Is Cell Phone Coverage in Yosemite National Park, California Contributing to Missing Persons.

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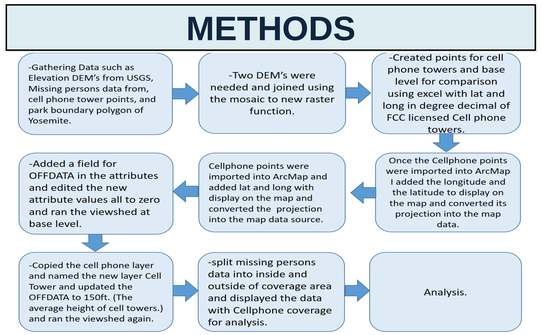
ABSTRACT

Every year hundreds of people go missing in state parks and cannot contact help due to limited cell coverage. In Yosemite National Park from 2000-2010, 213 people went missing. To evaluate if cell phone coverage is a significant factor in missing person cases in Yosemite. We needed to create a comparison of shortwave radio coverage area at ground level and cell tower coverage size. After which we can compare missing person data to coverage area for analysis with coverage area, the ratio of missing in each coverage area, and the average rescue time. This concludes in the trend that cell coverage area has faster rates of rescue but more false reports of missing persons.

INTRODUCTION

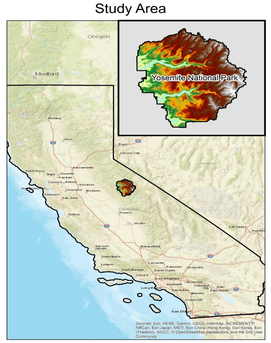
Every year many people go missing in National Parks like Yosemite. Not being able to contact emergency responders in emergencies or access mapping apps on mobile devices can be a big contributor to people going missing. In Yosemite ecologist do not want to spoil the scenery with unsightly cell towers, but does the benefit of cellular service outweigh ugly cell towers? (Leavenworth 2017) This issue limits the number of cellphone towers in state parks which in especially rugged topography tend to lose coverage area as terrain blocks cell phone signals and short-wave radio signals. Cell phones essentially use radio frequencies just like normal radio however the cellular frequencies are between 800-2400mhz and only have a wavelength of 1 foot.(Pendleton 2019) The radio waves tend to be blocked very easily and so viewshed analysis in GIS can be used to track cell phone coverage area in Yosemite in the effort to correlate missing persons and cellphone signal availability. I have collected missing persons data from a study done by Paul Doherty in 2016 which looks at cases of missing hikers in Yosemite from 2000 to 2010 and I will then correlate whether inadequate cell phone coverage could have an impact on missing persons in Yosemite National Park.

METHODS

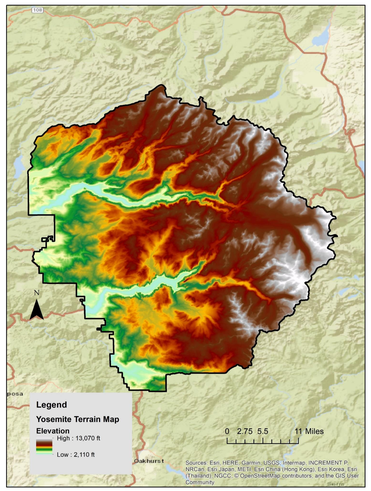


STUDY AREA

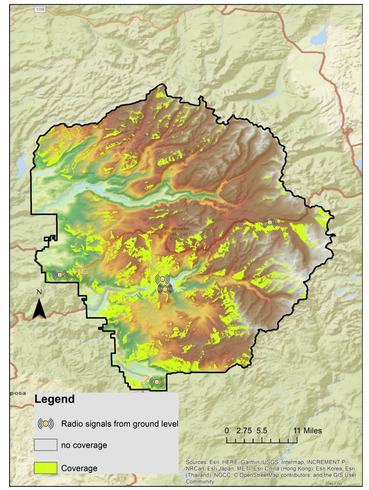
Study Area



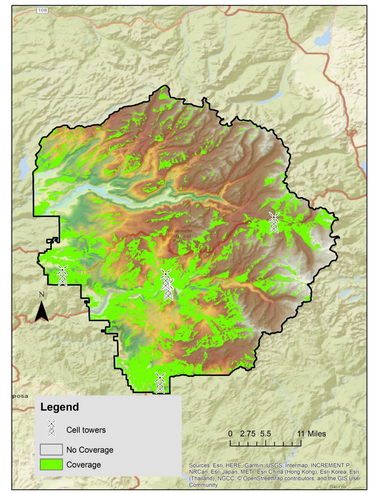
Terrain map of Yosemite National Park



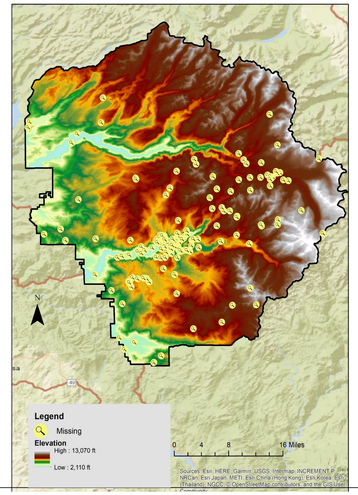
Shortwave Radio Signal Coverage



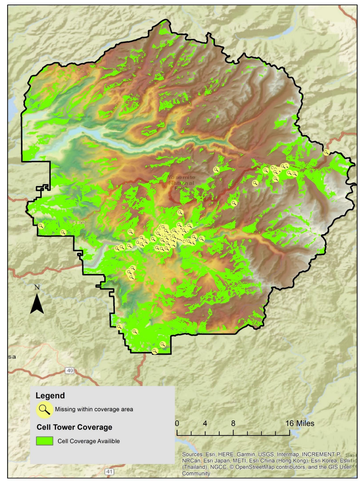
Cell Tower Signal Coverage



Total Missing Persons in Yosemite 2000-2010

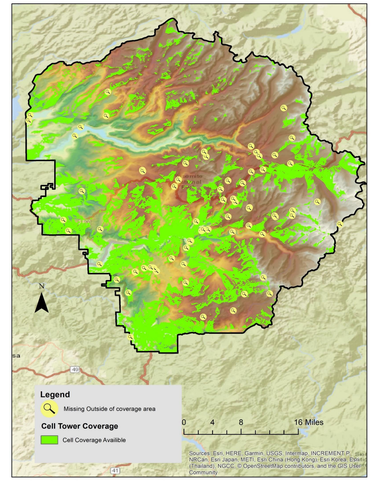


Missing Persons Within Cell Tower Range.



126 Missing Persons.
60% of total missing.
40% listed not missing.
7 hour average rescue time.

Missing Persons Outside Cell Tower Range.



87 Missing Persons.
40% of total missing.
29% listed not missing
12 hour average rescue time.

ACKNOWLEDMENTS

I would like to thank Dr. Dai the most for the help and guidance that made the construction of this project much less complex and time consuming than I anticipated. Also, I'd like to thank Starbucks for selling me that sweet caffeine to keep me going.

RESULTS & DISCUSSION

The results of the maps show a clear clustered pattern of missing persons in the Yosemite Valley. The grouping of missing persons in the valley does coincide with the popularity of the park's main attractions. There is a noticeable trend that despite having cell coverage in that area people are still going missing at a greater rate. Even though coverage is available, cell phone signals still have spots where service can be interrupted, but is that enough to account for the majority of missing persons in the Yosemite valley? According to the missing person's study, 40% of the missing in covered areas and 29% of uncovered areas were classified as "Not Lost" but listed as "Overdue". (Doherty 2016) This suggest that most people tend to stay closer to main attractions while more advanced hikers tend to have more serious emergencies situations in uncovered areas. The viewshed analysis at the 8 FCC cell towers found during data gathering show that ground level communication covers 14% of the park with an area of 169 square miles compared to 34% in cellular range that covers 392 square miles (City-Data.com 2009). The total number of missing inside of coverage area is 126 compared to 87 that are outside of cell range which can make the study look like there is more missing inside coverage area. However, Since 29% of missing persons outside of cell coverage were not lost vs 40% in coverage areas. how much money was wasted in those search and rescue efforts when a simple phone call would have saved time and resources? Finally, The average time that missing hikers are found in areas with cell service is 7 hours and 12 hours for areas without service. The debate against adding more cell towers to Yosemite and other National parks revolves around the protection of maintaining a pristine wilderness, but as you can see more cell towers can save time, money, and lives .

CONCLUSIONS

Viewshed analysis on radio signals from ground level can represent can reasonably shortwave radio signals like shortwave radio using Line of Sight methods. (Jewell 2014). When compared with cellular tower signals at the same points which for the purpose of this project will be the average height of the smallest tower types at 150ft. (Steel 2017) The comparison shows that the coverage of cellular service has greater potential to save lives than short wave radio signals due to the cell phone coverage nearly doubling in size. The correlation of missing persons with coverage and without coverage is substantial but is highly dependent on the attribute. Looking at the high percentage of the attribute 'not lost' in covered areas and a low percentage in areas without coverage shows that people tend to stick to the park's main attractions as 60% of the total missing persons reported are in the same two clusters. However, by looking at the average total hours of search time to rescue per covered and not covered areas we can see that there is a strong enough correlation to assume that better cell phone service coverage can significantly cut down on search and rescue efforts and shorter rescue times in the event of serious emergencies. This could help more advanced hikers that enjoy the less traveled sections of Yosemite that do not have cell phone coverage.

I don't at this point see any reason to suggest that Cell Phone coverage leads to people getting lost in the park, but there is a correlation with people getting found faster with coverage. If signal strength is increased or more cell towers are distributed evenly around the parks elevated areas, I think it may improve cell service that would lead to a safer park.

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