BCA Justifications Document
Prepared for: Paradise Recreation and Park District
Project Title: Creation of Wildfire Risk Reduction Buffers in Paradise, California (Phase I, Project No. PA-00003289)
Prepared On: 01/25/26
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EXECUTIVE SUMMARY

Purpose

This Benefit-Cost Analysis (BCA) was prepared to evaluate the Paradise Recreation and Park District's proposed wildfire mitigation project: Creation of Wildfire Risk Reduction Buffers in Paradise, California (Phase I, Project No. PA-00003289). The objective of the project is to reduce the risk of catastrophic wildfire to homes, businesses, and critical facilities by establishing strategically located fuel reduction zones and associated access improvements.

The BCA demonstrates that the project is cost-effective, with estimated benefits exceeding project costs by a ratio of 34:1.

Results

The analysis yields the following results

Project Benefits:

- **Reduced Impacts to Structures.** Avoided damages to 25,397 structures and their contents, valued at approximately $8 billion in replacement cost.
- **Avoided Suppression Costs.** Reduced state and local expenditures on fire suppression, estimated at $66 million, based on locally relevant per-acre benchmarks.
- **Ecosystem Services Preserved.** Avoided losses to forests, open space, and wetlands, valued at $14.6 million annually, estimated using FEMA's ecosystem service valuation framework.

Project Costs:

- **Acquisition and Easements.** $5.7 million to secure long-term treatment access of priority parcels.
- **Fuels Reduction Treatments.** $2.3 million for initial hazardous fuels reduction across eligible treatment areas.
- **Operations and Maintenance.** $ million annually for recurring treatments during Years 4–20, based on land cover-specific recurrence intervals.
- **Program Administration.** $2 million to cover transaction, coordination, oversight, and technical expenses.

The BCA demonstrates that the project is cost-effective, with estimated benefits exceeding project costs by a ratio of 34:1

Data Sources

The analysis relied on authoritative, nationally recognized and state-level datasets:

- **National Structure Inventory (NSI):** FEMA's nationwide database of building locations, characteristics, and replacement values.
- **Damage Inspection System (DINS):** Post-Camp fire inspection records from Cal Fire, used when NSI data were unavailable. These records provide assessor-based estimates for destroyed structures that have not been rebuilt.
- **Butte County Assessor Parcels:** Used to locate treatment parcels and link them to structures.
- **Xyloplan Treatment Zones:** Delineations of core treatment areas and grazing areas that identify priority treatment zones.
- **NHA Advisors Draft Budget and Integra Realty Resources Cost Estimates:** Used to establish treatment and acquisition costs.

Together, these datasets provide a conservative and transparent basis for estimating benefits.

Analysis Approach

The analysis followed a structured, reproducible workflow:

1. **Identify treatment parcels:** Parcels showing high-wildfire risk mitigation potential were selected.
2. **Apply buffers:** A two-mile buffer was applied to each treatment parcel to establish the benefit zone, consistent with FEMA's guidance for fuels reduction projects.
3. **Link structures:** Structures from NSI and DINS were spatially joined to parcels. NSI values were prioritized where both sources overlapped; DINS records were used only when NSI data were unavailable.
4. **Assign replacement values:** Values were assigned using FEMA's building replacement value tables, NSI estimates, or assessor-based improvements from DINS. Where no reasonable value could be assigned, a sentinel code was applied.

This method ensures results can be **replicated and updated if treatment parcels change**. Because landowner permission is required for each treatment area, the workflow allows parcels to be added or removed without compromising consistency of the analysis.

Conclusion

This BCA provides a clear, defensible, and transparent demonstration that the Paradise Recreation and Park District's proposed wildfire mitigation project is cost-effective. The analysis is grounded in FEMA's own datasets and guidance, applies conservative assumptions, and is adaptable to changes in landowner participation. The results confirm that the project will provide substantial risk reduction benefits to the community, far exceeding its costs.

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1. PROJECT CONTEXT

Background: Wildfire Risk in Paradise and Butte County

The Town of Paradise and surrounding communities in Butte County face an acute and ongoing risk of catastrophic wildfire. Steep topography, dense vegetation, and a warming, drier climate have combined to create conditions where small ignitions can quickly develop into large, fast-moving fires. These fires not only threaten homes and businesses but also endanger critical facilities and place residents at risk during evacuations.

The **Camp Fire of 2018** marked a watershed moment in the community's history. Nearly 90 percent of the housing stock was destroyed, more than 50,000 people were displaced, and the community suffered profound social and economic disruption. Since that time, the region has experienced repeated disasters—including the North Complex Fire (2020), the Dixie Fire (2021), and the Park Fire (2024)—as well as post-fire flooding and debris-flow events. While not all matched the scale of the Camp Fire, the cumulative effect has left the community in a prolonged state of recovery and highlighted the persistent nature of the wildfire hazard.

History of Impacts

These repeated wildfire events underscore the scale of potential losses. Catastrophic fires in the past decade have:

- Destroyed thousands of homes and displaced tens of thousands of residents.
- Damaged or destroyed critical public infrastructure, including schools, water systems, and power lines.
- Contributed to secondary hazards such as flooding, erosion, and debris flows on burned slopes.

The recurrence of these events demonstrates that wildfire is not an isolated or extraordinary occurrence in Paradise; it is a chronic hazard requiring sustained mitigation.

Alignment with FEMA and State Priorities

This project directly addresses **Action 1** identified in the Butte County's State Hazard Mitigation Plan: *enhance existing open space and park land, and add new land (through acquisition or easements) to provide community-scale hazard risk reduction.*

The project builds upon planning work initiated under a previous FEMA BRIC capacity-building grant and the California Office of Planning and Research Regional Resiliency Planning Grant. While informed by these earlier efforts, the present project stands independently and does not rely on or duplicate other funding sources. The Paradise Recreation and Park District (PRPD) has convened a broad coalition of public agencies, nonprofits, scientists, and technical experts to ensure the project is grounded in the best available science and aligned with long-term community recovery goals.

Project Scope and Objectives

The proposed project involves the **creation of wildfire risk reduction buffers** – strategically located parcels where vegetation management, emergency access improvements, and fuels treatments will reduce wildfire risk at a community scale. The key elements include:

- **Risk Reduction Buffers:** Acquisition or easements on targeted parcels to enable sustained fuels reduction and vegetation management.
- **Emergency Access Improvements:** Development of connected roads and trails to improve emergency vehicle access and provide alternative egress routes for residents.
- **Vegetation and Fuels Management:** Removal of hazard trees, reduction of fuel loads, and installation of erosion control measures in forested areas.
- **Watershed and Resource Protection:** Stabilization of burned slopes, erosion control, and restoration measures to protect water supply and ecological resources.

Problem –> Solution –> Benefit Summary

Paradise has repeatedly experienced catastrophic wildfire, and this project is designed to break that cycle by reducing fuel loads, improving emergency access, and protecting homes and lives at a community scale. The summary below links the hazard, its impacts, the proposed solution, and the expected outcomes.

- **Hazard:** The Paradise area faces a recurring threat of catastrophic wildfire, intensified by dense vegetation, steep terrain, and limited access.
- **Impact:** These conditions have repeatedly resulted in widespread structure loss, threats to human life, costly suppression operations, and long-term damage to natural resources and watersheds.
- **Solution:** The project will establish wildfire risk reduction buffers through strategic land acquisition and easements. These parcels will be managed for fuels reduction, hazard tree removal, erosion control, and improved road and trail connectivity to enable emergency access and resident egress.
- **Outcome:** By reducing fuel loads and providing defensible space for firefighting operations, the project will lower the risk of structure loss, enhance public and responder safety, reduce suppression costs, and protect watershed and natural resources at a community scale.



2. DATA SOURCES AND ASSUMPTIONS

The Benefit-Cost Analysis relies on a suite of data sources and clearly defined assumptions to estimate project benefits. These sources provide information on the location and value of structures, the extent of treatment areas, and the costs of implementing the project. Together, they establish a transparent and conservative basis for analysis.

Data Sources

The data sources for this analysis include both spatial and tabular datasets. Spatial data establish the geographic scope of treatments and the benefit area, while tabular data provide structure valuations and project cost estimates.

Spatial Data: Parcels and Treatment Zones

Spatial data defined the area of analysis and linked structures to planned treatments:

- **Xyloplan Treatment Zones.** Technical analysis that identified priority areas for fuels reduction. Xyloplan defined the treatment areas by modeling Fire Pathways (corridors where topography, fuels, and wind align to drive rapid fire spread) and scoring pathway segments based on the number of downstream structures at risk. Recommended treatment polygons were selected through a suitability analysis that weighted factors such as slope, accessibility, ember-casting potential, and the projected reduction in fire spread.
- **National Structure Inventory (NSI, ~2020).** FEMA's national dataset of building locations and attributes. Reflects the post-Camp Fire rebuilt building stock.
- **CAL FIRE Damage Inspection System (DINS, 2018).** Records of structures inspected after the Camp Fire. Used when no NSI record existed for a parcel, to represent destroyed structures that have not been rebuilt.
- **Butte County Assessor Parcels.** Used to locate parcels subject to hazardous fuels treatments and to link structures to properties.
- **Valuation Attributes.** NSI provides FEMA-assigned building replacement values (BRVs). DINS includes assessor-derived improvement values, which are generally lower than BRVs and thus conservative.
- **Butte County Assessor Parcels** were used to locate property boundaries and connect structures to specific parcels.

Valuation and Cost Inputs

Replacement values and project costs were assigned using standard FEMA methodologies and documented planning-level estimates:

- **Replacement Values.** For NSI structures, the NSI-provided BRVs were applied directly. For DINS structures, assessor-derived improvement values were used as a conservative proxy for pre-fire structure values. In practice, assessor values are almost always lower than FEMA's BRV defaults and should not exceed them except in rare anomalies. Structures without adequate data were excluded from the analysis.
- **Wildfire Suppression Costs.** Suppression costs were benchmarked using recent, authoritative sources: the Camp Fire (2018, $978 per acre), the National Interagency Fire Center five-year national average, and CAL FIRE/Legislative Analyst's Office reporting for

2020–2024. These datasets establish a defensible per-acre cost range and support the conservative use of the Camp Fire benchmark in this analysis.

- **Project Costs.** NHA Advisors developed planning-level budgets for hazardous fuels reduction treatments and recurrence intervals. Integra Realty Resources, certified general real estate appraisers, provided cost estimates for parcel acquisition and easements. These estimates are appropriate for BCA purposes as planning-level documentation.

Key Assumptions

The following assumptions guided the analysis:

- **Buffer Distance.** Benefits were assigned to structures within two miles of treatment parcels, consistent with FEMA guidance for fuels reduction projects.
- **Landowner Participation.** Treatments require landowner permission. The analysis is adaptable, allowing parcels to be added or removed as permissions change, and project benefit areas will change as a result, and as such, benefiting structures. This ensures that updated BCAs can be prepared as the project progresses.
- **Missing Data.** Structures and parcels lacking sufficient valuation data were excluded from the analysis. No imputation or speculative estimates were made.

3. PROJECT BENEFITS

This chapter documents the quantifiable benefits of the proposed wildfire mitigation project. Benefits are presented by category, consistent with FEMA Hazard Mitigation Assistance guidance, and reflect the avoided costs and damages that would result from reduced wildfire risk within the project benefit area. Each benefit calculation is based on authoritative data sources, transparent methods, and conservative assumptions designed to avoid overstating project effectiveness.

The categories of benefits addressed include:

- **Reduced Impacts to Structures.** Avoided damages to buildings and contents within two miles of treatment parcels.
- **Avoided Wildfire Suppression Costs.** Reduced state expenditures for fire suppression associated with fire response.
- **Environmental Benefits.** Avoided damages to watersheds, vegetation, and soils; enhanced retention of water supply reliability; and reduced erosion following severe wildfire events.

Benefit Category 1. Reduced Impacts to Structures

The largest share of benefits in this analysis comes from avoided damages to buildings and their contents. This section documents how benefiting structures were identified, valued, and prepared for input into the BCA Toolkit. The process began with defining the project's treatment parcels and two-mile benefit area, continued with reconciling and valuing structures from multiple datasets, and concluded with the generation of a master list of benefiting structures. Each step is transparent, reproducible, and intentionally conservative to avoid overstating benefits.

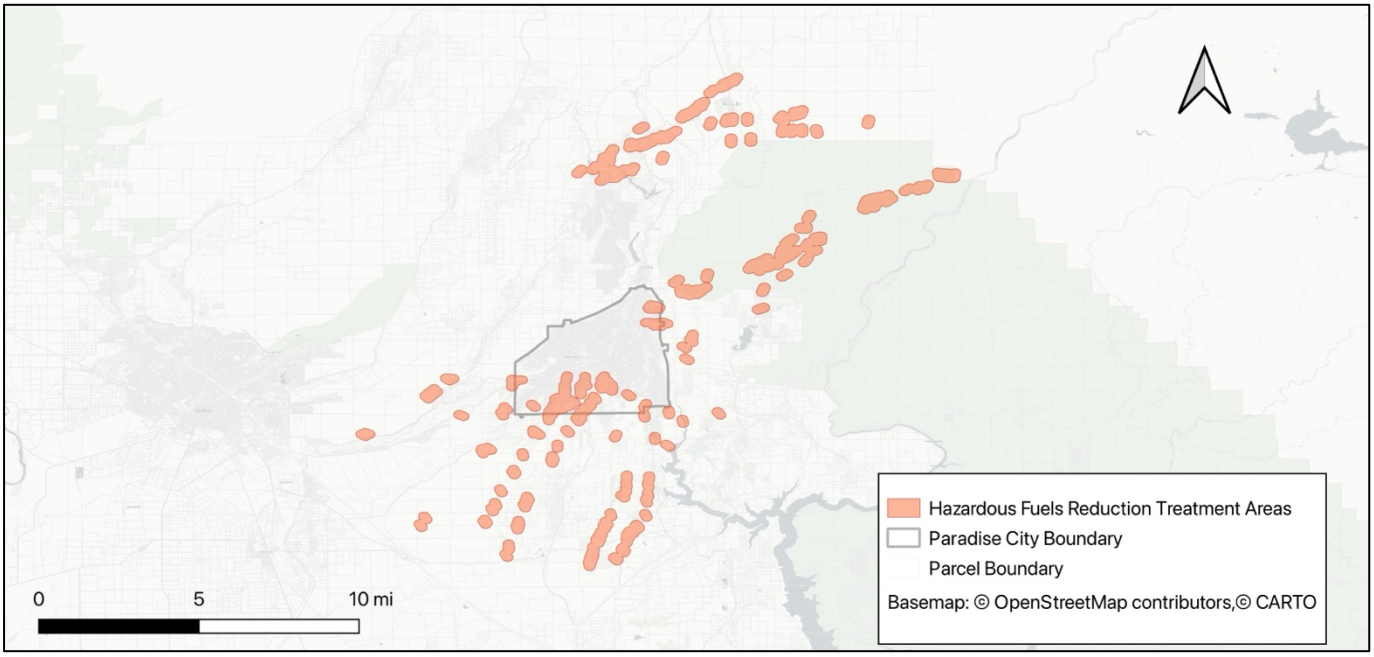
Method

Step 1: Identify treatment parcels

The first step in the analysis was to identify the set of parcels that define the geographic basis for the proposed hazardous fuels mitigation project. This step establishes the treatment parcels used to delineate the project benefit area and does not presume specific treatment extents, treatment methods, or final implementation mechanisms at the parcel level.

Xyloplan wildfire transmission modeling was used as an initial, landscape-scale screening tool to understand where hazardous fuels reduction is most relevant for reducing community wildfire risk from a wildfire transmission perspective. The model identifies potential wildfire transmission pathways, represented as elongated polygons (often referred to as "pill-shaped"), that illustrate how fire could move across the landscape under severe fire weather conditions (see Figure 1).

Figure 1. Hazardous Fuels Recommended Treatment Areas



Following the modeling-based screening, parcel selection was refined through collaboration with the Butte Fire Safe Council and application of local, on-the-ground knowledge. This refinement considered practical and programmatic factors that influence whether fuels reduction can reasonably be implemented, including:

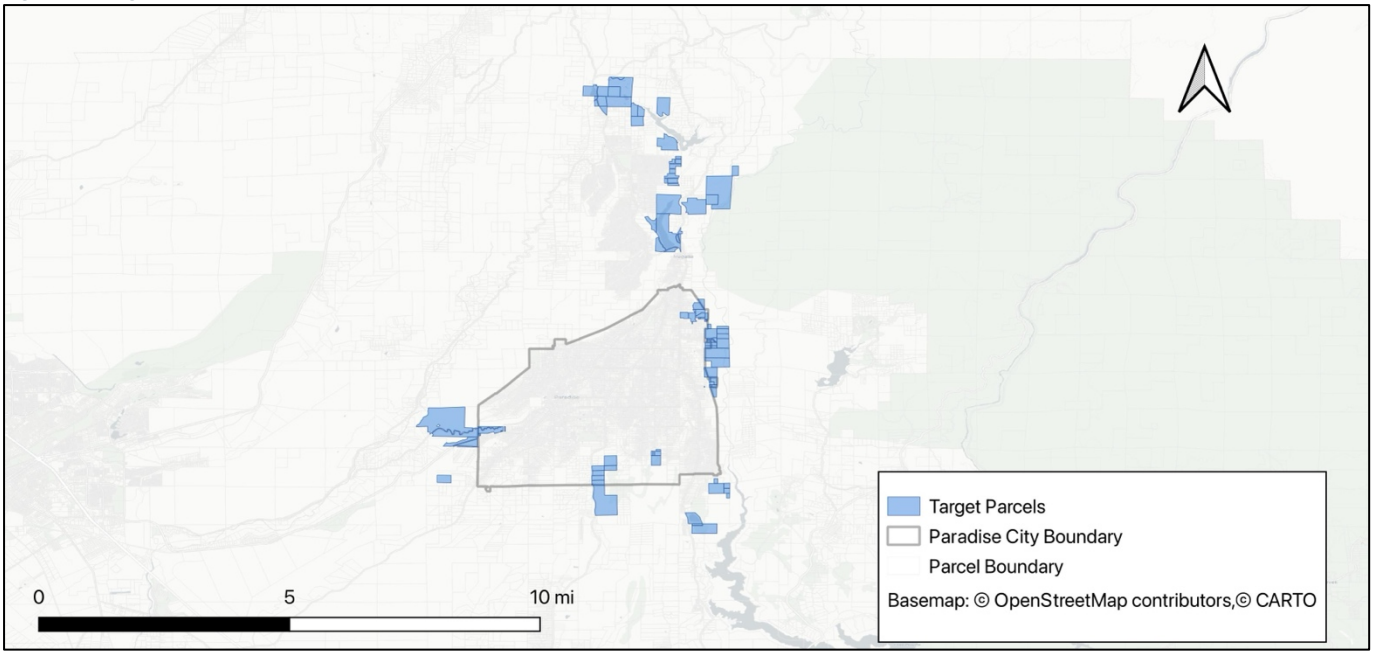
- Landownership and willingness to participate
- Access and operational feasibility
- Prior or planned treatments
- Parcel configuration and size
- Environmental and regulatory constraints
- Alignment with project objectives and implementation mechanisms

The outcome of this process is a refined list of 94 assessor parcels (APNs) identified as candidates for one or more implementation mechanisms, including acquisition, conservation easement, landowner agreement for treatment, or treatment of parcels already owned. Parcels are at varying stages of engagement (e.g., existing letters of intent, outreach targets, or flexible eligibility), but this does not affect how they are treated for purposes of benefit-cost analysis.

For BCA boundary definition, all identified parcels are treated consistently as treatment parcels. This approach is intentionally conservative from an eligibility standpoint and avoids conditioning benefit eligibility on future landowner decisions or site-specific treatment layouts. Final implementation mechanisms and treatment extents will be determined during project execution based on landowner participation and site-level considerations.

Figure 2 illustrates the spatial distribution of the selected treatment parcels. Collectively, these parcels represent locations where hazardous fuels reduction is expected to provide the greatest community-scale wildfire risk reduction benefits, based on a combination of modeled wildfire transmission patterns and implementation feasibility.

Figure 2. Target Parcels for Hazardous Fuels Reduction Activities



Because the analysis framework is parcel-based, it remains adaptable: if individual parcels are removed or added during implementation, the project benefit area can be recalculated using the same methodology, and any affected structures automatically included or excluded from the BCA.

Step 2: Define the project benefit area

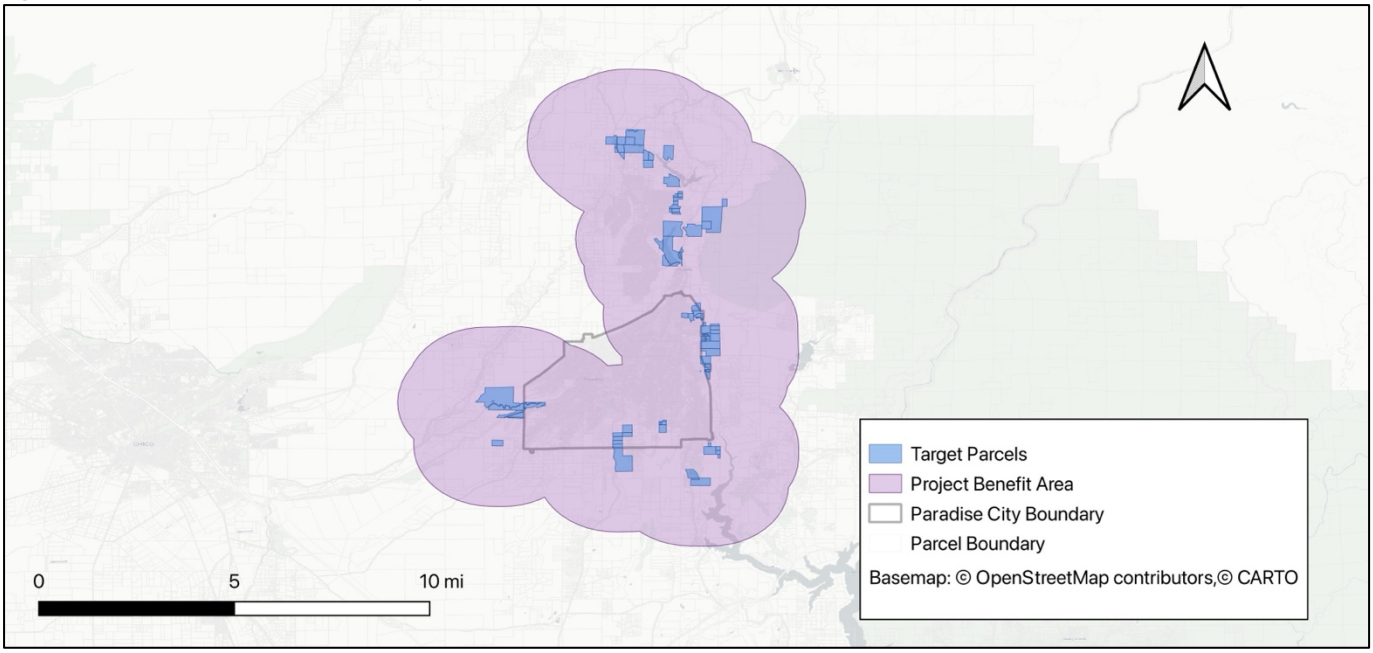
To establish the project benefit area, each treatment parcel was buffered outward by two miles. FEMA guidance states that "the area of effectiveness for fuels reduction projects is two miles from the perimeter of the project." This standard provides the defensible basis for identifying which structures can reasonably be credited with hazardous fuels reduction.

After buffering each targeted treatment parcel by two miles, the individual parcel buffers were dissolved into a single polygon to form the project benefit area (

Figure 3). This step produces a continuous boundary representing the full extent of treatment influence. Because the analysis is parcel-based, the benefit area can be recalculated if parcels are added or removed; structures that fall outside the revised boundary are dropped from the BCA.

This boundary provides the geographic framework for identifying benefiting structures in the next step of the analysis.

Figure 3. Hazardous Fuels Reduction Project Benefit Area



Step 3: Reconcile structure datasets

Two authoritative datasets were combined to create a single inventory of structures within the project area. The map in

The reconciled structure inventory was overlaid with the project benefit area to identify buildings eligible for inclusion in the BCA. As shown in

Figure 4, the analysis identifies NSI and DINS structures that intersect the purple two-mile buffer.

Figure 4 shows the distribution of both sources: blue points represent NSI structures (circa 2020) and red points represent DINS structures recorded after the 2018 Camp Fire.

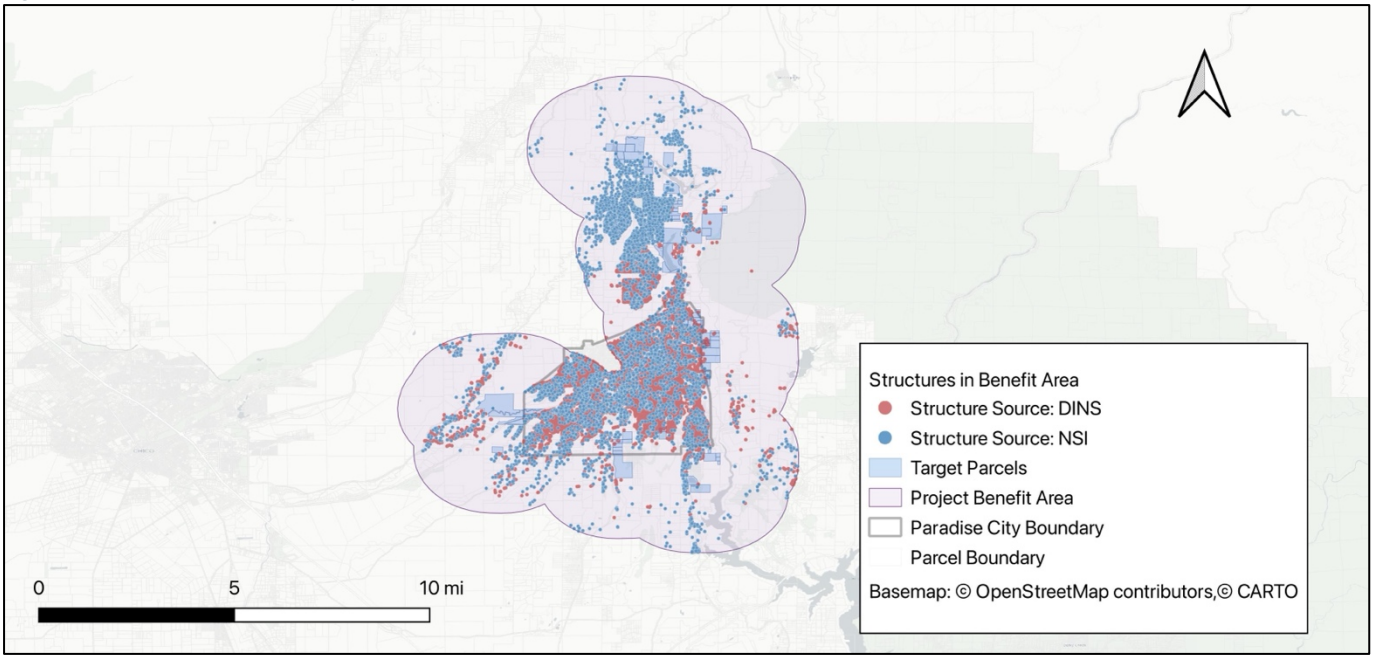
- NSI (preferred). The National Structure Inventory provides FEMA's nationwide dataset of building locations and attributes. NSI records were used whenever available, as they reflect the current, post-fire building stock, including rebuilt homes and facilities.
- DINS (fallback). CAL FIRE's Damage Inspection System records structures destroyed in the Camp Fire. These records were retained only when no NSI structure existed for a parcel, ensuring that unreplaced structures were still represented in the analysis.
- Deduplication. When both NSI and DINS records existed for the same parcel, NSI was retained and DINS dropped to prevent double counting.

This rule-based reconciliation produced a conservative and defensible structure inventory. NSI records reflect FEMA's default replacement values, while DINS records rely on assessor improvement values, which are generally lower. Together, they ensure that both current exposure and un-rebuilt losses are accounted for without overstating benefits.

The reconciled structure inventory was overlaid with the project benefit area to identify buildings eligible for inclusion in the BCA. As shown in

Figure 4, the analysis identifies NSI and DINS structures that intersect the purple two-mile buffer.

Figure 4. Structures Within the Project Area



Step 5: Assign damage values
Replacement values were assigned using a tiered approach:

- **NSI structures.** The FEMA-assigned BRV value was retained directly. No per-square-foot adjustments were made. This is conservative, as construction costs in Paradise are typically higher than the national averages underlying the BRVs.
- **DINS structures.** Assessor improvement values were used as a proxy for replacement value. These are generally lower than BRVs, further reducing the likelihood of overstating benefits.
- **Contents.** In accordance with Hazus defaults, contents value was set at 50 percent of the assigned structure replacement value.
- **Displacement.** Of the benefiting structures, 17,133 are residential. The local average household size of 2.1 persons per household was applied.

Results

The process produced a master list of benefiting structures, including identifiers, source, type, and assigned value. The final dataset includes:

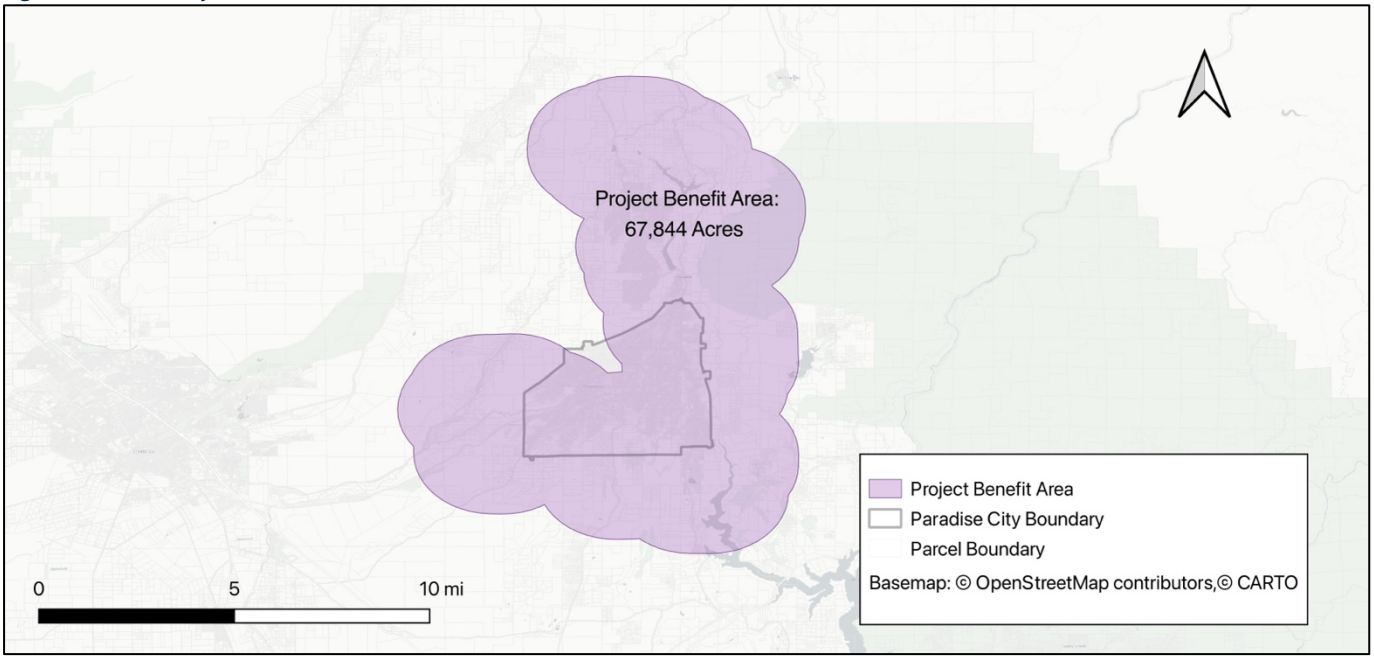
- **21,753 structures** within the project benefit area, including 17,133 residential structures.
- **$ 5.345 billion** in structure replacement value.
- **$2.67 billion** in contents replacement value.
- **37,979** in avoided displaced residents (2.1 persons per residential structure)

These values represent the inputs for the property damage category in the BCA Toolkit. Detailed tables by structure type and occupancy class are provided in **Appendix A**.

Benefit Category 2. Avoided Wildfire Suppression Costs

Wildfire suppression represents a significant and recurring public cost during major fire events. FEMA's Hazard Mitigation Assistance guidance allows suppression cost savings to be credited as a benefit when projects demonstrably reduce fire intensity or extent. By lowering fuel loads and slowing fire spread, hazardous fuels reduction treatments reduce the likelihood and severity of suppression operations within the project benefit area (see Figure 5).

Figure 5. Size of Project Benefit Area



Data Sources

Suppression cost benchmarks were drawn from multiple sources:

- **Camp Fire (2018).** $150 million in suppression costs over 153,336 acres, equating to $978 per acre. This value was selected for the BCA.
- **National Interagency Fire Center (NIFC).** Five-year national average of $465 per acre for suppression costs.
- **CAL FIRE and Legislative Analyst's Office (2020–2024).** Annual reports showing higher costs in California, with a five-year average of $2,337 per acre (Table 1).

These datasets establish a defensible per-acre range. The Camp Fire benchmark was used because it is locally relevant and conservative.

Table 1. Recent CAL FIRE Suppression Costs and Per-Acre Averages

Year	Acres Burned	Total CAL FIRE Protection Costs	Cost per Acre
2020	4,304,379	$3.1 billion	$720/acre
2021	2,511,378	$3.7 billion	$1,473/acre
2022	331,358	$3.3 billion	$9,959/acre
2023	332,822	$4.3 billion	$12,922/acre

2024	1,077,711	$4.2 billion	$3,896/acre
5-year average	1,711,530	$4 billion	$2,337/acre

Source: CAL FIRE, LAO.

Method

The project benefit area of 67,844 acres was multiplied by the Camp Fire per-acre suppression cost of $978:

Formula:

$$67{,}844\ acres \times \$978/acre = \$66{,}351{,}432$$

Result

The avoided suppression cost attributable to the project is estimated at $66.35 million. This figure is conservative relative to more recent statewide averages, which would yield estimates two to three times higher. By anchoring the calculation in a locally relevant wildfire and applying a lower-bound cost assumption, the analysis ensures that suppression cost savings are represented fairly and defensibly in the BCA.

Benefit Category 3. Ecosystem Services Losses Avoided

Wildfire can significantly degrade ecosystems, leading to loss of water quality, reduced soil stability, diminished vegetation cover, and long-term impacts on ecological services that support both human and natural communities. FEMA Hazard Mitigation Assistance guidance allows for the quantification of ecosystem service benefits where mitigation actions preserve or protect ecological functions. For this project, avoided ecosystem service losses were estimated by applying FEMA's standard ecosystem service valuation rates to the treatment parcels identified for acquisition or easement.

Method

The analysis began with the parcel list developed for the acquisition and easement step. Each parcel was cross-walked from its original land cover classification into FEMA's ecosystem service categories (Forests, Rural Green Open Space, Inland Wetlands, Developed). Table 2 presents the resulting distribution of treatment acres by land cover type. A total of 1,326 acres were identified as eligible for treatment and therefore capable of generating ecosystem service benefits.

Table 2. Land Cover Crosswalk

Land Cover	FEMA Land Cover Category	Estimated Treatment Area by Land Cover (Acres)
Evergreen Forest	Forests	440
Developed Open Space	Rural Green Open Space	47
Developed Low Intensity	N/A	24
Developed Medium Intensity	N/A	5
Developed High Intensity	N/A	0
Shrubland	Rural Green Open Space	138
Grassland/Pasture	Rural Green Open Space	668
Mixed Forest	Forests	0

Deciduous Forest	Forests	1
Emergent Herbaceous Wetlands/ Woody Wetlands	Inland Wetlands	2
Fallow Cropland	Rural Green Open Space	
Total		1,326

FEMA assigns standard per-acre values to each category to represent the annual economic value of ecosystem services preserved:

- **Forests:** $12,589 per acre per year
- **Rural Green Open Space:** $10,632 per acre per year
- **Inland Wetlands:** $8,171 per acre per year
- **Developed Land:** $0 per acre per year

These values were multiplied by the acres in each category to produce annual ecosystem service benefit estimates. Results are shown in Table 3

Table 3. Annual Ecosystem Service Benefits

Land Cover	Treatment Land Cover (Acres)	Percent of Total Acres	Annual Ecosystem Service Value Per Acre	Expected Annual Ecosystem Services Benefits
Forests	441	33%	$12,589	$5,550,016
Rural Green Open Space	851	64%	$10,632	$9,044,792
Inland Wetlands	2	0%	$8,171	$15,616
Developed Land	29	2%	$0	$0
Total	1,322	100%		**$14,610,424**

The resulting annual ecosystem service benefit is estimated at $14.6 million. This value reflects the improved ecological functions of forests, shrublands, grasslands, and wetlands within the project area. No value was assigned to developed land, consistent with FEMA guidance.

Summary of BCA Benefits

The proposed project delivers measurable reductions in wildfire risk across multiple benefit categories. Using FEMA-approved methods and conservative assumptions, the analysis quantifies avoided damages and costs that would otherwise be borne by households, businesses, and public agencies.

- **Reduced Impacts to Structures.** Avoided damages to 21,753 structures and their contents, valued at approximately $8 billion in replacement cost.
- **Avoided Suppression Costs.** Reduced state and local expenditures on fire suppression, estimated at $66.35 million, based on locally relevant per-acre benchmarks.
- **Ecosystem Services Preserved.** Avoided losses to forests, open space, and wetlands, valued at $14.6 million annually, reflecting FEMA's ecosystem service valuation framework.

4. PROJECT COSTS

Project costs for this analysis include three major components: parcel acquisition and easements, hazardous fuels reduction treatments, and program administration. Acquisition and easements provide the legal framework to secure treatment access and ensure long-term availability of priority parcels. Fuels reduction treatments represent the physical work of removing or reducing hazardous vegetation across identified treatment areas. Program administration covers the transaction, coordination, and oversight costs necessary to deliver the project. Each cost component was developed using conservative, planning-level assumptions and documented data sources, consistent with FEMA's BCA requirements.

Acquisition and Easement Costs

The project identifies a defined set of parcels that are eligible for one or more implementation mechanisms. From this set, a subset of parcels is anticipated to be implemented through acquisition or easement based on planning-level participation assumptions. Additional parcels are retained as eligible alternatives to provide implementation flexibility but are not included in the BCA cost calculations unless selected for implementation.

Method

Acquisition and easement costs were estimated using a structured, parcel-based methodology that integrates local parcel data, third-party valuation studies, and participation assumptions. This approach reflects the reality that final outcomes depend on landowner negotiations and site-specific considerations.

Data Sources

The analysis drew on three primary data sources:

- **Treatment Parcels.** A defined set of parcels identified through Xyloplan wildfire transmission modeling and refined in coordination with the Butte Fire Safe Council, representing locations where hazardous fuels reduction is expected to provide community-scale wildfire risk reduction benefits. This parcel set includes both primary and alternate parcels evaluated under a consistent methodology.
- **Assessor Parcel Data.** Butte County assessor records, used to identify parcel boundaries, land use classifications, and proposed implementation mechanisms (e.g., acquisition, easement, agreement).
- **Fair Market Value Estimates.** Planning-level acquisition and easement value ranges developed by Integra Realty Resources, which provide per-acre and total parcel value ranges by property category based on regional market conditions.

Cost Estimation

Acquisition and easement costs were estimated at the parcel level using Integra Realty Resources' Paradise-specific valuation ranges appropriate to each parcel's land use category. Easement costs were estimated as 40 percent of fee-simple value, consistent with Integra Realty Resources guidance for conservation easements that allow continued landowner use and ongoing vegetation management.

Based on the selected parcel set, the project includes 63 parcels targeted for acquisition or easement, with an estimated cost of $5.7 million, when accounting for real estate transaction costs and EHP compliance.

Treatment of Lands (Fuels Reduction and Vegetation Management)

Hazardous fuels reduction represents the second major cost component of the project. Treatment costs were estimated using a stepwise, parcel-based approach that integrates land cover composition, per-acre treatment costs, and maintenance recurrence intervals. This framework provides a transparent and reproducible basis for estimating treatment costs consistent with FEMA BCA requirements.

Method

Treatment parcels were identified through a collaborative, choice-based process conducted with the Butte Fire Safe Council to ensure feasibility and alignment with project objectives. For each selected parcel, treatment costs were estimated using Xyloplan-provided land-cover–specific treatment cost assumptions.

Parcel geometries were intersected with National Land Cover Database (NLCD) land cover classes to estimate the acreage of each land cover type within each parcel. For each land cover class, an estimated proportion of the parcel requiring treatment was applied, and treatment acres were multiplied by the corresponding per-acre unit cost. This produced land-cover–specific treatment cost estimates at the parcel level, which were then aggregated across the project area.

Treatment Cost Assumptions

Per-acre treatment costs and maintenance cycles vary by land cover type and reflect differences in vegetation structure, treatment intensity, and follow-up requirements. Table 4summarizes the treatment acreage, unit costs, one-time treatment costs, recurrence intervals, and annualized costs by land cover class.

The resulting estimated cost to complete one full cycle of fuels treatment across all selected parcels is approximately $2.28 million. This value represents the cost of implementing initial treatment activities across all land cover types included in the project.

Table 4. Landcover Treatment Cost Calculations

Land Cover	Eligible Treatment Area (Acres)	Unit Treatment Cost ($/Acre)	Expected Treatment Cost (One-Time; Participation Adjusted)	Treatment Cycle (Years)	Average Annualized Treatment Cost
Deciduous Forest	1.1	$3,000	$3,333	5	$667
Developed Low Intensity	23.9	$1,000	$23,863	3	$7,954
Developed Medium Intensity	5.5	$1,000	$5,497	3	$1,832
Developed Open Space	47.2	$1,000	$47,175	3	$15,725
Emergent Herbaceous Wetlands/Woody Wetlands	1.9	$0	$0	5	$0
Evergreen Forest	440.1	$3,000	$1,320,237	5	$264,047

Grassland/Pasture	668.4	$800	$534,746	3	$178,249
Shrubland	137.7	$2,500	$344,284	5	$68,857
Total	1,325.8		$2,279,136		$537,331

Long-Term Treatment Costs

While the table above summarizes one-time treatment costs, long-term project costs also depend on how frequently treatments must be repeated to maintain reduced wildfire risk. Applying the land-cover–specific recurrence intervals identified by Xyloplan allows treatment costs to be annualized and extended across the project's 20-year useful life for BCA purposes, estimated at approximately $500,000 for years 4-20.

Project Implementation & Compliance Activities

Project implementation and compliance activities include technical analyses, legal services, monitoring, outreach and education, and other activities required to implement the project in accordance with FEMA and state requirements. These activities support project delivery by enabling regulatory compliance, landowner coordination, treatment planning, contracting, and verification of implementation outcomes.

These costs are necessary to advance project actions from planning through implementation and to ensure that acquisitions, easements, and fuels reduction treatments can be executed, documented, and sustained in compliance with applicable requirements. Activities included under this category do not represent direct land acquisition or treatment work, but rather the supporting technical, legal, and compliance functions required to deliver those actions effectively.

Total project implementation and compliance activities are budgeted at approximately $2.02 million.

Summary of BCA Costs

The project cost estimate combines parcel acquisition and easements, hazardous fuels reduction treatments, and program administration. Together, these categories represent the full cost stream applied in the Benefit-Cost Analysis. All estimates were developed using conservative, planning-level assumptions and are expected to adjust as landowner negotiations and project implementation proceed. Table 5 summarizes the total project costs.

Table 5. Project Cost Summary

Cost Category	**Estimated Cost (Millions)**
Acquisition and Easements	$5.7 million
Fuels Reduction Treatments	$2.3 million
Project Implementation & Compliance Activities	$2 million
Operations & Maintenance (Years 4–20)	$500,000 per year

5. BCA INPUTS

Project Configuration

- **Project Title:** Creation of Wildfire Risk Reduction Buffers in Paradise, California (Phase I, Project No. PA-00003289)
- **Property Location:** Paradise, California
- **Property Structure Type:** Residential Building
- **Hazard Type:** Wildfire
- **Mitigation Action Type:** Hazardous Fuels Reduction
- **Damage and Frequency Relationship based on:** Modeled Damages

Cost Estimation

- **Discount Rate: 7% (default)**
- **Initial Project Costs:** $10,000,000
- **Project Useful Life:** 20 years
- **Annual Maintenance Cost:** $537,331

Hazard Properties

- **Average Burn Recurrence Interval for 95969:** 28 (default)
- **Project Effectiveness:** 10% (default)

Building Damages

- **Number of Structures:** 21,753
- **Building Replacement Value of All Structures:** $5,345,604,512

Contents Damages

- **Value of Building Contents:** $2,672,802,256 (default)

Other Damages

- **Fire suppression costs for typical wildfire within project benefit area:** $66,351,432

Displacement Costs Avoided

- **Displaced Residents:** 37,979

Ecosystem Services Losses Avoided

- **Total Project Area:** 1,322
- **Rural Open Green Space:** 64%
- **Inland Wetland:**0%
- **Forests:** 33%

Project Results

- **Project Benefits:** $530,382,460
- **Project Costs:** $15,692,492
- **BCR:** 33.8

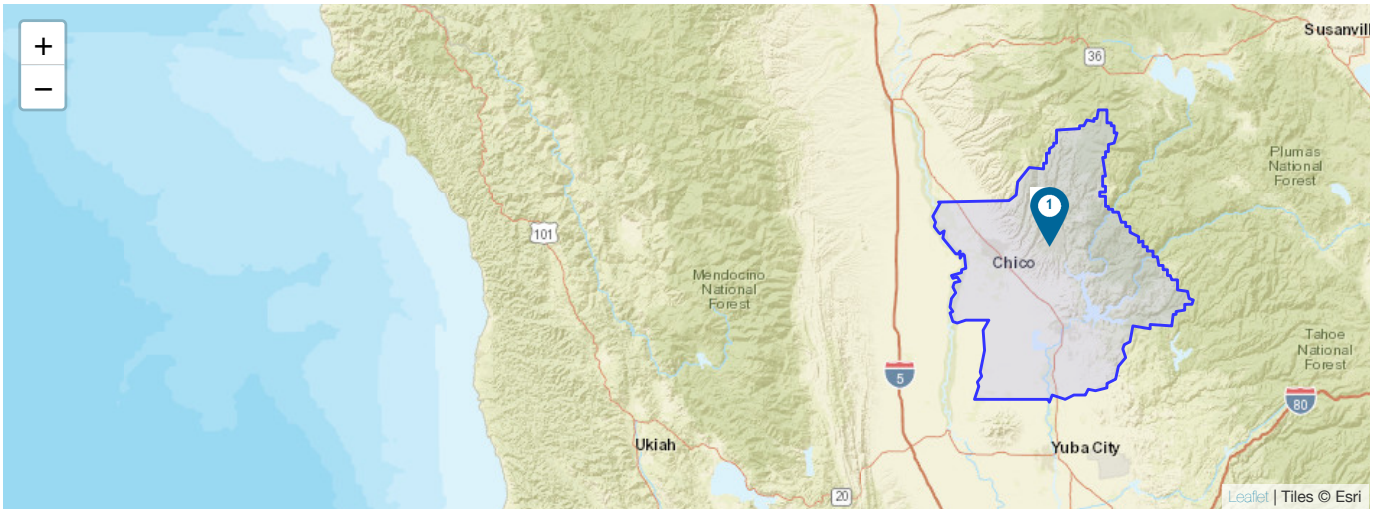
APPENDIX A. BENEFITING STRUCTURE SUMMARY

Structure Class	Count of Structures	NSI/DINS Structure Value
Single Family Residence Single Story	9,492	$1,361,123,743
UtilityMiscStructure	3,213	$339,358,904
Mobile Home Single Wide	338	$26,927,929
Mobile Home Double Wide	1,636	$164,436,690
Multi Family Residence Single Story	1,860	$485,261,686
Mobile Home Triple Wide	161	$14,684,176
Single Family Residence Multi Story	2,403	$499,128,109
Commercial Building Single Story	1,030	$1,214,993,797
Motor Home	30	$1,474,907
Mixed Commercial/Residential	6	$270,046
Multi Family Residence Multi Story	1,243	$593,386,006
Commercial Building Multi Story	173	$328,512,820
Church	3	$990,034
Infrastructure	6	$1,043,835
School	14	$58,093
Institutional Building Single Story	80	$162,677,688
Institutional Building Multi Story	17	$122,158,962
Agricultural Building Single Story	44	$28,151,262
Agricultural Building Multi Story	4	$965,824
Total	21,753	$5,345,604,512

A full list of structures can be found in the attached appendix_a_benefiting_structures.csv

Benefit-Cost Analysis

Project Name: Creation of Wildfire Risk Reduction Buffers in Paradise, California (Phase I, Project No. PA-00003289)



Map Marker ▲	Mitigation Title	Property Type	Hazard	Discount Rate (%)	Benefits (B)	Costs (C)	BCR (B/C)
1	Hazardous Fuels Reduction @ Paradise, California		Wildfire	7.0	$ 530,382,460	$ 15,692,492	33.80
TOTAL (SELECTED)					**$ 530,382,460**	**$ 15,692,492**	**33.80**
TOTAL					**$ 530,382,460**	**$ 15,692,492**	**33.80**

Property Configuration

Property Title:	Hazardous Fuels Reduction @ Paradise, California
Property Location:	95969, Butte, California
Property Coordinates:	39.752081, -121.621973
Hazard Type:	Wildfire
Mitigation Action Type:	Hazardous Fuels Reduction
Property Type:	Residential Building
Analysis Method Type:	Modeled Damages

Cost Estimation
Hazardous Fuels Reduction @ Paradise, California

Discount Rate (%):	7.0% Use Default:Yes
Project Useful Life (years):	20
Project Cost:	$10,000,000
Number of Maintenance Years:	20 Use Default:Yes
Annual Maintenance Cost:	$537,331

Hazard Properties
Hazardous Fuels Reduction @ Paradise, California

Average Burn Recurrence Interval for 95969:	28 Use Default:Yes
Project Effectiveness:	10

Building Damages
Hazardous Fuels Reduction @ Paradise, California

Number of Buildings Protected by Proposed Project:	21753
Total Building Replacement Value (BRV) of all building(s) within proposed project area:	$5,345,604,512

Comments

Number of Buildings:
Count of structures within the project benefit area - including NSI structures, and DINS structures (representing structures that have yet to be rebuilt.

Contents Damages
Hazardous Fuels Reduction @ Paradise, California

Value of Building Contents:	$2,672,802,256 Use Default:Yes

Displacement Costs Avoided
Hazardous Fuels Reduction @ Paradise, California

Lodging Per Diem:	$110 Use Default:Yes
Meals Per Diem:	$68 Use Default:Yes
How many residents will not be displaced from the primary residence(s) due to mitigation?:	37,979
Duration of Displacement (days):	365 Use Default:Yes
Total Residential Displacement Cost:	$1,677,398,380

Other Damages
Hazardous Fuels Reduction @ Paradise, California

Value of Infrastructure vulnerable to fire in project area:	$0
Value of Timber to be sold within proposed project area:	$0
Fire suppression costs for one typical fire within proposed project area:	$66,351,432
Other costs mitigated by proposed project:	$0

Comments

Fire Suppression Value:

Assumes a project benefit area of 67,844 acres, and a per-acre suppression cost of $978

Volunteer Costs Avoided

Hazardous Fuels Reduction @ Paradise, California

Number of Volunteers (volunteers/event):	0
Number of Days of Lodging:	0
Expected Annual Volunteer Benefits:	$0

Ecosystem Services Losses Avoided

Hazardous Fuels Reduction @ Paradise, California

Total Project Area (acres):	1,322
Percentage of Urban Green Open Space:	0.00%
Percentage of Rural Green Open Space:	64.00%
Percentage of Riparian:	0.00%
Percentage of Coastal Wetlands:	0.00%
Percentage of Inland Wetlands:	0.00%
Percentage of Forests:	33.00%
Percentage of Coral Reefs:	0.00%
Percentage of Shellfish Reefs:	0.00%
Percentage of Beaches and Dunes:	0.00%
Expected Annual Ecosystem Services Benefits:	$14,487,600

Benefits-Costs Summary

Hazardous Fuels Reduction @ Paradise, California

Discount Rate (%):	7.0% Use Default:Yes
Total Costs:	$15,692,492
Total Benefits:	$530,382,460
Benefit-Cost Ratio (BCR):	33.80