

# Risk Based Assessment Tool

## DOI BAER

### Wallow Fire

The DOI BAER Team used the **Risk Based Assessment Tool** to evaluate cost-effectiveness for proposed treatments to mitigate potential damage to Values-at-Risk (VAR) on the Wallow Fire. The tool was presented in the Rocky Mountain Research Station, General Technical Report, #205. Analysis in this tool is based on a combination of applying **Benefit/Cost Ratios (B/C ratio)** for **Market Value** resources and the **Implied Minimum Value (IMV)** method for **Non-Market Value** resources.

The intent of this tool is to improve the economic justification of recommended treatments, provide a common framework for authorization and review of proposed treatments, and improve the defensibility of BAER assessments to agencies and individuals with financial oversight responsibilities. Using the VAR Calculation Tool as part of the treatment decision-making processes requires 1) an understanding of how the tool calculates the B/C ratio of market VAR and the IMV of non-market VAR and 2) repeated use of the tool to evaluate the economic advantages of various treatment scenarios.

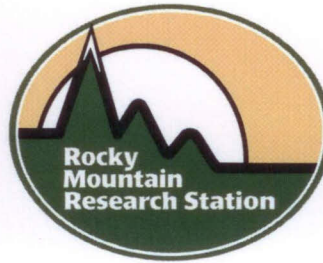
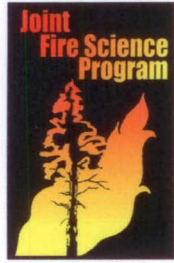
The BAER Team used the standard cost/risk analysis to evaluate prescribed specifications in the Wallow Fire BAER Plan. These same specifications were then evaluated with the Risk Based Assessment Tool. This tool does not evaluate specifications that address threats to life, so the road safety closures (gates) and flood warning signs prescribed in the Wallow Plan were not evaluated, but were included as a non-point value evaluation.

Specifications that address market value are deemed economically justified if the cost/benefit ratio is  $>1$ . The Sediment Removal specification had a B/C of 3.8. The other specifications were considered non-market value resources and given an implied minimum value. As long as the implied minimum value is greater than the treatment cost, the specification has a positive benefit/cost ratio. The non-market specifications within the Wallow plan had positive benefit/cost ratios.

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WELCOME TO THE BAER VALUES AT RISK CALCULATION TOOL, VERSION 8.0.1  
(November 2010)

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**NOTE: THIS IS A DEMONSTRATION VERSION OF THE VAR CALCULATION TOOL THAT HAS BEEN DESIGNED FOR USE IN THE BAER POST-FIRE ASSESSMENT PROCESS. THIS VERSION OF THE VAR CALCULATION TOOL IS CURRENTLY LIMITED TO CALCULATING AND SUMMARIZING VALUATIONS OVER TEN (10) MAP ZONES. EXAMPLES ARE INCLUDED TO ILLUSTRATE THE VAR AREA MAP WITH MAP ZONES AND THE FUNCTIONALITY AND PROCEDURE FOR USING THE VAR CALCULATION TOOL.**

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USDA Forest Service, Rocky Mountain Research Station

This tool uses **Risk-based Assessment** to evaluate cost-effectiveness for proposed treatments to mitigate potential damage to Values-at-Risk (VAR). Analysis in this tool is based on a combination of applying **benefit/cost ratios (B/C ratio)** for **Market Value** resources and the **Implied Minimum Value (IMV)** method for **Non-market Value** resources.

**Risk-based Assessment** estimates **expected value change** to threatened resources based upon the probability that a threat will occur, the cost of proposed mitigations, and the probability that the mitigation will be effective.

Resource valuation and cost/benefit analysis are based on the following assumptions:

1. No dollar value is assigned to a human life. Where life and safety are at risk no economic justification of the treatment is required assuming the proposed mitigation is deemed to be reasonably effective.
2. Directly assigning dollar values to **non-market resources** (e.g., Native American sacred sites, water quality, protection of threatened species) during BAER assessments is unrealistic; however, treatments proposed for **non-market resources** may be justified using the **Implied Minimum Value (IMV)** method, which measures the minimum value the resource must have to justify the proposed treatment costs.
3. Where dollar values can be assigned for resources with clear **market values** (e.g., new road culverts, grazing leases, campground structures) they should be assessed using the risk-based, **benefit/cost ratio (B/C ratio)** method.
4. **Loss of use** of a resource is a category of **market values**; however, the dollar value of loss of use may be difficult to obtain during a post-fire assessment. If the **market value of loss of use** is not available, substitute the **implied minimum value** of the described **loss of use**.

This VAR Calculation Tool is based on the premise that assessment of values-at-risk is a spatial issue. For a resource to be identified as a value-at-risk it must be linked spatially to a threat(s) that has the potential to cause damage or loss. These VAR-threat associations are the basic unit of VAR assessment and treatment justification.

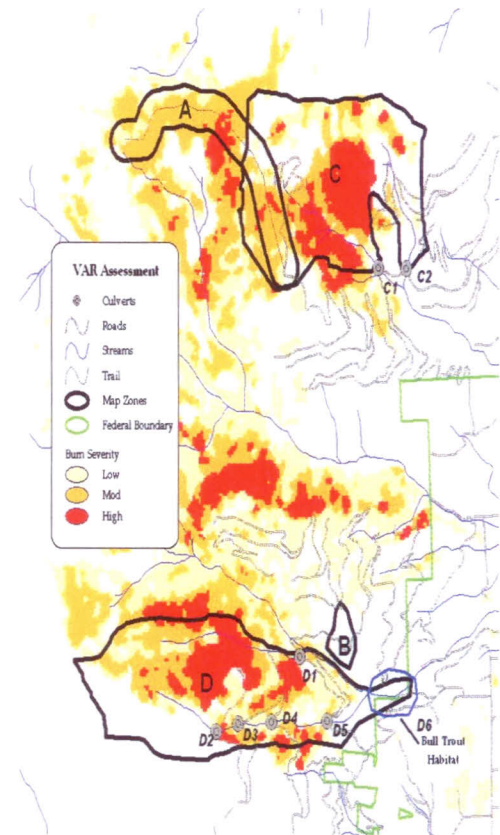
1. Describe VAR and why values are significant.

- a. Determine which category VAR best fits
  - i. **Life and safety**
  - ii. **Non-market: Cultural**
  - iii. **Non-market: Ecological**
  - iv. **Market: Direct**
  - v. **Market: Loss of use**
- b. For **market value** VAR determine cost to repair, replace, or restore

2. Describe threat(s) to VAR and

- a. Estimate probability that threat will occur.
- b. Describe potential impact or significance of the threat on VAR. When possible, provide numeric estimates of the magnitude of impact if the threat occurs (e.g., use models to estimate the expected post-fire peak flows and erosion response).

**NOTE:** For post-fire erosion threats, the Erosion Risk Management Tool (ERMiT), a web-based erosion prediction tool (<http://forest.moscowfs.wsu.edu/fswepp/>), can be used to determine the magnitude and probability of hillslope erosion occurring.



3. Map location of threat(s) relative to VAR

- a. Threat-VAR associations and proposed treatments are grouped into individual **Map Zones**. Valuation of VAR in each **Map Zone** is calculated individually on separate Map Zone pages (up to 10) in the VAR Calculation Tool.
- b. Identify the VAR in each map zone and label each with an identifier, or Map Link # (e.g. the first VAR in Map Zone A would be **Map Zone # A1**). Map and label source areas for threats.
- c. Compile the **Map Zones** into a **VAR Area Map** which is inserted into the VAR Calculation Tool (second worksheet behind the Welcome page). The VAR Area Map is generally a Burned Area Map with all the identified Map Zones on it. It may include a map inset when VAR are outside the burned area.

4. Determine the recommended treatments to mitigate threats.

- a. Describe where and how treatments are expected to mitigate threat. Map proposed treatments onto the **VAR Area Map**.
- b. Determine cost of proposed treatments.
- c. Estimate probability that proposed treatment will be successful.

**NOTE:** For post-fire erosion mitigation treatments, the Erosion Risk Management Tool (ERMiT), a web-based erosion prediction tool (<http://forest.moscowfs.wsu.edu/fswepp/>), can be used to determine the probable success of seeding, mulching, and erosion barrier treatments.

BAER Values At Risk Calculation Tool -- [forest.moscowfs.wsu.edu/BAERTOOLS/VAR](http://forest.moscowfs.wsu.edu/BAERTOOLS/VAR)  
USDA Forest Service, Rocky Mountain Research Station

**NOTE:** Users are encouraged to complete all **VAR Tool Preparation Steps** before entering data into the VAR Tool.

### Map Zone Logic

1. Each **Map Zone** is summarized on its own **Map Zone** worksheet. (Up to 10 **Map Zones** may be entered in this release.)
2. Each Map Zone worksheet permits VAR to be assigned in one of the five primary categories:
  - 1) **Life and safety**, 2) **Non-market: Cultural**, 3) **Non-Market: Ecological**, 4) **Market: Direct**, 5) **Market: Loss of Use**.
3. Multiple VAR may be assessed within a single **Map Zone** worksheet provided they are spatially linked to the same associated threats.
4. One worksheet per **Map Zone** is required because highly cost effective treatments within one zone should not subsidize treatments that are not cost-effective in another (that is, each component needs to be evaluated on its own merit).
5. Calculations from each **Map Zone** worksheet are automatically transferred to the Summary Sheet. Each **Map Zone** is summarized in a short section on the Summary page. The totals from all used **Map Zones** (up to 10 possible) are added together at the top of the Summary page.

### How Calculations Work

1. Calculations by VAR category
  - a. Life and safety only
    - If life and safety are the justification for treatment, no monetized value is required and no calculations are made
  - b. Market resources only: includes **Market: Direct** and **Market: Loss of use**
    - If proposed treatment(s) are to protect only a market VAR, the inputs on the **Map Zone** page will calculate the B/C ratio.
    - If the **B/C ratio** <1 for market VAR, then treatment is not economically justified.
    - If professional judgment determines that treatments should still occur, a description of the rationale for that judgment should accompany the request.
  - c. Non-market resources only: includes **Non-market: Cultural** and **Non-Market: Ecological**
    - If proposed treatment(s) are to protect only a **non-market value**, the **implied minimum value (IMV)** is calculated.
    - The IMV method does not require direct dollar valuation of **non-market** resources, and instead provides a minimum value for the VAR based on the cost of the proposed treatment. If the BAER team determines that the value of the VAR exceeds the IMV, the treatment is justified as a wise use of public funds. If they believe the VAR value is less than the IMV, the treatment is not warranted.
    - A clear description of the **non-market** VAR will enable reviewers' to appreciate the BAER team's assessment that the value of the non-market VAR exceeds the calculated IMV.
  - d. Mixed Market and **Non-market Values**
    - When a **Map Zone** includes both market and non-market values a hybrid approach is required.
    - For the market value resources a **B/C ratio** is calculated.
    - If **B/C ratio** is  $\geq 1$ , the treatment is justified without assessment of the non-market VAR.

- If **B/C ratio** is < 1, the dollar amount required to make B/C ratio = 1 is assigned to the non-market VAR and used to calculate the IMV.
- The assessment of the IMV assigned to the **non-market** VAR should be conducted as described for **non-market** VAR above.

## 2. Reduction in Probability of Loss

Probability of experiencing resource value loss if no treatment occurs minus the probability if treatment does occur (e.g., If erosion exceeds the tolerable limit of  $0.5 \text{ t ac}^{-1}$ , it will raise the sediment load of Stream A above the standards. Thus, if the probability that erosion will exceed the tolerable limit without treatment is 73 percent and the probability that erosion will exceed tolerable limit with straw mulch treatment in place is 22 percent, then the **reduction in probability of loss** =  $0.73 - 0.22 = 0.51$ .

## 3. Expected Benefit of Treatment (calculated for market VAR only)

The expected resource value change with treatment minus the expected resource value change without treatment. Expected value change is defined as the change in resource value time the probability of a post-fire event causing the change. Probability with treatment (**prob**<sub>w/trx</sub>) is defined as the probability of the post-fire event causing the specified value change if treatment were to occur. Probability without treatment (**prob**<sub>w/o</sub>) is the probability of the post-fire event causing the specified value change without treatment.

$$\text{benefit}_{\text{exp}} = \text{value change} * \text{prob}_{\text{w/trx}} - \text{value change} * \text{prob}_{\text{w/o}}$$

Through this method the value of the resource of concern is discounted by the expected effectiveness of the treatment. For example, extreme flooding without treatment is expected to destroy a bridge worth \$450,000. If the probability of destructive flooding is 40% without treatment and straw mulch treatment is expected to reduce the threat to 25%, the reduction in probability equals  $0.40 - 0.25$ , or 0.15. Therefore the **expected benefit of treatment** =  $\$450,000 * 0.15 = \$67,500$ .

## 4. Implied Minimum Value (calculated for **non-market** VAR and occasionally for market VAR if monetary values can not be determined)

The minimum value of **non-market** VAR based on the cost to protect the resource adjusted for the expected effectiveness of the proposed treatment. The cost of the treatment (cost<sub>trx</sub>) is divided by the difference in the probability of loss without treatment (**p** loss<sub>w/o</sub>) and probability of loss with treatment (**p** loss<sub>w/trx</sub>), or

$$\text{IMV} = \text{cost}_{\text{trx}} / (\text{p loss}_{\text{w/o}} - \text{p loss}_{\text{w/trx}})$$

The more effective the proposed treatment the lower the **implied minimum value** that must be justified to protect the **non-market** resource. For example, without treatment extreme post-fire erosion is expected to threaten critical bull trout spawning habitat. Loss of spawning habitat is estimated to occur at erosion levels greater than 1 ton per acre. The ERMIT tool could be used to estimate the probability of reaching this level of sedimentation with and without treatment. If no treatment were to occur the probability of reaching the 1 ton per acre threshold is estimated as 70 percent. Straw mulch treatment is calculated to reduce the probability of reaching this level of sediment delivery to 25% at a cost of \$100,000. Therefore the **implied minimum value** of bull trout spawning habitat =  $\$100,000 / (0.70 - 0.25) = \$222,222$ .

## Completing VAR Area Map Page

1. Copy completed **VAR Area Map** onto designated space and resize as necessary
2. Complete general fire information
3. Briefly summarize VAR-Threat associations in each **Map Zone**
4. Add any clarifying comments as necessary

**Note:** Default page formatting will print to two 8.5x11 pages. Row heights can be manually expanded to accommodate text as necessary. Printing formatting may flow over more than two pages.

## Completing Map Zone Worksheets

1. Enter the following information into **white** cells as necessary to describe each **Map Zone**
  - a. VAR by category
    - **Life and Safety** and **Non-market** VAR: Include VAR name, Map Link #, and simple description.
    - **Market** VAR: Include VAR name, Map Link #; select Value Source from dropdown list; add quantity; and Resource Value.
  - b. Probability values (enter as decimal) for:
    - Probability of experiencing loss with no treatment; select Source from dropdown menu.
    - Probability of experiencing loss if treatment occurs.
2. Cells with **orange** fill will automatically calculate and the results will automatically be transferred to the Summary page.
3. Enter any comments in the space provided at the bottom of the worksheet.
4. Using link to view **Non-Market Values** Literature.
  - a. The link opens a dialogue box to access a dropdown list of groups of non-market resources frequently encountered (Property, Soil Productivity, T&E Species, Watershed, and Wildlife).
  - b. Follow link to "About Non-Market Value Literature" for explanations, possible use and limitations of these literature summaries.
  - c. We do not recommend using this literature to identify a monetary price for non-market values; we recommend the IMV approach described above. However, this literature may be used to compare values developed within the literature against calculated IMVs.



## DEFINITIONS

**BENEFIT/COST (B/C) RATIO:** The ratio of the expected benefit of a treatment divided by the cost of treatment. A B/C value must be greater than or equal to one (1) for a treatment to be justified economically; if  $B/C < 1$  the treatment is not economically justified. However, B/C may not be the sole criteria to determine whether a treatment should be implemented.

**EXPECTED BENEFIT OF TREATMENT:** The expected resource value change with treatment minus the expected resource value change without treatment.

**EXPECTED BENEFIT CHANGE:** The reduction in resource value from damage or loss associated with a post-fire threat times the probability of loss.

**HAZARD:** A source of danger (similar to a threat) or chance that an outcome will occur (similar to risk). Cautious use of the word hazard, often used in the context of both threats and risks, is necessary for clear communication. Unless a valued resource is in harm's way, a hazard, like a threat, poses no risk.

**IMPLIED MINIMUM VALUE (IMV):** The minimum value of non-market VAR based on the cost to protect the resource adjusted for the expected effectiveness of the proposed treatment. The cost of the treatment is divided by the difference in the probability of loss without treatment and probability of loss with treatment.

**LOSS OF USE:** Instances where the damage to a resource precludes significant public use (e.g. primary road closure to an isolated recreation based economy). Given BAER timelines it may be challenging to calculate the market value associated with loss of use -- consultation with resource economists is advised.

**MAP ZONES:** An area of interconnected VAR, threats, and treatments that serves as a single geographically defined analysis unit. Obvious geographic units include watersheds, areas adjacent to trails or roads, and contiguous habitats, rangelands, or forests probably threatened by the same threat or associated threats. The number of Map Zones will vary by the number and locations of VAR as well as the size and complexity of the wildfire.

**MARKET VALUES:** Applied to resources for which well established markets and prices exist and can easily be expressed in dollars; e.g. developed facilities and infrastructure, grazing allotments, timber, and loss of use.

**MONETIZED VALUE:** Resource value expressed as a dollar value, e.g. cost to purchase, repair, or replace.

**NON-MARKET VALUES:** Resource values where markets and prices are not well defined; e.g. cultural and historic resources, ecological values.

**REDUCTION IN PROBABILITY OF LOSS:** Probability of a post-fire threat causing a loss of resource value in the absence of treatment minus the probability of loss with treatment.

**RISK:** The probability of loss occurring to a valued asset or resource. Risk assessment addresses potential damage or destruction resulting from identified threats.

**RISK-BASED ASSESSMENT:** The process of evaluating the potential resource damage or loss given the probability that the threat will occur, the change in the resource value if it does, the cost of proposed mitigation, and the probability that the mitigation will be successful.

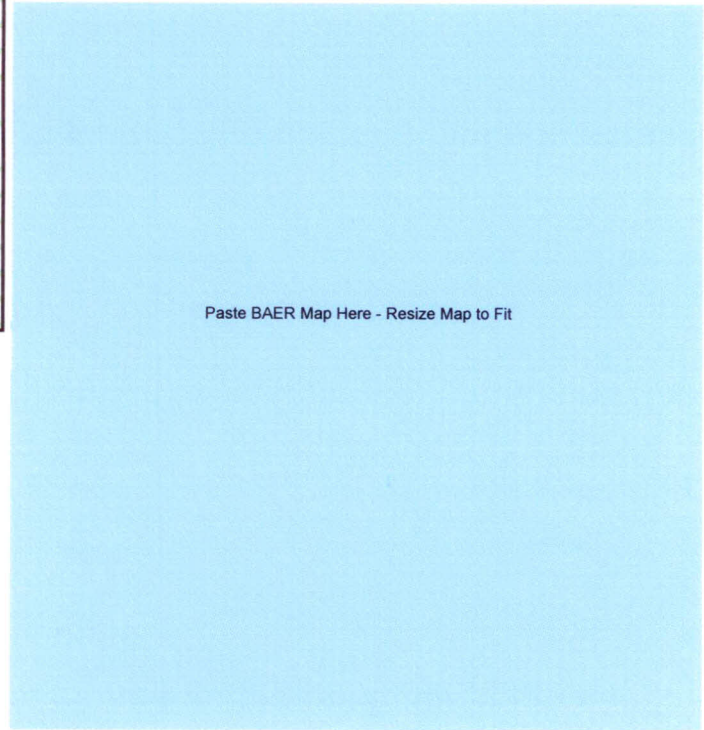
**THREAT:** Potential to inflict injury or damage, e.g. high severity burn, snags, noxious weeds, sedimentation into stream, soil loss. A threat poses no risk without potential loss to a resource of concern.

**VAR AREA MAP:** A BAER summary map which includes the full extent of all Map Zones (VAR and associated threats) along with relevant geographic features to explain the fire, topographic, and political landscape.

<b>Fire Name</b>	Wallow
<b>Location</b>	San Carlos and Ft. Apache Agency
<b>Date</b>	7/3/2011
<b>Analyst name</b>	Brad Burmark
<b>Contact Information</b>	707-562-8950

Briefly describe VAR-Threat relationships for each Map Zone  
 (Note: the fields below will auto expand as needed)

<b>Map Zone A</b>	Pump Station along Black River on San Carlos Res
<b>Map Zone B</b>	Pueblo Ruins
<b>Map Zone C</b>	Protect cultural artifacts from looting
<b>Map Zone D</b>	San Carlos Reservation and Ft. Apache Reservation noxious weed surveys
<b>Map Zone E</b>	San Carlos Reservation and Ft. Apache Reservation road use (Public Safety)
<b>Map Zone F</b>	
<b>Map Zone G</b>	
<b>Map Zone H</b>	
<b>Map Zone I</b>	
<b>Map Zone J</b>	
<b>Notes (optional):</b>	



<b>Fire Name</b>	Wallow
<b>Location</b>	San Carlos and Ft. Apache Agency
<b>Date</b>	7/3/2011

**EACH MAP ZONE REPRESENTS A SYSTEM OF LINKED TREATMENTS AND ASSOCIATED VALUES AT RISK**

**MAP ZONE A - VALUES AT RISK (VAR)**

Map link #	<i>Life and Safety</i>	Description

PLEASE NOTE: IF PUBLIC SAFETY IS A FACTOR, B/C RATIO SHOULD NOT BE RELEVANT AND SHOULD STRICTLY BE AN ACCOUNTING EXERCISE

Map link #	<i>Non-Market: Cultural Values</i>	Description

Map link #	<i>Non-Market: Ecological</i>	Description

Map link #	<i>Market Values: Direct</i>	Description	Total
			\$ -
			\$ -
			\$ -

Map link #	<i>Market Values: Loss-of-Use</i>	Description	Total
	Pump Station	Loss of operation	\$ 100,000
			\$ -
			\$ -

Probability of experiencing the loss with no treatment (enter as decimal)	0.80
Source of loss probability with no treatment: <input type="text"/> Select Source...	
Market Resource Value	\$ 100,000

**TREATMENT DESCRIPTION**

Map link #	<i>Proposed treatment</i>	Total
SCA1	Sediment Removal	\$ 20,000
		\$ -
		\$ -

Probability of experiencing loss if treatment occurs (enter as decimal)	0.05
Source of loss probability with treatment: <input type="text"/> Select Source...	
Total Treatment Cost	\$ 20,000

**VAR CALCULATION RESULTS**

REDUCTION IN PROBABILITY OF LOSS	0.75
EXPECTED BENEFIT OF TREATMENT	\$ 75,000
Expected Benefit/Cost ratio of treatment for market resources only (economically justified if > 1.0)	3.8
IMPLIED MINIMUM VALUE OF PROTECTING NON-MARKET RESOURCE VALUES	\$ -

Comments

[Non-Market Values Literature](#)

Fire Name	Wallow
Location	San Carlos and Ft. Apache Agency
Date	7/3/2011

**EACH MAP ZONE REPRESENTS A SYSTEM OF LINKED TREATMENTS AND ASSOCIATED VALUES AT RISK**

**MAP ZONE B - VALUES AT RISK (VAR)**

Map link #	<i>Life and Safety</i>	Description
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PLEASE NOTE: IF PUBLIC SAFETY IS A FACTOR, B/C RATIO SHOULD NOT BE RELEVANT AND SHOULD STRICTLY BE AN ACCOUNTING EXERCISE

Map link #	<i>Non-Market: Cultural Values</i>	Description
	Pueblo Ruins	Protect ruins from falling snags, some trees growing in foundation can fall and lift the foundation wall

Map link #	<i>Non-Market: Ecological</i>	Description
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Map link #	<i>Market Values: Direct</i>	Description	Total
			\$ -
			\$ -
			\$ -

Map link #	<i>Market Values: Loss-of-Use</i>	Description	Total
			\$ -
			\$ -
			\$ -

Probability of experiencing the loss with no treatment (enter as decimal)	0.80
Source of loss probability with no treatment: <input type="text"/> Select Source...	
Market Resource Value	\$ -

**TREATMENT DESCRIPTION**

Map link #	<i>Proposed treatment</i>	Total
SCA2	Protect Pueblo Ruin, remove trees in foundations	\$ 925
		\$ -
		\$ -

Probability of experiencing loss if treatment occurs (enter as decimal)	
Source of loss probability with treatment: <input type="text"/> Select Source...	
Total Treatment Cost	\$ 925

**VAR CALCULATION RESULTS**

REDUCTION IN PROBABILITY OF LOSS	0.80
EXPECTED BENEFIT OF TREATMENT	\$ -
Expected Benefit/Cost ratio of treatment for market resources only (economically justified if > 1.0)	
IMPLIED MINIMUM VALUE OF PROTECTING NON-MARKET RESOURCE VALUES	\$ 1,156

Comments

[Non-Market Values Literature](#) [View Literature](#)

<b>Fire Name</b>	Wallow
<b>Location</b>	San Carlos and Ft. Apache Agency
<b>Date</b>	7/3/2011

**EACH MAP ZONE REPRESENTS A SYSTEM OF LINKED TREATMENTS AND ASSOCIATED VALUES AT RISK**

**MAP ZONE C - VALUES AT RISK (VAR)**

Map link #	<i>Life and Safety</i>	Description
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PLEASE NOTE: IF PUBLIC SAFETY IS A FACTOR, B/C RATIO SHOULD NOT BE RELEVANT AND SHOULD STRICTLY BE AN ACCOUNTING EXERCISE

Map link #	<i>Non-Market: Cultural Values</i>	Description
	Cultural artifacts	Artifact looting, especially after sites are exposed from fire burning vegetation away.

Map link #	<i>Non-Market: Ecological</i>	Description
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Map link #	<i>Market Values: Direct</i>	Description	Total
			\$ -
			\$ -
			\$ -

Map link #	<i>Market Values: Loss-of-Use</i>	Description	Total
			\$ -
			\$ -
			\$ -

Probability of experiencing the loss with no treatment (enter as decimal)	0.90
Source of loss probability with no treatment: <input type="text"/> Select Source...	
Market Resource Value	\$ -

**TREATMENT DESCRIPTION**

Map link #	<i>Proposed treatment</i>	Total
SCA3	Placement of surveillance cameras	\$ 4,000
		\$ -
		\$ -

Probability of experiencing loss if treatment occurs (enter as decimal)	0.20
Source of loss probability with treatment: <input type="text"/> Select Source...	
Total Treatment Cost	\$ 4,000

**VAR CALCULATION RESULTS**

REDUCTION IN PROBABILITY OF LOSS	0.70
EXPECTED BENEFIT OF TREATMENT	\$ -
Expected Benefit/Cost ratio of treatment for market resources only (economically justified if > 1.0)	
IMPLIED MINIMUM VALUE OF PROTECTING NON-MARKET RESOURCE VALUES	\$ 5,714

Comments

[Non-Market Values Literature](#) [View Literature](#)

Fire Name	Wallow
Location	San Carlos and Ft. Apache Agency
Date	7/3/2011

**EACH MAP ZONE REPRESENTS A SYSTEM OF LINKED TREATMENTS AND ASSOCIATED VALUES AT RISK**

**MAP ZONE D - VALUES AT RISK (VAR)**

Map link #	Life and Safety	Description
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PLEASE NOTE: IF PUBLIC SAFETY IS A FACTOR, B/C RATIO SHOULD NOT BE RELEVANT AND SHOULD STRICTLY BE AN ACCOUNTING EXERCISE

Map link #	Non-Market: Cultural Values	Description
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Map link #	Non-Market: Ecological	Description
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	Detection of invasive species	Concern over spread of invasive plants into exposed burn areas
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Map link #	Market Values: Direct	Description	Total
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			\$ -
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			\$ -
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			\$ -
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Map link #	Market Values: Loss-of-Use	Description	Total
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[Non-Market Values Literature](#) [View Literature](#)

<b>Fire Name</b>	Wallow
<b>Location</b>	San Carlos and Ft. Apache Agency
<b>Date</b>	7/3/2011

**EACH MAP ZONE REPRESENTS A SYSTEM OF LINKED TREATMENTS AND ASSOCIATED VALUES AT RISK**

**MAP ZONE E - VALUES AT RISK (VAR)**

Map link #	Life and Safety	Description	
	Public safety on roads	Keep public from using unsafe roads	
<b>PLEASE NOTE: IF PUBLIC SAFETY IS A FACTOR, B/C RATIO SHOULD NOT BE RELEVANT AND SHOULD STRICTLY BE AN ACCOUNTING EXERCISE</b>			
Map link #	Non-Market: Cultural Values	Description	
Map link #	Non-Market: Ecological	Description	
Map link #	Market Values: Direct	Description	Total
			\$ -
			\$ -
			\$ -
Map link #	Market Values: Loss-of-Use	Description	Total
			\$ -
			\$ -
			\$ -

Probability of experiencing the loss with no treatment (enter as decimal)	
Source of loss probability with no treatment:	Select Source...
Market Resource Value	\$ -

**TREATMENT DESCRIPTION**

Map link #	Proposed treatment	Total
SCA5, FTA 2	Install flood warning signs	\$ 17,000
SCA6, FTA3	Road safety closures (install gates)	\$ 45,000
		\$ -
Probability of experiencing loss if treatment occurs (enter as decimal)		
Source of loss probability with treatment:		Select Source...
Total Treatment Cost		\$ 62,000

**VAR CALCULATION RESULTS**

REDUCTION IN PROBABILITY OF LOSS	
EXPECTED BENEFIT OF TREATMENT	\$ -
Expected Benefit/Cost ratio of treatment for market resources only (economically justified if > 1.0)	
IMPLIED MINIMUM VALUE OF PROTECTING NON-MARKET RESOURCE VALUES	\$ -

Comments

[Non-Market Values Literature](#) [View Literature](#)

<b>Fire Name</b>	Wallow
<b>Location</b>	San Carlos and Ft. Apache Agency
<b>Date</b>	7/3/2011

<b>SUMMARY</b>	<b>Total Treatment Cost</b>	<b>\$ 100,925</b>
	<b>Expected Benefit of Treatment</b>	<b>\$ 75,000</b>
	<b>Implied Minimum Value (IMV)</b>	<b>\$ 24,371</b>

	<b>Value Type</b>	<b>Value at Risk</b>	<b>Implied Value and/or Benefit Cost</b>
<b>MAP ZONE A</b>	Life and Safety	No	
	Non-Market: Cultural Values	No	
	Non-Market: Ecological Values	No	
	Market Values: Direct	No	\$ -
	Market Values: Loss of Use	<b>Yes</b>	\$ 100,000
	<i>Total Market Resource Value</i>		\$ 100,000
	<i>Proposed Treatment</i>		\$ 20,000
	Reduction in Probability of Loss		0.75
	Expected Benefit of Treatment		\$ 75,000
	Exp B/C Ratio of Treatment for Market Resources Only		3.8
<b>Implied Minimum Value (IMV) of Protecting Non-Market Resource Values</b>			<b>\$ -</b>

	<b>Value Type</b>	<b>Value at Risk</b>	<b>Implied Value and/or Benefit Cost</b>
<b>MAP ZONE B</b>	Life and Safety	No	
	Non-Market: Cultural Values	<b>Yes</b>	
	Non-Market: Ecological Values	No	
	Market Values: Direct	No	\$ -
	Market Values: Loss of Use	No	\$ -
	<i>Total Market Resource Value</i>		\$ -
	<i>Proposed Treatment</i>		\$ 925
	Reduction in Probability of Loss		0.80
	Expected Benefit of Treatment		\$ -
	Exp B/C Ratio of Treatment for Market Resources Only		
<b>Implied Minimum Value (IMV) of Protecting Non-Market Resource Values</b>			<b>\$ 1,156</b>

	<b>Value Type</b>	<b>Value at Risk</b>	<b>Implied Value and/or Benefit Cost</b>
<b>MAP ZONE C</b>	Life and Safety	No	
	Non-Market: Cultural Values	<b>Yes</b>	
	Non-Market: Ecological Values	No	
	Market Values: Direct	No	\$ -
	Market Values: Loss of Use	No	\$ -
	<i>Total Market Resource Value</i>		\$ -
	<i>Proposed Treatment</i>		\$ 4,000
	Reduction in Probability of Loss		0.70
	Expected Benefit of Treatment		\$ -
	Exp B/C Ratio of Treatment for Market Resources Only		



	Value Type	Value at Risk	Implied Value and/or Benefit Cost
	<b>Implied Minimum Value (IMV) of Protecting Non-Market Resource Values</b>		\$ 5,714

	Value Type	Value at Risk	Implied Value and/or Benefit Cost	
MAP ZONE D	Life and Safety	No		
	Non-Market: Cultural Values	No		
	Non-Market: Ecological Values	Yes		
	Market Values: Direct	No	\$ -	
	Market Values: Loss of Use	No	\$ -	
	<i>Total Market Resource Value</i>			\$ -
	<i>Proposed Treatment</i>			\$ 14,000
	Reduction in Probability of Loss			0.80
	Expected Benefit of Treatment			\$ -
	Exp B/C Ratio of Treatment for Market Resources Only			
	<b>Implied Minimum Value (IMV) of Protecting Non-Market Resource Values</b>		\$ 17,500	

	Value Type	Value at Risk	Implied Value and/or Benefit Cost	
MAP ZONE E	Life and Safety	Yes		
	Non-Market: Cultural Values	No		
	Non-Market: Ecological Values	No		
	Market Values: Direct	No	\$ -	
	Market Values: Loss of Use	No	\$ -	
	<i>Total Market Resource Value</i>			\$ -
	<i>Proposed Treatment</i>			\$ 62,000
	Reduction in Probability of Loss			
	Expected Benefit of Treatment			\$ -
	Exp B/C Ratio of Treatment for Market Resources Only			
	<b>Implied Minimum Value (IMV) of Protecting Non-Market Resource Values</b>		\$ -	

	Value Type	Value at Risk	Implied Value and/or Benefit Cost	
MAP ZONE F	Life and Safety	No		
	Non-Market: Cultural Values	No		
	Non-Market: Ecological Values	No		
	Market Values: Direct	No	\$ -	
	Market Values: Loss of Use	No	\$ -	
	<i>Total Market Resource Value</i>			\$ -
	<i>Proposed Treatment</i>			\$ -
	Reduction in Probability of Loss			
	Expected Benefit of Treatment			\$ -
	Exp B/C Ratio of Treatment for Market Resources Only			
	<b>Implied Minimum Value (IMV) of Protecting Non-Market Resource Values</b>		\$ -	

	Value Type	Value at Risk	Implied Value and/or Benefit Cost
	Life and Safety	No	

	Value Type	Value at Risk	Implied Value and/or Benefit Cost	
MAP ZONE G	Non-Market: Cultural Values	No		
	Non-Market: Ecological Values	No		
	Market Values: Direct	No	\$ -	
	Market Values: Loss of Use	No	\$ -	
	<i>Total Market Resource Value</i>			\$ -
	<i>Proposed Treatment</i>			\$ -
	Reduction in Probability of Loss			
	Expected Benefit of Treatment			\$ -
Exp B/C Ratio of Treatment for Market Resources Only				
<b>Implied Minimum Value (IMV) of Protecting Non-Market Resource Values</b>			\$ -	

	Value Type	Value at Risk	Implied Value and/or Benefit Cost	
MAP ZONE H	Life and Safety	No		
	Non-Market: Cultural Values	No		
	Non-Market: Ecological Values	No		
	Market Values: Direct	No	\$ -	
	Market Values: Loss of Use	No	\$ -	
	<i>Total Market Resource Value</i>			\$ -
	<i>Proposed Treatment</i>			\$ -
	Reduction in Probability of Loss			
Expected Benefit of Treatment			\$ -	
Exp B/C Ratio of Treatment for Market Resources Only				
<b>Implied Minimum Value (IMV) of Protecting Non-Market Resource Values</b>			\$ -	

	Value Type	Value at Risk	Implied Value and/or Benefit Cost	
MAP ZONE I	Life and Safety	No		
	Non-Market: Cultural Values	No		
	Non-Market: Ecological Values	No		
	Market Values: Direct	No	\$ -	
	Market Values: Loss of Use	No	\$ -	
	<i>Total Market Resource Value</i>			\$ -
	<i>Proposed Treatment</i>			\$ -
	Reduction in Probability of Loss			
Expected Benefit of Treatment			\$ -	
Exp B/C Ratio of Treatment for Market Resources Only				
<b>Implied Minimum Value (IMV) of Protecting Non-Market Resource Values</b>			\$ -	

	Value Type	Value at Risk	Implied Value and/or Benefit Cost
MAP ZONE J	Life and Safety	No	
	Non-Market: Cultural Values	No	
	Non-Market: Ecological Values	No	
	Market Values: Direct	No	\$ -
	Market Values: Loss of Use	No	\$ -
<i>Total Market Resource Value</i>			\$ -