BURN SEVERITY AND ITS IMPACT ON SOIL PROPERTIES: 2016 ERSKINE FIRE IN THE
SOUTHERN SIERRA NEVADA
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Purpose/Statement of Interest
Wildfires are one of the most dominant natural and human-caused agents of
landscape change. Furthermore, their after effects, particularly slope failure and debris
flow, continue to alter the landscape years after the fire has passed. In fact, wildfires
and consequential debris flow and slope failure events cost human lives and cause
billions of dollars in damage annually. The 2016 Erskine Fire near Lake Isabella caused
two fatalities and damaged 285 structures. Even more, climatic trends for southern
California project that wildfires and consequential slope failure events may increase in
frequency in the coming years, further disrupting communities, economic productivity,
and safety. Thus, in attempt to reveal the 2016 Erskine fire's potential to alter the
landscape, the physical properties of unburned soils and soils of low, moderate, and
high burn severities will be explored. Employing liquid limit, plastic limit, and shear
strength tests will elucidate the effects burn severity has on the physical properties of
soil within the 2016 Erskine fire perimeter. The goal of this project is to explore the
correlation between burn severity and soil properties and how this influences slope
failure and debris flow.

Significance
Natural hazards, such as wildfires, cause billions of dollars in damage and
thousands of human casualties worldwide (Galve, Jorge Pedro et al., 2016; Nadim et al.,
2006). The 2016 Erskine fire occurred during June and July of 2016 and ultimately
burned 48,020 acres, destroyed 285 homes, and took two human lives
(inciweb.nwcg.gov). Nonetheless, the 2016 Erskine fire contributes to worldwide
cumulative damage assessments. Within another recently burned region of the Sierra
Nevada, massive debris flows occurred and caused temporary closure of Highway 395
and damaged more than twenty structures, including residences (Wagner et al., 2012).
Recent studies have shown a trend of longer fire seasons, and climate models indicate
wildfires will continue to be more frequent (Yoon, et al., 2015). Increases in wildfire-induced slope failure and debris flow events are likely to result from intensifying fire
seasons.
In this study, soil characteristics conducive to slope failure within the Erskine fire
perimeter will be explored. The results will elucidate the influence fire intensity has on
soil properties and may aid to enact measures that can help mitigate the damage when
the next slope failure event occur. Completion of this research project could also help
establish California State University, Bakersfield as a leading contributor to original

can trigger flash floods, and thus enhance slope failure and debris flow probability
(Crozier, 2010). Coupling recently burned landscapes and steeply dipping mountain
slopes with flash flood events generates a high likelihood for slope failure (González-Ollauri and S. B. Mickovski, 2015; Lu, 2014). The study area within the 2016 Erskine fire
perimeter is such a place bounded by recently burned, steeply dipping, and sparsely
vegetated hill slopes, which pose a high potential for slope failure or debris flow events.
Moreover, soil is one significant agent influencing slope failure and debris flow.
Soil can be loosely defined as the unconsolidated material that overlies bedrock and is

1. Description of the mentoring process between you and the student, including how
you plan to develop the student’s strengths and remediate any weaknesses.
Mr. Sade Haake has consistently ranked as a top-10 student in the several classes
he has taken of mine and ŝƐĐƵƌƌĞŶƚůǇǁŽƌŬŝŶŐŽŶŚŝƐƚŚĞƐŝƐĂƐĂŵĂƐƚĞƌ͛ƐƐƚƵĚĞŶƚŝŶƚŚĞ
Department of Geological Sciences. He is also well informed about fundamental geology
concepts and their relationship to our proposed project. In previous projects with Sade,
he demonstrated that he can apply his knowledge to help solve real-world problems
through the application of science. Thus, Sade is an excellent student who can help me
achieve the goals of the