# DAT 223 Project One Proposal Template

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**Date:** May 22nd, 2022

## Problem Statement

The Western Forest Service seeks to reduce the rate of Spruce Beetle infections or epidemics that occur in the Rocky Mountain regions of Colorado. Specifically, the forest service seeks insight into which areas need to be prioritized, ways to prevent future infestations, and ways to mitigate and manage current infestations by:

* Thinning dense stands of trees and removing downed and infested trees.
* Possible use of insecticides.
* Possible use of pheromone packs to disrupt the attraction of beetles.

## High-Level Requirements

The Western Forest Service would ideally like to accomplish the following:

* Identifying the highest priority locations in which to focus the mitigation and/or reduction efforts. Targeting these high-priority areas is likely to have the largest impact on conservation efforts.
* Determining whether or not high priority locations share similarities in soil types. The need for this information will have to be expanded on.
* Determining whether or not these locations are located near a body of water. The proximity to water sources will determine the “value” of the locations regarding conservation efforts. Indirectly, proximity to water sources may be advantageous if considering methods such as “controlled burns” to clear dense areas or areas of high “undergrowth.”
* Calculating the average distance between these locations and a roadway. This distance may determine the cost of conservation efforts and damage control efforts by limiting access to these high-priority areas.

## Types of Questions

To define our constraints, we will need to ask open-ended questions to determine if the presented solutions are the only solutions in mind. We will need to determine the relevance of each question and the solution proposed. Open-ended questions will help with answers to things like “whether or not pesticide use is recommended.” Focused questions will be needed to answer questions such as “what is the average distance to a roadway.” The relevancy of each goal, solution, and question presented must also be determined before further exploration.

## Questions

The following questions may help to narrow the eventual scope of this research:

* Are different access types considered for distance purposes or just paved roadways? Why?
* To what end do soil type similarities influence decisions? How does this information help us? Why is it relevant?
* Tree age, proximity to other trees, underbrush/undergrowth, which characteristics determine whether an area is considered “high priority?”
* Are “high priority” areas considered the same as “high-value” areas (recreation areas, lakes, campgrounds, trailheads, etc.). Why or why not?
* Are there other mitigation or reduction efforts being considered that haven’t been listed? Why or why not?
* Are different water source types (River, lake, spring, etc.) valued higher than others? Why?
* Where are the best areas to deploy pesticides? Pheromone packs? What are the worst areas?
* Can the efficacy of the pesticides or pheromone packs be increased? If so, how?
* What are the best methods to thin out more dense areas? What are the worst areas?
* What are the best methods to reduce old-growth trees? Are there ways to better protect these trees?

## Key Audience(s)

Key stakeholders include in a general sense, the Western Forest Service of Colorado, but more specifically the executive decision-makers and leadership within the forest service. They would likely have the information on which areas of forest are denser than others, which areas have current infestations, older growth, and specific tree species. Information on the efficacy of pheromones and pesticides will come from the manufacturers of chosen products or product candidates. Roadway data could be gathered via satellite technology, or possibly sourced from the Colorado department of transportation.

## Delivery Method(s)

Multiple methods of delivery may work well for discovering answers to the previous questions. These methods include:

1. Focus group analysis. To clarify the issues and desired outcomes of the research, the open-ended questions above would be best aimed at the decision-making group of the forest service.
2. For information regarding specifics such as soil types, forest density, etc., expert interviews may be helpful. The data required will also likely come from interviewing different entities such as the forest service itself, or the department of transportation instance.

## Rationale

The desired outcomes are already known to the decision-makers at the forest service, however, the best methods to achieve those outcomes are not clear and require further investigation. The areas of most dire need have to be identified first, and then the best solution or combination of solutions needs to be determined and gauged for effect. Once these methods are known, and most needed locations are known, conservation efforts that are greatly needed can be tuned to be more effective. This has the potential to save the forest service a lot of money, which can then be aimed at conservation efforts elsewhere. This investigation may also help to save the state money in the case of forest fires due to undergrowth or old-growth forests. The residents of local areas, as well as the general population, will also benefit from these conservation efforts, which will help to maintain these protected areas. Information discovered in this investigation may also help to aid conservation in other parks, forests, etc. regardless of whether or not they are in Colorado.