stages respectively and both host species may be reservoirs for zoonotic diseases that threaten human health, so are likely to increase TBD exposure-risk to humans. Though encountered at low relative abundance, wild pigs (hog) are reservoirs of additional pathogens that cause disease in humans. Cows were the only domesticated host encountered and are interesting for their potential effect on tick abundances because they are typically treated to prevent ticks from feeding or to prevent tick reproduction and disease transmission if ticks do feed on them.”*  “Tick abundances” section: “*The lowest tick abundance for both sample years was at Avon Park AFR (excepting Moody AFB), which is at least partly attributable to management resulting in poor microclimates for ticks in the areas we sampled at the installation that experiences the highest temperatures. An additional factor that may contribute to the low tick abundance at Avon Park AFR is the cattle grazing because the cattle are treated with tick prevention medicines.*”  Added a Summary to the end of the Results and Discussion: “*Effects of fire management appear to be the strongest determinant of tick abundances in analyses thus far, with fewer ticks collected from more recently burned plots. The relationship between litter biomass and tick abundance and litter biomass and time since last fire also suggests the direct and indirect effects of prescribed fire management. Fires have a direct effect in terms of destroying ticks with the only refuge for ticks during fire being into the soil layer, less flammable litter, or being in unburned patches by happenstance. Fires also have an indirect effect by reducing the amount of litter and vegetation cover, which provide ticks with a daily refuge from inhospitable weather conditions. As yet, it is unclear how the Daymet climate variables may affect the relationships between fire management, vegetation characteristics, and tick abundances. Thus far we have explored effects of long-term averages (30- and 15-years) and the coefficient of variation of the annual averages over these time periods for maximum and minimum temperature, and annual totals for precipitation. None of these aggregated variables had a statistically significant effect on tick abundances, host abundances, vegetation metrics, or time since fire. The coefficient of variation for total annual precipitation over the past 30 years contributed the most information to a model of tick abundance, suggesting that variation in climate is more biologically relevant for estimating tick populations. It also may not be surprising that long-term aggregations of values did not explain much variation in tick or host abundances in these areas that are predominantly under intense management, i.e. management may be the driving factor and it overrides any climate signal. In the same vein, the ability to apply prescribed fire depends on a complex combination of factors including current weather conditions that determine whether a fire falls within the prescription and can be conducted that day. Among these factors are relative humidity, smoke dispersion (wind speeds and atmospheric mixing), precipitation, and air temperature. We are currently working on aggregating variables in different ways, such as seasonally and days per year that are potentially acceptable “burn days,” in order to link weather conditions to fire frequency and use this relationship to make projections under future climate scenarios. In current models of fire frequency, the installation accounts for the greatest amount of variation, which is indicative in part of the logistical capability of an installation to use prescribed fire as a major management technique. For example, we learned from talking with land managers that Fort Benning (one of the larger and busier installations in our study) has nearly every management unit on an 18- to 36-month fire return cycle and is equally capable of conducting prescribed fires during the dormant or growing season. In comparison, Moody AFB (the smallest installation) has a small natural resources management staff and are limited nearly entirely to conducting dormant season burns.”* | Luke, Whalen, Drew & Steven |
| Part 2A: Experimental Design: Experimental Apparatus | Confusing: description of FABIO in first sentence describes a piece of equipment; in second sentence it is referred to as "experimental fires". | We have revised this sentence to be clearer about referring to the small scale apparatus and not to experimental fires:  “The small-scale (1 m2) experimental apparatus enabled repeated fires and measurements of fire characteristics across multiple fuel loads without the onerous task of establishing all experimental plots prior to a large-scale prescribed fire.” | Luke, Whalen, Drew & Steven |
| Part 2A: Experimental Design | The statement:  "We qualitatively compared the statistically modeled relationships of the measurements recorded during the five experimental fires using the FABIO with the average values of the seven locations that we measured during the prescribed fire."  ...is confusing because:  1. it comes under the heading "Statistical Analyses"; and  2. the nature of the qualitative comparison indicated needs further elaboration to be understood and to link to the associated discussion in the Results and Discussion section. | We have revised the sentence to be clearer about the importance of the prescribed fire for comparison to our small scale fires, as well as added additional elaboration about this comparison in the discussion:  “In order to compare measurements from our small scale fires to fires in natural settings, we visually compared average values from the seven locations where we recorded measurements during the prescribed fire to the statistically modeled relationships of the measurements recorded during the experimental fires using the FABIO.”  “However, in comparison to the fires with both fuel structures combined, which is more representative of natural fuel conditions for cogongrass, the relationship from the experimental fires using piled fuel likely isn’t representative of fires in natural settings. Therefore, experiments that manipulate fuel loads with disregard to vertical fuel structure may produce inaccurate predictions of the ecological effects of fire due to inaccurate estimates of how fuel loads affect fire temperatures and residence time (Fernandes and Cruz 2012).”  “When the interest is in the ecological effects of fire, reconstruction of natural fuel structure is paramount in bridging the gap between field studies and laboratory flammability assessments (Fernandes and Cruz 2012). By controlling for standing fuel structure, our device provides a more realistic substitute for full-scale experimental fires.” | Luke, Whalen, Drew & Steven |
| Part 2A: Title, Technical Approach, and Results and Discussion | The title and the discussion comment here that the FABIO apparatus "may improve scaling small-scale fire experiments" imply that the focus of this section is on improving methods for measuring fire intensity. However:  1. This objective is not included in the list of objectives in the "Objective" section.  2. The technical approach does not provide any comparison with other methods--so does not inform this question.  The presentation of results focuses on the relationship between fuel characteristics and fire intensity and height.  \*\*Recommend revising the title to be consistent with stated objective 2A and removing or revising discussion of methodological improvements to avoid the implication that this work demonstrates methodological improvements in recreating or measuring fire characteristics more than anecdotally. | 1. We have added this as a specific objective in the list of objectives:  “2) Conduct field experiments to determine the A) effect of fuel structure on fire temperature and residence time of invasive cogongrass, including relationships between fuel load, flame height, and fire intensity…”  2. We have provided a conceptual figure that illustrates how our methodology bridges the gap between laboratory (flammability) studies and outdoor large-scale field studies (see Fig. 25).  We have revised the title to be more consistent with the new objective #2 and clarify that this is a new methodological approach to measuring fire characteristics while maintaining vertical fuel structure.  New title:  “An experimental method for testing the effects of fuel structure on fire temperature and residence time” | Luke, Whalen, Drew & Steven |
| Part 2A: Results and Discussion | "We demonstrated our methodology with cogongrass, a widespread and problematic invader in the Southeast USA, and report the most ...accurate measurements to date..."  This statement is not supported by experimental design (i.e. no counterfactual) or sufficient citations. | We have moved up a paragraph that provides context of the other references that quantify maximum temperature of cogongrass fires under different methodologies.  “To date, most reports on the effects of cogongrass on fire behavior in the USA have been qualitative. Only one peer-reviewed study we are aware of has compared temperatures from cogongrass fires to native vegetation fires in the same landscape (Lippincott 2000). They reported a maximum temperature of 458ºC in a cogongrass fuel bed versus 318ºC in native vegetation using temperature-indicating paints. Maximum temperatures >260ºC at 91 cm above ground level were reported by Enloe *et al.* (2013), also using temperature-indicating paint. In comparison, the highest maximum temperature we estimated was 985ºC at 50 cm above ground level. In addition to maximum temperature, we report the first estimates of temperature residence time for fires where cogongrass is the dominant fuel. Interestingly, the temperature residence time from our experimental fires with standing fuels was similar to that of the prescribed fire in a native long leaf pine ecosystem within the same range of fuel loads. This similarity suggests that the negative impacts of cogongrass via effects on fire behavior in the Southeast USA is driven by the higher fuel loads it generates compared to native vegetation.” | Luke, Whalen, Drew & Steven |
| Part 2B | Acknowledging that the underlying experiment here is a work in progress, the structure of the approach here is focused and concise.  Ultimately, unless additional work is able to discern a meaningful relationship between cogongrass and host densities, the potential secondary relationships and cycles here should be presented as requiring further study. | We have revised this section of the manuscript to be clearer that these relationships should be viewed as possibilities and that future work is needed to determine these relationships.  “This research may reveal an additional mechanism by which plant invasion may alter tick abundance by directly impacting tick survival. However, potential indirect effects of plant invasion on tick abundance include changes in host density. The combined understanding of these direct and indirect effects will allow us to determine the net outcome for changes in tick-borne disease risk. While further study is needed to determine these relationships, we set up a list of possible scenarios of the potential impacts on tick abundance given an increase in tick survival (Figure 34, Figure A1).” | Luke, Whalen, Drew & Steven |
| Part 3 | I feel this part especially would benefit from a concise but informative introduction that sets out some of the known context for the experiments and results presented including:  --expected tick diversity and occurrence at different sites referencing documented range of different species  --basic known relationships between tick spp. and associated TBAs  --expected TBA diversity and occurrence in different tick spp. and perhaps at different sites based on documented associations and ranges |  | Brian & Page |
| Part 3: Results and Discussion | (either here or in some sort of intro): Since a key part of this section relates to imperilment of humans and wildlife, it would be good to include some statements about the relative risk to these groups (at least humans and perhaps selected wildlife spp.) from some or all of the ticks and/or TBAs expected and found to be present in these areas and how much (hypothetically if necessary), densities of ticks might correlate with risk of disease or mortality. |  | Brian & Page |
| Part 4: Overall | I found the overall storyline of this section hard to follow. While there are many important insights, I think the section would benefit by better organization of 1. the objectives of this section (there are many explicit and implicit that are not included in the "Objective" section of the report), 2. Technical approach (generally structured so that a reader can understand what parts of the modeling work correspond with specific objectives, and 3. Results and discussion (which again should be structured so that results can be associated with specific objectives and discussion related to specific results).  Additionally, I was surprised (both in this section and others) to find little if any discussion of the current and potential future climate context of the various sites (bases) from which data were collected. Since there are many stated and implied management implications of this work overall, it seems that some discussion of the contrasting contexts and futures of the different bases should be an important parts of discussion. | ***I found the overall storyline of this section hard to follow. While there are many important insights, I think the section would benefit by better organization of 1. the objectives of this section (there are many explicit and implicit that are not included in the "Objective" section of the report.***  *We added a separate and more explicit “Objectives” subsection which breaks up our modeling objectives into more identifiable parts. We refer back to these listed sub-objectives throughout the technical approach and results.*  *“****Modeling Sub-objectives***  *The fourth objective of this project is to model how vegetation will respond to future climate scenarios, fire, management, and invasion, and then to connect these projections to our understanding of the environmental controls of tick abundance and TBD risk (vegetation, climate, fire), to be able to connect future circumstances and management decisions to ticks and TBD outcomes. Modeling future vegetation in the southeast under different climate, fire, management, and invasion scenarios requires the development of new tools and techniques. To organize how each development contributes to our ultimate goal, we subdivide this task into 6 sub-objectives. Specifically, because the possible number of scenarios to consider under all factorial combinations of native vegetation, invasives, climate, management, and fire is exceedingly large (both to produce and understand), we approach the problem by adding each factor incrementally, analyzing the key dimensions of ecosystem response and sensitivity, and then carrying forward a reduced set of scenarios when adding the next factor.*  *4 A) Analyze ED2 projections for southeastern pine forests under different climate scenarios*  *4 B) Develop and validate Cogongrass Plant Functional Type (PFT)*  *4 C) Use ED2 to explore different invasion & climate scenarios*  *4 D) Couple ED2 to a more advanced fire model and run ED2 under different fire scenarios*  *4 E) Upgrade the representation of management techniques in ED2 and test effects on forests, invasion, fire, and climate*  *4 F) Produce an interactive tool for land managers to interactively explore effects.”*    **2. Technical approach (generally structured so that a reader can understand what parts of the modeling work correspond with specific objectives,**  In addition to in-text references to specific sub-objectives, we added sub-objectives into our heading titles.  “*Objective 4 A: Southern Pine Forest Under Different Climate Scenarios*”  “*Objectives 4 B & 4 C: Cogongrass Plant Functional Type Development and Analysis*”  *“Objectives 4 D & 4 E: Representation of disturbance (4 D) and management (4 E) in ED2”*  *“Objective 4 F: Produce an interactive tool for land managers to interactively explore effects”*  **3. Results and discussion (which again should be structured so that results can be associated with specific objectives and discussion related to specific results).**  Like above, we made results and discussion section with headings matching those in the Technical Approach section. As in the technical approach, we also referred to the sub-objectives in line.  **I found the overall storyline of this section hard to follow. While there are many important insights, I think the section would benefit by better organization**  We additionally tried to address this comment by paring down text in the Technical Approach & Results for section “Objectives 4 D & 4 E: Representation of disturbance (4 D) and management (4 E) in ED2” to keep our narrative cleaner. We cut two figures, a table, and reduced the number of words by about 60%, Because a published paper exists documenting our work, we tried summarize and highlight how this paper fit into larger objectives.   **Additionally, I was surprised (both in this section and others) to find little if any discussion of the current and potential future climate context of the various sites (bases) from which data were collected. Since there are many stated and implied management implications of this work overall, it seems that some discussion of the contrasting contexts and futures of the different bases should be an important parts of discussion**  We added a figure (Figure 39) that plots future meteorological scenarios used to drive ED2 when simulating future pine forests. We have not yet run ED2 at the different bases. | Mike & Tess |
| Overall | This study can provide managers with specific, defensible tools to better manage DoD properties to benefit natural communities and reduce disease risk to humans and wildlife.  Tightening the organization of the technical approaches and current (interim) data will increase the clarity of this important work and provide 1) provide managers in the areas included in the study and 2) managers in other areas with related conditions with more actionable information upon which to base management actions. |  | Brian |