



A photograph of a rustic wooden cabin nestled in a dense forest. The cabin has a small porch and a visible window. The surrounding area is filled with tall evergreen trees and some deciduous foliage. A path leads towards the cabin through the undergrowth in the foreground.

Tree Risk Assessment

Tahoe Cabin

742 Tahoe Road
Lake Tahoe, CA
September 13, 2021

Executive Summary & Table of Contents

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Tahoe Cabin is a historic cabin located at 742 Tahoe Road near South Lake Tahoe. Several members of the Flanders family have been concerned about managing a historic structure within a dense forest. The Flanders asked Nidus Consulting to perform a Tree Risk Assessment with the goal of identifying the trees most likely to fail and cause damage to the cabin or injure residents.

Observations. Page 4

Of the approximately 50 trees that could strike the cabin, I identified five trees most likely to fail and strike the cabin. Of these five trees, trees #3, 4, and 5 were moderate risk. Trees #1 and 2 were low risk.

Analysis. Page 7

At Tahoe Cabin the services and disservices that trees provide are easily apparent. The cabin nestled in the forest is one of its main appeals and creates an important aesthetic and experience to the family and their guests. But with two large tree failures causing major structural damage to the upper cabin and water tank in the past 20 years, it is clear that this forested environment has risks.

Tree management decisions are always made with partial information. While it is theoretically possible to inventory every tree and aerial inspections and internal decay testing, balancing the level of data collection with the management decisions is important. In the **Recommendations** section, I will recommend both tree management and further data collection, but goals and confidence in decisions should be discussed by the Flanders family.

Recommendations. Page 8

I recommend removing trees #1-5. The most likely failure mode of each tree is either whole tree failure or large codominant stem failures. Reducing the risk through pruning or other mitigation will not reduce the risk and maintain the integrity of the tree. I recommend removing trees #1 and 2 even though they are low risk because their risk will likely increase over time, and it is easier to manage them before they become a problem. I would prioritize the removal of trees #3 and 5 because of their moderate risk and minimal benefits they are offering. I recommend using a Certified Arborist with a valid California Contractors License and is bonded.

I recommend a tree inventory and management plan for Tahoe Cabin. These types of tree removal decisions can be made with this type of analysis, but a cohesive approach to how the Flanders family wants the future forest to be will help make tree decisions like these. A written Management Plan can be particularly helpful for properties managed by multiple parties with a wide variety of different uses and goals.

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Ryan Gilpin performed a Level 1 Risk Assessment for all trees that could impact the cabin as outlined in the *Tree Risk Assessment Best Management Practices* (Smiley et al 2017) on October 26, 2019. Trees that had (1) an observable defect making failure more than improbable in the next two years and (2) at least a medium likelihood of impact were identified for a Level 2 Risk Assessment.

Introduction and Assignment

Tahoe Cabin is a historic cabin located at 742 Tahoe Road near South Lake Tahoe. The cabin is owned by the Flanders family in the El Dorado National Forest under the Recreational Residence Program with a Special Use Permit.

The site is largely forested with a mixed conifer deciduous canopy. *Pinus jefferyi* (Jeffery pine), *Pinus contorta* (lodgepole pine), *Abies concolor* (white fir), *Calocedrus decurrens* (incense cedar), *Juniperus grandis* (western juniper) are the primary upland trees. While *Populus tremuloides* (quaking aspen) and *Salix* sp. (willow) dominate the riparian areas.

In 2018 a *P. jefferyi* failed onto the upper cabin causing significant damage to the structure. Several members of the Flanders family have been concerned about managing a historic structure within a dense forest. The Flanders asked Nidus Consulting to perform a Tree Risk Assessment with the goal of identifying the trees most likely to fail and cause damage to the cabin or injure residents.



Observations

Level 1 Risk Assessment

Of the approximately 50 trees that could strike the cabin, I identified five trees most likely to fail and strike the cabin.

Level 2 Risk Assessment

Of these five trees, trees #3, 4, and 5 were moderate risk. Trees #1 and 2 were low risk.



Abies concolor #1 had a trunk diameter of 30 inches and was in poor condition. Codominant trunks arise at 40 feet with bulge and sap flow. The basal flare was constrained by a rock structure and the southern side of trunk had depressions and sap flow.

The codominant attachment at 40 feet was **possible** to fail in the next two years with a **medium** likelihood of impact. The consequences to the cabin of this impact would be **significant**. Overall, this tree was **low risk**.



Observations

Abies concolor#2 had a trunk diameter of 18 inches and was in fair condition. The trunk swept east, leaning towards the lower cabin. It was growing in a dense group of trees with its base two feet from base of a 40-inch trunk diameter *A. concolor*.

The entire tree is **possible** to fail in the next two years with a **medium** likelihood of impact. The consequences to the cabin of this impact would be **significant**. Overall, this tree is **low risk**.

Abies concolor#3 had a trunk diameter of 34 inches and was in poor condition. Codominant trunks arose from 50 feet, and the tree was growing into crown of a 50" Jeffery pine. The base of the tree was on the slope 1 foot from upper cabin.

The codominant attachment at 50 feet was **possible** to fail in the next two years with a **high** likelihood of impact. The consequences to the cabin of this impact would be **severe**. Overall, this tree was **moderate risk**.



Observations

Abies concolor #4 had a trunk diameter of 41 inches and was dead. The tree failed in 2004 and destroyed the water tank and structure. The snag had many cavities and was located on slope above water tank.

The entire tree is **possible** to fail in the next two years with a **high** likelihood of impact. The consequences to the cabin of this impact would be **significant**. Overall, this tree is **moderate risk**.



Populus tremuloides #5 had a trunk diameter of approximate 15 inches and was in poor condition. It had recently failed and was being held up over water tank by a willow.

The entire tree was **probable** to fail in the next two years with a **high** likelihood of impact. The consequences to the cabin of this impact would be **minor**. Overall, this tree was **medium risk**.



Analysis

Balancing Risk and Benefits

At Tahoe Cabin the services and disservices that trees provide are easily apparent. The cabin nestled in the forest is one of its main appeals and creates an important aesthetic and experience to the family and their guests. But with two large tree failures causing major structural damage to the upper cabin and water tank in the past 20 years, it is clear that this forested environment has risks.

Balanced tree management will be important to weigh these services against disservices. Removal of all trees that might cause damage would drastically change the cabin experience. Failing to manage the trees would likely increase the risk of future damage.

A complicating factor is how stand grown trees respond to removal of neighboring trees. Often trees that grow in dense forested environments are more likely to fail when they are exposed to new forces (primarily wind) due to removing neighbors. So, it is important that each tree removal is warranted and does not needlessly increase the risk of future damage.

The Flanders family has a low risk tolerance. While they appreciate and enjoy the forest, there are so many trees within 100 feet of the cabins that removing a few trees will not significantly change the experience. If many trees are removed, I suspect that the risk tolerance for each individual tree will increase because the value of that tree to the cabin experience will increase.

Making Decisions Based on Information

The five trees identified as the highest risk all had the cabin as a target. People are more valuable targets than structures, but the current use of the cabin is somewhat limited especially during the inclement weather of the winter months when most failures seem to occur. Much of the time people spend at the cabin, they are at least partially protected by the structure. The area of the cabin that people spend the most time and are least protected is on the porch. However, this time is limited enough that the likelihood of a tree failure impacting a person at the cabin is very low.

Tree management decisions are always made with partial information. While it is theoretically possible to inventory every tree and aerial inspections and internal decay testing, balancing the level of data collection with the management decisions is important. In the **Recommendations** section, I will recommend both tree management and further data collection, but goals and confidence in decisions should be discussed by the Flanders family.



Recommendations

Tree Removal

I recommend removing trees #1-5. The most likely failure mode of each tree is either whole tree failure or large codominant stem failures. Reducing the risk through pruning or other mitigation will not reduce the risk and maintain the integrity of the tree. I recommend removing trees #1 and 2 even though they are low risk because their risk will likely increase over time, and it is easier to manage them before they become a problem. I would prioritize the removal of trees #3 and 5 because of their moderate risk and minimal benefits they are offering. I recommend using a Certified Arborist with a valid California Contractors License and is bonded.



Tree Management and Data Collection

I recommend a tree inventory and management plan for Tahoe Cabin. These types of tree removal decisions can be made with this type of analysis, but a cohesive approach to how the Flanders family wants the future forest to be will help make tree decisions like these. A written Management Plan can be particularly helpful for properties managed by multiple parties with a wide variety of different uses and goals.

At this time, I do not recommend any aerial inspections or decay testing. These will offer more information and may identify the next round of tree removals and planning. But they are time intensive and often provide confusing results that are difficult to interpret and make management decisions based on. After the inventory and management plan, it may be clearer how these analyses would benefit the Flanders family.

Ultimately, the Flanders family and the Forest Service are the land managers and decision makers about tree management. I have provided information to help make those decisions. Please contact me with any questions or comments about my observations and recommendations.



Ryan Gilpin
Principal Consultant
Nidus Consulting

Level 1 Risk Assessment

Ryan Gilpin performed a Level 1 Risk Assessment for all trees that could impact the cabin as outlined in the *Tree Risk Assessment Best Management Practices* (Smiley et al 2017) on September 1, 2021. Trees that had (1) an observable defect making failure more than improbable in the next two years and (2) at least a medium likelihood of impact were identified for a Level 2 Risk Assessment.

Level 2 Risk Assessment

The following data was collected for each tree included in the Level 2 Risk Assessment:

1. Tree genus and species
2. Trunk diameter at 54" height
3. Tree condition, a combined rating of health, structure and form based on the *Guide for Plant Appraisal* (Council of Landscape Appraisers 2019):
 - a. Good – no or minor dieback, defoliation or discoloration; no or minor, correctable defects; functional and aesthetic form
 - b. Fair – dieback, defoliation or discoloration of crown moderate; a single significant defect or multiple moderate defects; compromised function and aesthetics for form
 - c. Poor – low foliage density and poor foliage color throughout crown; a single serious defect or multiple significant defects; unappealing form and provides little function
 - d. Dead – no live foliage or branches

Methods

Level 2 Risk Assessment (continued)

4. Likelihood of failure – Matrix 1 vertical axis
5. Likelihood of impact – Matrix 1 horizontal axis
6. Consequences of impact – Matrix 2 horizontal axis
7. Risk Rating – Matrix 2 result

Matrix 1. Likelihood Matrix

		Likelihood of Impact			
		Very Low	Low	Medium	High
Likelihood of Failure	Imminent	Unlikely	Somewhat likely	Likely	Very likely
	Probable	Unlikely	Unlikely	Somewhat likely	Likely
	Possible	Unlikely	Unlikely	Unlikely	Somewhat likely
	Improbable	Unlikely	Unlikely	Unlikely	Unlikely

Matrix 2. Risk Rating Matrix

		Consequences of Failure			
		Negligible	Minor	Significant	Severe
Likelihood of Impact & Failure	Very Likely	Low	Moderate	High	Extreme
	Likely	Low	Moderate	High	High
	Somewhat Likely	Low	Low	Moderate	Moderate
	Unlikely	Low	Low	Low	Low