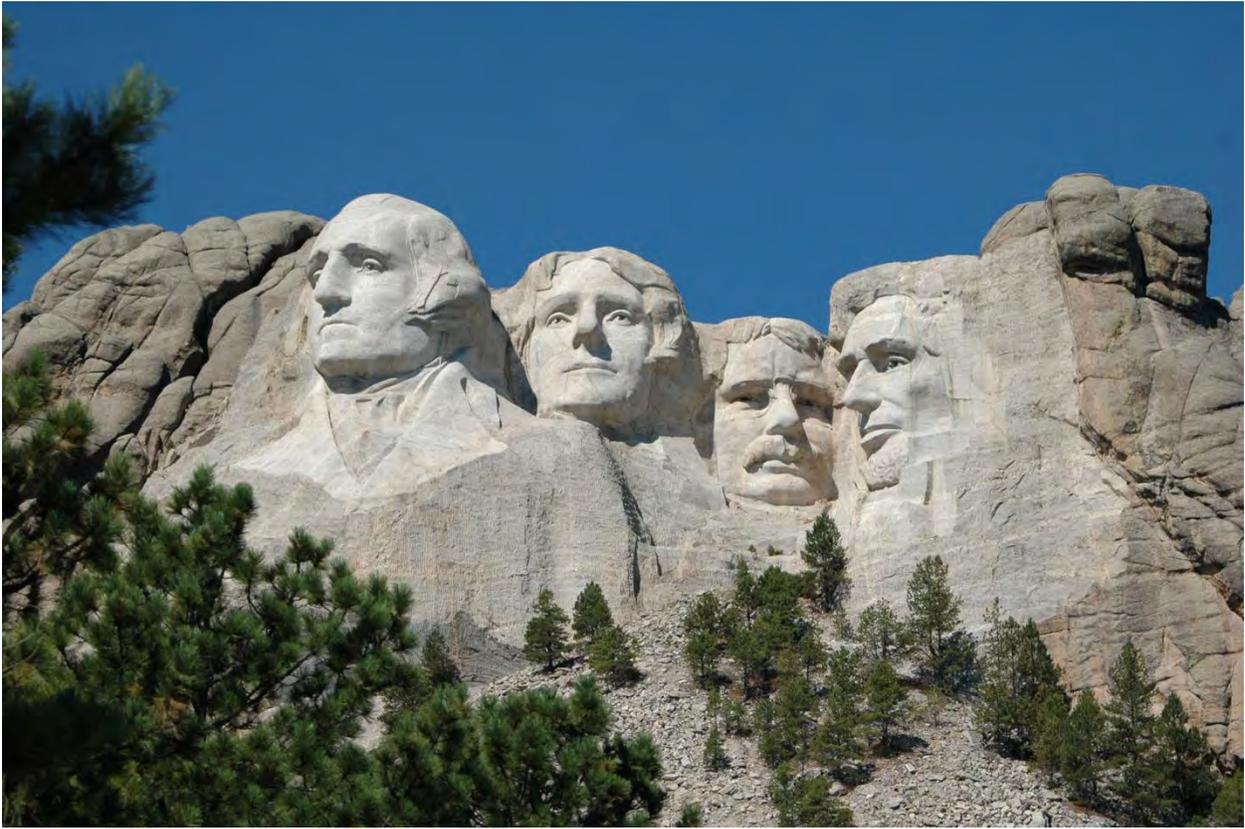


Mount Rushmore National Memorial  
Mountain Pine Beetle  
Resource Assessment and Action Plan



NATIONAL PARK SERVICE

Mount Rushmore National Memorial, South Dakota

February 2010



**Mount Rushmore National Memorial  
Mountain Pine Beetle  
Resources Assessment & Action Plan**

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**REVIEW AND APPROVAL -- National Park Service**

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**Recommended by Rapid Resource Assessment Team – Holbeck, NPS**

**Date**

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**Gerard Baker, Superintendent, Mount Rushmore National Memorial, NPS**

**Date**

**DRAFT**

**Mount Rushmore National Memorial  
Mountain Pine Beetle  
Resources Assessment & Action Plan**

**EXECUTIVE SUMMARY**

A landscape-level mountain pine beetle (MPB) epidemic is occurring in the central Black Hills of South Dakota. The most active area of MPB population growth and highest concentration of tree mortality is in close proximity to Mount Rushmore National Memorial. Tree mortality has reached nearly 100% in much of the affected area, and the oncoming infestation has recently been observed within the Memorial.

On Tuesday February 23, 2010, a National Park Service Rapid Resource Assessment Team (RRAT) arrived at the Memorial to develop an action plan to evaluate the potential impacts of mountain pine beetle infestation in the ponderosa pine forests of the Memorial. The team met with memorial staff, local, state, and federal partners for an in-briefing to understand the issues, develop objectives, and begin to develop an action plan.

Issues of importance identified at the in-briefing include:

- Loss of old growth forest due to MPB or wildfire
- Trees with cultural significance
- Loss of park infrastructure from wildfire
- Historic significance of the sculpture and surrounding forested landscape
- Visual aesthetics of large significant trees in proximity to the sculpture
- Ecological integrity
- Treatment effectiveness monitoring
- Water quality issues associated with insecticide use
- Communication and public relations
- Visitor and employee safety
- Historic forest structure
- Coordination with park neighbors
- Catastrophic wildfire

The primary objectives of the Mountain Pine Beetle Resource Assessment and Action Plan are:

- Evaluate potential impacts of mountain pine beetle (MPB) infestation on forests of the Memorial
- Determine strategies and tactics necessary to mitigate the impacts of MPB
- Develop both short and long-term treatment strategies for MPB
- Develop appropriate fire management strategies to defend the Memorial from unwanted fire
- Evaluate fire ecology and fire management strategies
- Provide long-term sustained healthy forest ecosystems
- Identify geographic treatment units, and establish treatment priorities for each unit
- Develop cost estimates for treatment plans
- Develop an action plan for implementation
- Evaluate proposed actions within the scope of NPS policy and legislation
- Maintain and strengthen relationships with neighbors, partners, state & local governments
- Develop a communication plan for proposed actions

The results of this planning process are documented in Resource Assessments found in Appendix I and detailed treatment Specifications found in Part C. A summary of treatment costs can be found in Part B. Appendix II contains environmental compliance documentation prepared in accordance with National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) and the policies that implement them. This appendix analyzes reasonably foreseeable individual and cumulative impacts of treatment actions proposed in the MPB Plan and evaluates the consistency of proposed actions with

existing NEPA and NHPA planning documents. Appendix III contains photographic documentation and Appendix IV contains planning maps. Appendix V contains supporting documentation for the plan.

### **Mount Rushmore Management Direction**

A General Management Plan (GMP) for the Memorial was completed in 1980. The National Park Service is engaged in a planning process leading to a new GMP. Through that process the Memorial has created a Purpose Statement, identified a Significance Statement, and identified Fundamental Resources and Values.

#### **Purpose Statement:**

“The purpose of Mount Rushmore National Memorial is to commemorate our national history and progress, and to preserve and protect the sculpture and the historic, cultural, and natural setting while providing for the education, enjoyment, and inspiration of the public.”

#### **Significance Statements:**

- Mount Rushmore is an internationally recognized symbol representing the ideals of freedom and democracy for all.
- Mount Rushmore preserves a diverse ecological landscape in a dramatic setting of granite walls and spires.
- Mount Rushmore preserves one of the largest contiguous stands of old growth Ponderosa pine forest and associated habitat remaining in the Black Hills region.
- The sculpting of Mount Rushmore is an early example of heritage tourism as an economic revitalization tool.
- Mount Rushmore is a marvelous engineering achievement.
- The carving is an artistic expression that forever changed the natural landscape to create a cultural icon reflecting the nation's history.

#### **Fundamental Resource and Values:**

- The sculpture
- The natural setting
- The American story
- Unimpeded views of the sculpture

These resources and values maintain the Memorial's purpose and significance, and if these resources are allowed to deteriorate, the Memorial's purpose and significance would be jeopardized.

### **Mountain Pine Beetle**

Mountain pine beetle (*Dendroctonus ponderosae*) is a native species in the Western United States. It primarily attacks ponderosa pine in the Black Hills. Populations of mountain pine beetle are typically found at endemic levels, reproducing in the trees of stressed and overly dense forests. MPB epidemics are cyclic in nature, driven by certain environmental conditions that cause beetle populations to increase dramatically, in a population boom. Other environmental conditions then cause the epidemic to bust.

The mountain pine beetle completes one generation cycle per year in the Black Hills. Adult flight typically occurs in July and August, with the peak flight around the first week of August. During this flight, adult beetles leave previously infested trees and attack new host trees. The adults attack green trees, chew through the bark and construct galleries, along which eggs are laid. Larvae hatch from the eggs and begin feeding on the phloem of the tree in late summer to early fall. Larvae, pupae or callow adults overwinter under the bark of the infested tree. In the spring, the beetle finishes its maturation process under the bark of the tree.

Mountain pine beetle are a historic component of the Black Hills forest ecosystem, with outbreaks occurring periodically. In the mid 1990's, beetle caused mortality was at low, endemic levels across the forest. Starting in the late 1990's large beetle epidemics started and over the past 10 years there have been outbreaks in Beaver Park in the northern Hills and a large outbreak in the central Black Hills. The recent outbreak in the central Hills has caused landscape level changes in the forest.

Outbreaks of MPB can cause considerable changes in forested areas, including reduction in stand density basal area. Dead and dying trees increase fuel loading, which increases fire danger exponentially. The current epidemic threatens visitor safety, along with cultural and natural resources of the Memorial.

### **Mount Rushmore Forests**

Ponderosa pine (*Pinus ponderosa*) forest is the dominant vegetation at the Memorial. Because forests of the Memorial have been protected from timber harvest, these stands maintain many old growth characteristics. However, their structure has changed significantly over the past century due largely to the lack of natural or prescribed fire. The historical natural fire regime at Mount Rushmore is best characterized as one of low-severity surface fires with occasional small patches of passive crown fire. The historical fire frequency at the Memorial was approximately 15-17 years, with the last widespread wildfire burning through the Memorial in 1893. Subsequently, today's forest has an abundance of small, young trees and fewer large, old trees across the landscape. These conditions make the forest overly dense, and susceptible to severe wildfires and insect outbreaks.

### **Resource Assessments**

This plan specifically addresses the presence of Mountain Pine Beetle (MPB) at Mount Rushmore National Memorial. It includes Resource Assessments (Appendix I) of important resources and recommends Specifications for Treatment (Part C.) to effectively address the issues identified. The plan presents the following assessments:

- Forest Health
- Cultural Resources
- Fire Management
- Compliance
- Education and Outreach

### **Recommendations**

The draft plan identifies potential treatments that fall into four categories: administration & education, prevention, control, and monitoring. The following recommended treatments are detailed within the body of the plan:

- Spraying high value trees with insecticide to prevent loss within the developed area
- Search, mark, and remove infested trees throughout the Memorial
- Thin forests along the Highway 244 corridor to create a fuel and bug break
- Thin forests throughout the Memorial to varying density and age class levels
- Thin a 300 foot MPB and fire break along the south, west, and east boundary of the Memorial
- Introduce prescribed fire throughout the Memorial after thinning
- Communicate MPB management issues to the public

Proposed specifications for treatment encompass a suite of treatment options which when taken collectively comprise a multipronged approach to manage MPB, while offering protection from catastrophic wildfire. Because the plan is in draft form, subject to public comment, and continued NEPA analyses, several parallel treatments have been proposed. Some of the other treatment specifications overlap to some degree, or are contingent on the outcome of further NEPA analyses.

An important management objective communicated to the team is to protect old growth forest and individual large diameter trees. One element of the plan would remove large diameter green infested trees, when detected, in order to protect other live trees from infestation. No large diameter, old growth live trees would be thinned through this plan. The ability of Memorial staff to manage public perception, and visitor understanding regarding the plan will be critical to success. The workload envisioned in this plan would overwhelm existing staff. The implementation leader specification would provide capacity and oversight leading to success of the plan. Appropriately thinned healthy forests are bug resistant and fire resistant. The fuel thinning specifications included in this plan would accomplish this. The plan as written is professionally credible, actionable, and fundable.

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**Mount Rushmore National Memorial  
Mountain Pine Beetle  
Resources Assessment & Action Plan**

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**Mount Rushmore National Memorial  
Mountain Pine Beetle  
Resources Assessment & Action Plan**

The objective of the Rapid Resource Assessment Team (RRAT) is to develop a professionally credible, actionable, and fundable resource assessment and action plan that addresses the presence of Mountain Pine Beetle in Mount Rushmore National Memorial.

**Specific Rapid Resource Assessment Team Objectives**

- See executive summary

**PART A - RRAT TEAM ORGANIZATION**

POSITION	TEAM MEMBER / AFFILIATION
Team Leader	Chris Holbeck, NPS – Midwest Regional Office
Forest Health	Erv Gasser, NPS – Pacific West Region
Cultural Resources	Stephen Rogers, NPS – Midwest Regional Office
Historian	Amy Bracewell, NPS Mount Rushmore
Fire Management	Jim McMahill, NPS – Midwest Regional Office
Fire Ecology	Cody Wienk, NPS – Midwest Regional Office
Education and Outreach	Navnit Singh, NPS Mount Rushmore
Education and Outreach	Blaine Kortemeyer - NPS Mount Rushmore
Education and Outreach	Rhonda Schier – NPS Mount Rushmore
Geographic Information	Jon Freeman, NPS – NGP Fire Mgnt Office
Resource Management/Park to Team Liaison	Bruce Weisman, NPS – Mount Rushmore

**Resource Advisors:** (Note: Resource Advisors are individuals who assisted the RRAT with the preparation of this plan. See the consultations Section of this plan for a full list of agencies and individuals who were consulted or otherwise contributed to the development of this plan.

Name	Affiliation	Specialty
Coe Foss	SD DOA	Forester
Kurt Allen	USFS	Entomologist
John Ball	SDSU	Entomologist
Dan Swanson	NPS Fire	Fire Ecologist
Mike Bynum	NPS I&M	Botanist

Spec #	Title	Units	Cost per Unit	FY10	FY11	FY12	FY13	FY14	FY15	FY16	Total
<b>Administration and Education</b>											
1	Project Manager			\$84,500	\$79,000	79000	79000				\$321,500
2	MPB Environmental Assessment			\$50,000							\$50,000
3	Education Outreach and Public Information Operations			\$54,500	\$54,500						\$109,000
4	Project Public Information Officer			\$25,000							\$25,000
<b>Prevention</b>											
5	Preventative Spray in developed areas	1000	\$35	\$35,000	\$35,000	\$35,000	\$35,000	\$35,000			\$175,000
6	Highway 244 Fuel Break	30	\$1,500	\$45,000							\$45,000
7	Fuels Thinning w/ chipping of 6 inch or less and piling of 7 to 10 inch trees			\$1,500,000							\$1,500,000
8	Prescribed fire					\$51,240	\$89,240	\$49,640	\$38,690	\$29,240	\$258,050

Spec #	Title	Units	Cost per Unit	FY10	FY11	FY12	FY13	FY14	FY15	FY16	Total
9	300 foot boundary variable density thinning	200	\$1,407	\$281,300	\$281,300	\$281,300	\$281,300	\$281,300			\$1,406,500
10	Verbenone Experimental treatment	6	\$320	\$1,920	\$1,920	\$1,920	\$1,920	\$1,920			\$9,600
11	Mark and remove trees within hardwood areas	20	\$2,208	\$44,160	\$44,160	\$44,160	\$44,160	\$44,160			\$220,800
<b>Control</b>											
12	Mark and remove infested trees – lop and scatter	900	\$118	\$105,840	\$105,840	\$105,840	\$105,840	\$105,840			\$529,200
13	Mark and remove infested trees – Whole tree removal	50	\$2,023	\$101,140	\$101,140	\$101,140	\$101,140	\$101,140			\$505,700
<b>Monitoring</b>											
14	Monitor and Treat for non-native plants	100	\$508	\$50,800	\$50,800	\$50,800	\$50,800	\$50,800			\$254,000
15	Monitor for Treatment Effectiveness & Forest Health Conditions	1200	\$41	\$48,760	\$48,760	\$48,760	\$48,760	\$48,760			\$243,800
<b>TOTALS</b>				\$2,427,920	\$802,420	\$799,160	\$837,160	\$718,560	\$38,690	\$29,240	<b>\$5,653,150</b>

**Mount Rushmore National Memorial  
Mountain Pine Beetle  
Resources Assessment & Action Plan**

**Part C SPECIFICATIONS**

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**PART C - INDIVIDUAL TREATMENT SPECIFICATION**

<b>TREATMENT/ACTIVITY NAME</b>	MPB Action Plan Project Manager	<b>Spec-#</b>	1
<b>FISCAL YEAR(S)</b>	2010, 2011, 2012, 2013	<b>Spec Cost</b>	\$321,500

**WORK TO BE DONE** (describe or attach exact specifications of work to be done):

<p><b>A. General Description:</b> A term COTR qualified GS-9 is needed to oversee the entirety of the mountain pine beetle project</p> <p><b>B. Location/(Suitable) Sites:</b> Mount Rushmore National Memorial and adjacent public, state, and private lands.</p> <p><b>C. Design/Construction Specifications:</b></p> <ol style="list-style-type: none"> <li>1. Project Manager will coordinate all aspects of the MPB Action Plan including administering contracts, documentation of treatments installed, maintaining financial tracking of cost, providing at least annual reports of treatment progress, submitting supplemental requests for funding, ensuring the completion of all approved treatments, and coordinating treatments with other divisions in the park, other agencies and potential private landowners.</li> <li>2. Project Manager will coordinate on-the-ground implementation of treatments including site orientation of contractors, developing daily/weekly work plans for contractors/crews, and supervising their work.</li> <li>3. Project Manager will submit any necessary project funding proposals</li> <li>4. At completion of the funding period the Project Manager will prepare a final accomplishment report for each of the treatments conducted.</li> </ol> <p><b>D. Purpose of Treatment Specifications (relate to damage/change caused by fire):</b> Due to the complexity of the MPB Action Plan, a general Project Manager will provide the Memorial the management, administrative, and fiscal support for proper administration of the short and long-term treatments of the Action Plan. This specification should fund the oversight necessary for the installation of all treatments.</p> <p><b>E. Treatment consistent with Agency Land Management Plan (identify which plan):</b> Position and grade is consistent with NPS Management Guidelines.</p> <p><b>F. Treatment Effectiveness Monitoring Proposed:</b> Review of projects, financial accountability, and oversight will be conducted by Chief of Natural Resources, Mount Rushmore National Memorial.</p>
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**LABOR, MATERIALS AND OTHER COST:**

<b>PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).</b>	<b>COST / ITEM</b>
Term GS-9 COTR Project Manager @ \$71,000/year x 4 years	\$284,000
<b>TOTAL PERSONEL SERVICE COST</b>	<b>\$284,000</b>
<b>EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.</b>	
Laptop commuter, computer supplies	\$5,000
<b>TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST</b>	<b>\$5,000</b>
<b>MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):</b>	
Miscellaneous supplies	\$500
<b>TOTAL MATERIALS AND SUPPLY COST</b>	<b>\$500</b>
<b>TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):</b>	
1 GSA 4x4 vehicle \$8,000/year x 4 FYs	\$32,000
<b>TOTAL TRAVEL COST</b>	<b>\$32,000</b>
<b>CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):</b>	
<b>TOTAL CONTRACT COST</b>	

**SPECIFICATION COST SUMMARY**

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
2010	4/15/2010	9/30/2010	F				\$84,500
2011	10/1/2010	9/30/2011	F				\$79,000
2012	10/1/2011	9/30/2012	F				\$79,000
2013	10/1/2012	9/30/2013	F				\$79,000
<b>TOTAL</b>							<b>\$321,500</b>

**Work Agent:** C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

**SOURCE OF COST ESTIMATE**

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	P, T
3. Estimate supported by cost guides from independent sources or other federal agencies	P, T, E, M
4. Estimates based upon government wage rates and material cost.	P, T
5. No cost estimate required - cost charged to Fire Suppression Account	

**P** = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

**RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:**

See Executive Summary.
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**PART C - INDIVIDUAL TREATMENT SPECIFICATION**

<b>TREATMENT/ACTIVITY NAME</b>	Mountain Pine Beetle Environmental Assessment	<b>Spec-#</b>	2
<b>FISCAL YEAR(S)</b>	2010	<b>Spec Cost</b>	\$50,000

**WORK TO BE DONE** (describe or attach exact specifications of work to be done):

**A. General Description:**  
Long term impacts and plans for addressing the mountain pine beetle epidemic will need to be reviewed through a NEPA environmental assessment (EA).

**B. Location/(Suitable) Sites:**  
Mount Rushmore National Memorial

**C. Design/Construction Specifications:**

1. Develop an EA consistent with NPS policy and management guidelines
2. The EA should address aspects of the Mount Rushmore N Mem Mountain Pine Beetle Resources Assessment and Action Plan
3. Develop the affected environment and the potential impacts to those environments.
4. Complete within ~ 180 days
5. Coordinate with NPS for public comment

**D. Purpose of Treatment Specifications :**  
Analyze long term impacts from the proposed actions

**E. Treatment consistent with Agency Land Management Plan (identify which plan):**  
EA should be consistent with the 2003 Fire Management Plan, the 1986 Natural Resource Management Plan and the pending General Management Plan

**F. Treatment Effectiveness Monitoring Proposed:**  
Through the integrated public scoping, public comment, and consultations, the EA should have inherent review processes to ensure effectiveness of decision.

**LABOR, MATERIALS AND OTHER COST:**

<b>PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).</b>	<b>COST / ITEM</b>
	\$
	\$
	\$
<b>TOTAL PERSONEL SERVICE COST</b>	<b>\$</b>
<b>EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.</b>	
	\$
	\$
<b>TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST</b>	<b>\$</b>
<b>MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):</b>	
	\$
<b>TOTAL MATERIALS AND SUPPLY COST</b>	<b>\$</b>
<b>TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):</b>	
<b>TOTAL TRAVEL COST</b>	
<b>CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):</b>	
Contract to coordinate and produce environmental assessment	\$50,000
<b>TOTAL CONTRACT COST</b>	<b>\$50,000</b>

**SPECIFICATION COST SUMMARY**

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY10	4/15/2010	November 1, 2010	S	1	\$50,000		\$50,000
<b>TOTAL</b>							<b>\$50,000</b>

**Work Agent:** C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

**SOURCE OF COST ESTIMATE**

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	C
3. Estimate supported by cost guides from independent sources or other federal agencies	C
4. Estimates based upon government wage rates and material cost.	
5. No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services, E = Equipment M = Materials/Supplies, T = Travel, C = Contract, F = Suppression

**RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:**

See Compliance Assessment in Appendix I
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**PART C - INDIVIDUAL TREATMENT SPECIFICATION**

<b>TREATMENT/ACTIVITY NAME</b>	Mountain Pine Beetle Education Outreach and Public Information Operations	<b>Spec-#</b>	3
<b>FISCAL YEAR(S)</b>	2010-2011	<b>Spec Cost</b>	\$109,000

**WORK TO BE DONE** (describe or attach exact specifications of work to be done):

<p><b>A. General Description:</b> Develop MORU education and outreach interpretive and public information programs</p> <p><b>B. Location/(Suitable) Sites:</b> Mount Rushmore National Memorial and the surrounding area</p> <p><b>C. Design/Construction Specifications: N/A</b></p> <ol style="list-style-type: none"> <li>1. Develop park publications based on the NPS identity standards</li> <li>2. Develop employment opportunities using NPS programs like the Teacher-Ranger-Teacher (TRT) program, Volunteers in Parks (VIP) and through the Student Conservation Association (SCA)</li> <li>3. Produce multimedia programs that are consistent with NPS guidelines and other NPS programs</li> <li>4. Obtain quality educational supplies for the use in classroom and park programs</li> </ol> <p><b>D. Purpose of Treatment Specifications (relate to damage/change caused by fire):</b> Education and outreach</p> <p><b>E. Treatment consistent with Agency Land Management Plan (identify which plan):</b> New employment, program development and interpretive publications should be consistent with guidelines and themes found in the memorial's General Management Plan, Long Range Interpretive Plan and other management plans</p> <p><b>F. Treatment Effectiveness Monitoring Proposed:</b> Yearly GPRA surveys, classroom program evaluations and other visitor evaluations can be used to determine effectiveness of interpretive programs and goals.</p>
---

**LABOR, MATERIALS AND OTHER COST:**

<b>PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).</b>	<b>COST / ITEM</b>
One (1) Seasonal intern position	\$15,000
One (1) GS-05 Teacher-Ranger-Teacher (TRT) position (seasonal)	\$16,000
Seasonal employee rent for park housing	\$10,000
Background security investigation checks	\$1,000
NPS uniforms & TRT items	\$3,000
<b>TOTAL PERSONEL SERVICE COST</b>	<b>\$45,000</b>
<b>EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.</b>	
1 Laptop computer, software applications & programs	\$7,000
1 digital video camera, 1 digital still camera	\$7,000
<b>TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST</b>	<b>\$14,000</b>
<b>MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):</b>	
Curriculum / workshop books, supplies, materials for multiple classrooms and student evaluations, handbooks, binders	\$10,000
Backpack learning kits, GPS units, and hand lenses	\$10,000
Publication development, printing and procurement	\$30,000
<b>TOTAL MATERIALS AND SUPPLY COST</b>	<b>\$50,000</b>

<b>TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):</b>	
<b>TOTAL TRAVEL COST</b>	<b>N/A</b>
<b>CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):</b>	
	\$
<b>TOTAL CONTRACT COST</b>	<b>N/A</b>

**SPECIFICATION COST SUMMARY**

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
2010	4/1/2010	9/30/2010					\$54,500
2011	4/1/2011	9/30/2011					\$54,500
<b>TOTAL</b>							<b>\$109,000</b>

**Work Agent:** C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

**SOURCE OF COST ESTIMATE**

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	E,M
3. Estimate supported by cost guides from independent sources or other federal agencies	E,M
4. Estimates based upon government wage rates and material cost.	P
5. No cost estimate required - cost charged to Fire Suppression Account	

**P** = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

**RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:**

See education and outreach resource assessment, Appendix I.
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**PART C - INDIVIDUAL TREATMENT SPECIFICATION**

<b>TREATMENT/ACTIVITY NAME</b>	Project Public Information Officer	<b>Spec-#</b>	<b>4</b>
<b>FISCAL YEAR(S)</b>	2010	<b>Spec Cost</b>	<b>\$25,000</b>

**WORK TO BE DONE** (describe or attach exact specifications of work to be done):

**A. General Description:**  
An NPS Public Information Officer (PIO) would be devoted to this project to produce press releases updating the news and the public on weekly developments. The PIO would plan media events, briefings and meetings with interested parties to help facilitate communication and awareness of the project.

**B. Location/(Suitable) Sites:**  
Mount Rushmore National Memorial and surrounding area

**C. Design/Construction Specifications:**

1. PIO would need to be employed for a minimum of 6 months at the beginning of the project
2. Media communication would include press releases, media events, publications, and briefings
3. The PIO would advise project management on critical public issues and concerns
4. The PIO would develop a communications plan for the project

**D. Purpose of Treatment Specifications :**  
The Public Information Officer would assist the project manager and the park's management team with public communication concerning the project

**E. Treatment consistent with Agency Land Management Plan (identify which plan):**  
It is consistent with NPS management policies

**F. Treatment Effectiveness Monitoring Proposed:**  
The project manager and park management will determine the effectiveness of public communication and assist the PIO in developing appropriate communication methods throughout the project.

**LABOR, MATERIALS AND OTHER COST:**

<b>PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).</b>	<b>COST / ITEM</b>
GS-09/01 Public Information Officer / 6 months	\$25,000
	\$
	\$
<b>TOTAL PERSONEL SERVICE COST</b>	<b>\$25,000</b>
<b>EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.</b>	
	\$
	\$
<b>TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST</b>	<b>\$</b>
<b>MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):</b>	
.	\$
<b>TOTAL MATERIALS AND SUPPLY COST</b>	<b>\$</b>
<b>TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):</b>	
<b>TOTAL TRAVEL COST</b>	

<b>CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):</b>	
	\$
<b>TOTAL CONTRACT COST</b>	<b>\$</b>

**SPECIFICATION COST SUMMARY**

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY10	3/15/2010	9/15/2010		1	\$25,000		\$25,000
<b>TOTAL</b>							<b>\$25,000</b>

**Work Agent:** C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

**SOURCE OF COST ESTIMATE**

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	
3. Estimate supported by cost guides from independent sources or other federal agencies	
4. Estimates based upon government wage rates and material cost.	P
5. No cost estimate required - cost charged to Fire Suppression Account	

**P** = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

**RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:**

See Education and Outreach Assessment in Appendix I
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**PART C - INDIVIDUAL TREATMENT SPECIFICATION**

<b>TREATMENT/ACTIVITY NAME</b>	Preventative Spray in Developed Areas	<b>Spec-#</b>	5
<b>FISCAL YEAR(S)</b>	2010-2014	<b>Spec Cost</b>	\$175,000

**WORK TO BE DONE** (describe or attach exact specifications of work to be done):

<p><b>A. General Description:</b> Protect identified high-value trees in developed areas of the Memorial from mountain pine beetle through the use of an insecticidal spray.</p> <p><b>B. Location/(Suitable) Sites:</b> Trees within developed areas, along roads and major trails throughout the park.</p> <p><b>C. Design/Construction Specifications:</b></p> <ol style="list-style-type: none"> <li>1. Identify all non-infested, high-value trees within the developed areas of the park and along park roads and trails. These include historic and/or scientifically significant trees or stands of trees; trees that have high aesthetic importance in the visual aspect, or are deemed important to the park's "front country" scene. These trees would be preventatively sprayed (sprayed prior to beetle infestation) with an approved pesticide for mountain pine beetle. Protection will allow maintenance of existing trees in developed areas and reduce the costs of dead tree removal from these areas. Identified trees would be marked with a metal tag and located with a GPS and mapped in GIS.</li> <li>2. Application of this insecticide should be done by a licensed pesticide applicator.</li> <li>3. Pesticides of choice would either be carbaryl (Sevin) or permethrin (Astro or Onyx).</li> <li>4. Trees will be sprayed with a ground sprayer (mounted in a truck or ATV) to cover the bole of the tree to a height where the tree is 6 inches in diameter. Pesticide treatments to the same tree should be done between April 15 and June 15 each year for approximately the next 5 years or until local beetle populations have declined.</li> <li>5. Treatments should be completed at a time when there is no rain expected for 4 hours following treatment. Treatments should be done in low wind (less than 5 mph) conditions to reduce the possibility of drift.</li> <li>6. Locations to be sprayed should be communicated to park staff.</li> <li>7. Applications should be made at a time of the day when visitation is minimal or when the park is closed to the public (11:00pm-5:00am).</li> <li>8. Consideration should be given to signing treated sites.</li> <li>9. Access to treated sites is possible when the spray has dried on the tree, generally 4 hours after spraying.</li> <li>10. Project Manager to oversee this treatment and act as COTR. See Project Manager Specification.</li> </ol> <p><b>D. Purpose of Treatment Specifications (relate to damage/change caused by fire):</b> To protect live high-value trees from being attacked from mountain pine beetle in developed areas.</p> <p><b>E. Treatment consistent with Agency Land Management Plan (identify which plan):</b> Treatment is in line with NPS Management Guidelines and policies.</p> <p><b>F. Treatment Effectiveness Monitoring Proposed:</b> Visually inspect protected trees every September/October post spray to make sure none have been attacked. Record tree information and treatment in a database. Monitor surface and groundwater quality to be sure that spray runoff is not impacting water quality.</p>
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**LABOR, MATERIALS AND OTHER COST:**

<b>PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item):</b> Do not include contract personnel costs here (see contractor services below).	<b>COST / ITEM</b>
Project Manager to complete project oversight and COTR. See Project Manager Specification.	
<b>TOTAL PERSONEL SERVICE COST</b>	
<b>EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item):</b> Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	

<b>TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST</b>		
<b>MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):</b>		
<b>TOTAL MATERIALS AND SUPPLY COST</b>		
<b>TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):</b>		
<b>TOTAL TRAVEL COST</b>		
<b>CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):</b>		
\$25/tree @ 1000 trees/year x 5 years		\$125,000
USGS contract to monitor water quality annually \$10K/year x 5 years		50,000
<b>TOTAL CONTRACT COST</b>		<b>\$175,000</b>

**SPECIFICATION COST SUMMARY**

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
2010	4/15/2010	6/15/2010	S	trees	\$35	1000	\$35,000
2011	4/15/2011	6/15/2011	S	trees	\$35	1000	\$35,000
2012	4/15/2012	6/15/2012	S	trees	\$35	1000	\$35,000
2013	4/15/2013	6/15/2013	S	trees	\$35	1000	\$35,000
2014	4/15/2014	6/15/2014	S	trees	\$35	1000	\$35,000
<b>TOTAL</b>							<b>\$175,000</b>

**Work Agent:** C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

**SOURCE OF COST ESTIMATE**

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	
3. Estimate supported by cost guides from independent sources or other federal agencies	C
4. Estimates based upon government wage rates and material cost.	P
5. No cost estimate required - cost charged to Fire Suppression Account	

**P** = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

**RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:**

See Forest Health Assessment Appendix 1, and Beetle Risk Map, Appendix IV.
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**PART C - INDIVIDUAL TREATMENT SPECIFICATION**

<b>TREATMENT/ACTIVITY NAME</b>	Highway 244 Fuel break thinning w/ hand piles	<b>Spec-#</b>	6
<b>FISCAL YEAR(S)</b>	2010	<b>Spec Cost</b>	\$45,000

**WORK TO BE DONE** (describe or attach exact specifications of work to be done):

**A. General Description:** There are a significant number of stands of old growth ponderosa pine within Mount Rushmore National Memorial. Do to successful suppression practices in the area, the ponderosa regeneration has grown significantly and poses a danger to the large ponderosa pine as ladder fuel should a fire come into the area. The objective of this thinning project is to enter the area and thin all ponderosa pine that are 10 inch diameter at breast height (DBH) and smaller and pile it for later burning.

**B. Location/(Suitable) Sites:** Thinning locations are located along the Highway 244 corridor within Mount Rushmore National Memorial.

**C. Design/Construction Specifications:** Treatments will be implemented in accordance with the following:

Specifications  
 Because the unit is in Mount Rushmore National Memorial, minimizing the visual evidence of work, and minimizing the impacts on leave trees is of great importance.

1. Chainsaws used in project area will have approved spark arresters (.023-inch mesh screen)
2. Cut and pile green ponderosa pine with a DBH of 10 inches and less and any paint marked tree
3. All stumps will be cut parallel to the ground and cut no higher than one inch above the ground
4. All slash will be piled on site in a manner that facilitates safe burning at a later date
5. Pile specs as follows:
  - All stems and tops from cut trees shall be piled.
  - Slash piles will not be located on top of stumps or downed logs
  - Only wood that is cut will be piled. Leave dead and down fuel in place.
  - All felled trees will be completely limbed.
  - Piles should be in a cone or teepee shape so they will collapse inward as they burn
  - Piles will be constructed in a compact way with little air space inside pile so that COTR will not be able to push a closed fist through the pile
  - All slash will be bucked to 5 feet or less before piling.
  - All stems and tops from cut trees shall be piled.
  - Previous storm damaged trees already on the ground WITH needles shall be bucked, top down until the stem is greater than 5.0 inch D.B.H. The remaining stem shall be left on the ground.
  - All slash piles will be a minimum of 4 feet in diameter and 4 feet high and a maximum of 6 feet diameter and 6 feet high. All ends that stick out of piles must be bucked off and piled.
  - Slash piles will be placed in the center of openings between trees and no closer than 20 feet from existing standing trees or closer than 10 feet from each other.
6. The contractor shall NOT use any mechanized equipment to construct the piles.
7. To ensure field crews understand and remember all the specifications, the contractor will keep a copy of the statement of work on site during operations.
8. All remaining trees within 30 feet of the highway will be pruned up to 10 feet.

Limitations

- No off road vehicle use
- All work associated vehicles will park together in designated area
- Use of motorized equipment other than hand held equipment will not be permitted
- Avoid cutting Aspen and birch
- All conduct outside the specified work is subject to park rules and regulations concerning: littering, wildlife harassment, collecting, resource damage and other topics as specified for the NPS in the Code of Federal Regulations title 36

**D. Purpose of Treatment Specifications:** In light of over one hundred years of suppression practices in the area the ponderosa regeneration has grown significantly and poses a danger to the large ponderosa pine as ladder fuel should a fire come into the area

**E. Treatment Consistent with Agency Land Management Plan:** Mount Rushmore National Memorial, Midwest Region, National Park Service. Fire Management Plan and associated Environmental Assessment.

**F. Treatment Effectiveness Monitoring Proposed:** NPS Fire Effects Monitoring protocols will be conducted following treatment to determine treatment effectiveness.

**LABOR, MATERIALS AND OTHER COST:**

<b>PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item):</b> Do not include contract personnel costs here (see contractor services below).	<b>COST / ITEM</b>
<b>Total Personnel Service Cost</b>	
<b>EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item):</b> Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	<b>COST / ITEM</b>
<b>Total Equipment Purchase, Lease Or Rental Cost</b>	
<b>MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):</b>	<b>COST / ITEM</b>
<b>Total Materials and Supply Cost</b>	
<b>TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):</b>	<b>COST / ITEM</b>
<b>Total Travel Cost</b>	<b>\$ 0</b>
<b>CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):</b>	<b>COST / ITEM</b>
\$1500 a acre per National Fire Plan IDIQ Fuels Contracting website x 30 acres	\$45,000
<b>Total Contract Cost</b>	<b>\$45,000</b>

**SPECIFICATION COST SUMMARY**

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY10	4/01/2010	09/30/11	S	30	\$1500	Thin/pile Hwy 244 corridor	\$45,000
<b>TOTAL</b>							<b>\$45,000</b>

**Work Agent:** C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

**SOURCE OF COST ESTIMATE**

1.	Estimate obtained from 2-3 independent contractual sources.	
2.	Documented cost figures from similar project work obtained from local agency sources.	C
3.	Estimate supported by cost guides from independent sources or other federal agencies	E,M
4.	Estimates based upon government wage rates and material cost.	
5.	No cost estimate required - cost charged to Fire Suppression Account	

**P = Personnel Services, E = Equipment M = Materials/Supplies, T = Travel, C = Contract, F = Suppression**

**RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:**

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**PART C - INDIVIDUAL TREATMENT SPECIFICATION**

<b>TREATMENT/ACTIVITY NAME</b>	Fuels thinning w/ chipping of 6 inch or less and piling of 7 to 10 inch trees	<b>Spec-#</b>	7
<b>FISCAL YEAR(S)</b>	2010	<b>Spec Cost</b>	\$1,500,000

**WORK TO BE DONE** (describe or attach exact specifications of work to be done):

<p><b>A. General Description:</b> There are a significant number of stands of old growth ponderosa pine within Mount Rushmore National Memorial. Due to successful suppression practices in the area, the ponderosa regeneration has grown significantly and poses a danger to the large ponderosa pine as ladder fuel should a fire come into the area. The objective of this thinning project is to enter the area and thin all ponderosa pine 6-inch diameter at breast height (DBH) and smaller and chip it on sight with dispersal to be spread out with the use of an articulating chipper. 7 inch to 10 inch DBH ponderosa pine would be cut and hand piled for later burning.</p> <p><b>B. Location/(Suitable) Sites:</b> Thinning and chipping locations are located throughout the entire 1,278 acre Mount Rushmore National Memorial.</p> <p><b>C. Design/Construction Specifications:</b> Treatments will be implemented in accordance with the following:  <u>Specifications</u>                  Because the unit is in Mount Rushmore National Memorial, minimizing the visual evidence of work, and minimizing the impacts on leave trees is of great importance.</p> <ol style="list-style-type: none"> <li>9. Chainsaws used in project area will have approved spark arresters (.023-inch mesh screen)</li> <li>10. Cut and chip green ponderosa pine with a DBH of 6 inch and less. Trees from 7 inches to 10 inches will be cut and hand piled as well as any paint marked trees.</li> <li>11. All stumps will be cut parallel to the ground and cut no higher than one inch above the ground</li> <li>12. All slash will be piled on site in a manner that facilitates safe burning at a later date</li> <li>13. Chip specs as follows:                         <ul style="list-style-type: none"> <li>→ Chipped material will be left in place and must remain within the unit boundaries. No areas shall have chips greater than 3 inches deep</li> </ul> </li> <li>14. Pile specs as follows:                         <ul style="list-style-type: none"> <li>→ All stems and tops from cut trees shall be piled.</li> <li>→ Slash piles will not be located on top on stumps or downed logs</li> <li>→ Only wood that is cut will be piled. Leave previous dead and down in place.</li> <li>→ All felled trees will be completely limbed.</li> <li>→ Piles should be in a cone or teepee shape so they will collapse inward as they burn</li> <li>→ Piles will be constructed in a compact way with little air space inside pile so that COTR will not be able to push a closed fist through the pile</li> <li>→ All slash will be bucked to 5 feet or less before piling.</li> <li>→ All stems and tops from cut trees shall be piled.</li> <li>→ Previous storm damaged trees already on the ground WITH needles shall be bucked, top down until the stem is greater than 5.0 inch D.B.H. The remaining stem shall be left on the ground.</li> <li>→ All slash piles will be a minimum of 4 feet in diameter and 4 feet high and a maximum of 6 feet diameter and 6 feet high. All ends that stick out of piles must be bucked off and piled.</li> <li>→ Slash piles will be placed in the center of openings between trees and no closer than 20 feet from existing standing trees or closer than 10 feet from each other.</li> </ul> </li> <li>15. The contractor shall NOT use any mechanized equipment to construct the piles.</li> <li>16. To ensure field crews understand and remember all the specifications, the contractor will keep a copy of the statement of work on site during operations.</li> </ol> <p><u>Limitations</u></p> <ul style="list-style-type: none"> <li>▪ No off road vehicle use</li> <li>▪ All work associated vehicles will park together in designated area</li> <li>▪ Use of motorized equipment other than hand held equipment will not be permitted</li> <li>▪ Avoid cutting Aspen and birch</li> <li>▪ All conduct outside the specified work is subject to park rules and regulations concerning: littering, wildlife harassment, collecting, resource damage and other topics as specified for the NPS in the Code of Federal Regulations title 36</li> </ul> <p><b>D. Purpose of Treatment Specifications:</b> In light of over one hundred years of suppression practices in the area the ponderosa regeneration has grown significantly and poses a danger to the large ponderosa pine as ladder fuel should a fire come into the area</p> <p><b>E. Treatment Consistent with Agency Land Management Plan:</b> Mount Rushmore National Memorial, Midwest Region, National Park Service. Fire Management Plan and associated Environmental Assessment.</p> <p><b>F. Treatment Effectiveness Monitoring Proposed:</b> NPS Fire Effects Monitoring protocols will be conducted following treatment to determine treatment effectiveness.</p>
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**LABOR, MATERIALS AND OTHER COST:**

<b>PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item):</b> Do not include contract personnel costs here (see contractor services below).	<b>COST / ITEM</b>
<b>Total Personnel Service Cost</b>	
<b>EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item):</b> Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	<b>COST / ITEM</b>
<b>Total Equipment Purchase, Lease Or Rental Cost</b>	
<b>MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):</b>	<b>COST / ITEM</b>
<b>Total Materials and Supply Cost</b>	
<b>TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):</b>	<b>COST / ITEM</b>
<b>Total Travel Cost</b>	<b>\$ 0</b>
<b>CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):</b>	<b>COST / ITEM</b>
\$2500 a acre per National Fire Plan IDIQ Fuels site x 600 acres	\$1,500,000
<b>Total Contract Cost</b>	<b>\$1,500,000</b>

**SPECIFICATION COST SUMMARY**

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY10	04/01/2010	09/30/11	T	600	\$2500		\$1,500,000
<b>TOTAL</b>							<b>\$1,500,000</b>

**Work Agent:** C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

**SOURCE OF COST ESTIMATE**

1.	Estimate obtained from 2-3 independent contractual sources.	
2.	Documented cost figures from similar project work obtained from local agency sources.	C
3.	Estimate supported by cost guides from independent sources or other federal agencies	E,M
4.	Estimates based upon government wage rates and material cost.	
5.	No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services, E = Equipment M = Materials/Supplies, T = Travel, C = Contract, F = Suppression

**RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:**

Treatment Unit Map (appendix 4)
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**PART C - INDIVIDUAL TREATMENT SPECIFICATION**

<b>TREATMENT/ACTIVITY NAME</b>	Prescribed Fire	<b>Spec-#</b>	8
<b>FISCAL YEAR(S)</b>	2012, 2013, 2014, 2015, 2016	<b>Spec Cost</b>	\$258,050

**WORK TO BE DONE** (describe or attach exact specifications of work to be done):

<p><b>A. General Description:</b> The use of prescribed fire will decrease fire related risks to life, property and Park resources. Reintroduction of prescribed fire will increase ecosystem health in Mount Rushmore National Memorial.</p> <p><b>B. Location/(Suitable) Sites:</b> Prescribed Fire burn units are located throughout 1,278 acre Mount Rushmore National Memorial. .</p> <p><b>C. Design Specifications:</b> Prescribed Fire Treatments will be implemented in accordance with the following:  1. Provide for public and fire personnel safety during implementation of the project.  2. Burn 70-90% of the burnable project area.  3. Decrease fuel loading by 40-60% 1 yr. post burn</p> <p><b>D. Purpose of Treatment Specifications:</b> In light of over one hundred years of suppression practices in the area the fuel loading has increased significantly and poses a danger to the Memorial.</p> <p><b>E. Treatment Consistent with Agency Land Management Plan:</b> Mount Rushmore National Memorial, Midwest Region, National Park Service. Fire Management Plan and associated Environmental Assessment.</p> <p><b>F. Treatment Effectiveness Monitoring Proposed:</b> NPS Fire Effects Monitoring protocols will be conducted following treatment to determine treatment effectiveness.</p>
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**LABOR, MATERIALS AND OTHER COST:**

	<b>PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).</b>	<b>COST / ITEM</b>
	Personnel costs are figured to the per acre cost of burns based on previous burns of similar size and fuel type. Many federal agencies do not charge for their base 8 hourly rate so other federal agencies will reciprocate on their projects. Overtime pay and weekend overtime can drive up the cost per acre. Though fall and spring burning happen with shorter days. (12hours)	\$246,850
	<b>Total Personnel Service Cost</b>	<b>\$246,850</b>
	<b>EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.</b>	<b>COST / ITEM</b>
	Prescribed burn support to replace burst hoses and misc fire equipment (i.e., broken shovels, pulaskis) \$2000 yr x 5 years	\$10,000
	<b>Total Equipment Purchase, Lease Or Rental Cost</b>	<b>\$10,000</b>
	<b>MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):</b>	<b>COST / ITEM</b>
	50 gallons of diesel fuel x \$3 a gallon x 5 yrs	\$750
	30 gallons of unleaded gasoline x \$3 a gallon x 5yrs	\$450
	<b>Total Materials and Supply Cost</b>	<b>\$1,200</b>
	<b>TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):</b>	<b>COST / ITEM</b>
	Not applicable -	
	<b>Total Travel Cost</b>	<b>\$ 0</b>
	<b>CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):</b>	<b>COST / ITEM</b>
	Not applicable	
	<b>Total Contract Cost</b>	

**SPECIFICATION COST SUMMARY**

FISCAL YEAR	TREATMENT UNIT	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY12	Starling	10/01/2012	09/30/2013	F	245	\$200		\$51,240
FY13	Baldy	10/01/2013	09/30/2014	F	435	\$200		\$89,240
FY14	Grizzly	10/01/2014	09/30/2015	F	237	\$200		\$49,640
FY15	Housing	10/01/2015	09/30/2016	F	162	\$225		\$38,690
FY16	Lafferty	10/01/2016	09/30/2017	F	108	\$250		\$29,240
							<b>TOTAL</b>	<b>\$258,050</b>

**Work Agent:** C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

**SOURCE OF COST ESTIMATE**

1.	Estimate obtained from 2-3 independent contractual sources.	
2.	Documented cost figures from similar project work obtained from local agency sources.	P,M,T,E
3.	Estimate supported by cost guides from independent sources or other federal agencies	P,E,M
4.	Estimates based upon government wage rates and material cost.	P,T
5.	No cost estimate required - cost charged to Fire Suppression Account	

**P** = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

**RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:**

See Mount Rushmore National Memorial Treatment Units Map for identified management treatment unit priorities ((Appendix IV)  
 Example of personnel by position required for similar burns based on fuel type and geographic area. (80-90 personnel total)

POSITION	MINIMUM NUMBER NEEDED	MINIMUM QUALIFICATIONS
Burn Boss	1	RXB2
Firing Boss	1	FIRB
Holding Specialist	1	TFLD
***Hand Crew	2 (20 FFT2)	Type 2 Hand crew
Holders	10	FFT2
Fire Effect Monitor	2	FEMO (t)
Engine Boss	5	ENGB
Engine Crew Members	10	FFT2
ATV/UTV Operators	3	ATVO
Lighters	8	FFT2
Law Enforcement Rangers- At briefing, available to close road	2	Do not need red card

**PART C - INDIVIDUAL TREATMENT SPECIFICATION**

<b>TREATMENT/ACTIVITY NAME</b>	300' Boundary Variable Density Thinning	<b>Spec-#</b>	9
<b>FISCAL YEAR(S)</b>	2010-2014	<b>Spec Cost</b>	\$1,406,500

**WORK TO BE DONE** (describe or attach exact specifications of work to be done):

<p><b>A. General Description:</b> Selectively removing trees to increase the vigor of the remaining trees at a variable density to reduce mountain pine beetle susceptibility and to promote a healthy forest.</p> <p><b>B. Location/(Suitable) Sites:</b> Treatments will be used across the entire Memorial on stands of trees that are NOT infested with mountain pine beetle.</p> <p><b>C. Design/Construction Specifications:</b></p> <ol style="list-style-type: none"> <li>All forested areas of the Memorial will be considered for treatments that have not been infested by mountain pine beetle. This treatment would be done in conjunction with the Fuels Thinning Specifications.</li> <li>Treatments may range from heavy thinning (down to 40 basal area) to leaving stands untreated. The desired effect is to create a mosaic of diverse forest age classes and densities across the landscape.</li> <li>Within developed areas of the Memorial, thinning should remove trees that are 6" dbh and smaller depending on aesthetics and viewsheds.</li> <li>Areas left untreated should be no more than 50 acres and should be surrounded by areas that have reduced stand densities.</li> <li>Consideration can be given to creating a 300 foot buffer along the boundary with Black Elk Wilderness on the west and south sides of the Memorial and also on the east side. Stand density in the buffer would be at the lower end, generally around 40 basal area.</li> <li>Cutting and removal should be done when the trees are driest (August-December) although non-infested trees can be cut at any time and removed.</li> <li>By creating a more diverse landscape the natural area will be less susceptible to future beetle attacks.</li> <li>Contract oversight and COTR completed by Project Manager (See Project Manager Specification).</li> </ol> <p><b>D. Purpose of Treatment Specifications (relate to damage/change caused by fire):</b> The overall purpose of variable density treatments is to create a landscape that is more resilient to large scale beetle epidemics. The buffer would act as an area to reduce immigration of beetles from the wilderness area.</p> <p><b>E. Treatment consistent with Agency Land Management Plan (identify which plan):</b> Treatment is consistent with NPS Management Guidelines and the Memorial's Fire Management Plan.</p> <p><b>F. Treatment Effectiveness Monitoring Proposed:</b> Post treatment inspection of remaining stand structure. Yearly monitoring, for 5 years, of different density treatments for beetle activity.</p>
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**LABOR, MATERIALS AND OTHER COST:**

<b>PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item):</b> Do not include contract personnel costs here (see contractor services below).	<b>COST / ITEM</b>
NPS, 6 person crew (GS-5), \$3180/week x 10 weeks/year x 5 FYs	\$159,000
Contract Oversight and COTR completed by Project Manager (See Project Manager Specification)	
<b>TOTAL PERSONEL SERVICE COST</b>	<b>\$159,000</b>
<b>EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item):</b> Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	
Chainsaws and supplies	\$7,500
<b>TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST</b>	<b>\$7,500</b>
<b>MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):</b>	

<b>TOTAL MATERIALS AND SUPPLY COST</b>		\$
<b>TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):</b>		
2 GSA 4x4 vehicle \$8,000/year x 5 FYs		\$40,000
<b>TOTAL TRAVEL COST</b>		<b>\$40,000</b>
<b>CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):</b>		
Treatment of 200 acres/year @ \$1200/acre x 5 years		1,200,000
<b>TOTAL CONTRACT COST</b>		<b>1,200,000</b>

**SPECIFICATION COST SUMMARY**

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
2010	9/15/2010	4/15/2011	F/C	acres	\$1407	200	\$281,300
2011	9/15/2011	4/15/2012	F/C	acres	\$1407	200	\$281,300
2012	9/15/2012	4/15/2013	F/C	acres	\$1407	200	\$281,300
2013	9/15/2013	4/15/2014	F/C	acres	\$1407	200	\$281,300
2014	9/15/2014	4/15/2015	F/C	acres	\$1407	200	\$281,300
<b>TOTAL</b>							<b>\$1,406,500</b>

**Work Agent:** C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

**SOURCE OF COST ESTIMATE**

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	
3. Estimate supported by cost guides from independent sources or other federal agencies	C
4. Estimates based upon government wage rates and material cost.	P
5. No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services, E = Equipment M = Materials/Supplies, T = Travel, C = Contract, F = Suppression

**RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:**

See Forest Health Assessment Appendix 1 and See Appendix IV, Beetle Risk Map.
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**PART C - INDIVIDUAL TREATMENT SPECIFICATION**

<b>TREATMENT/ACTIVITY NAME</b>	Verbenone Experimental Treatment	<b>Spec-#</b>	10
<b>FISCAL YEAR(S)</b>	2010-2014	<b>Spec Cost</b>	\$9,600

**WORK TO BE DONE** (describe or attach exact specifications of work to be done):

**A. General Description:** This would be an experimental treatment with the USFS. Use of verbenone, which is considered to be useful in some pine/mountain pine beetle scenarios as an anti-aggregation pheromone, may be of unknown effectiveness in the Black Hills. At this time it has shown little effectiveness in ponderosa pine systems in the Black Hills. This treatment would be a test in conjunction with the USFS to determine its effectiveness against mountain pine beetle in the Black Hills.

**B. Location/(Suitable) Sites:** Treat selected stands as a trial in the Memorial.

**C. Design/Construction Specifications:**

1. Stands removed from high visitor use areas will be selected to be tested for the effectiveness of verbenone.
2. At this time, the use of verbenone should be restricted to pouches as opposed to flakes; the use of flakes has even less testing in field trials now.
3. Verbenone should be applied in June just prior to beetle flight.
4. Verbenone should be applied at the rate of 35-40 pouches an acre, spread evenly across the stand to be protected.
5. Area to be treated is approximately 6 acres.
6. Locations of treated trees will be marked by a metal tag as well as with GPS and mapped into GIS.
7. NPS will cooperate with USFS personnel to implement this treatment.

**D. Purpose of Treatment Specifications (relate to damage/change caused by fire):** To prevent beetle attacks in uninfested trees with anti-aggregation pheromones.

**E. Treatment consistent with Agency Land Management Plan (identify which plan):** Treatment is in line with NPS Management Guidelines.

**F. Treatment Effectiveness Monitoring Proposed:** Visually inspect treated areas in September/October for newly attacked trees.

**LABOR, MATERIALS AND OTHER COST:**

<b>PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item):</b> Do not include contract personnel costs here (see contractor services below).	<b>COST / ITEM</b>
Conducted by USFS personnel.	
<b>TOTAL PERSONEL SERVICE COST</b>	
<b>EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item):</b> Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	
<b>TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST</b>	<b>\$</b>
<b>MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):</b>	
Verbenone, 40 pouches/acre @ 6 acres x 5 years @ \$8.00/pouch	\$9,600
<b>TOTAL MATERIALS AND SUPPLY COST</b>	<b>\$9,600</b>
<b>TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):</b>	

<b>TOTAL TRAVEL COST</b>	
<b>CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):</b>	
<b>TOTAL CONTRACT COST</b>	

**SPECIFICATION COST SUMMARY**

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
2010	7/15/2010	10/15/2010	F	acres	\$320	6	\$1,920
2011	7/15/2011	10/15/2011	F	acres	\$320	6	\$1,920
2012	7/15/2012	10/15/2012	F	acres	\$320	6	\$1,920
2013	7/15/2013	10/15/2013	F	acres	\$320	6	\$1,920
2014	7/15/2014	10/15/2014	F	acres	\$320	6	\$1,920
<b>TOTAL</b>							<b>\$9,600</b>

**Work Agent:** C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

**SOURCE OF COST ESTIMATE**

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	
3. Estimate supported by cost guides from independent sources or other federal agencies	E
4. Estimates based upon government wage rates and material cost.	P
5. No cost estimate required - cost charged to Fire Suppression Account	

**P** = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

**RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:**

See Forest Health Assessment Appendix 1 and See Appendix IV, Beetle Risk Map.
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**PART C - INDIVIDUAL TREATMENT SPECIFICATION**

<b>TREATMENT/ACTIVITY NAME</b>	Mark & Remove Trees within Hardwood Areas	<b>Spec-#</b>	11
<b>FISCAL YEAR(S)</b>	2010-2014	<b>Spec Cost</b>	\$220,800

**WORK TO BE DONE** (describe or attach exact specifications of work to be done):

<p><b>A. General Description:</b> Hardwood enhancement involves removing all pine trees where there are trees or regenerating stands of any hardwood species.</p> <p><b>B. Location/(Suitable) Sites:</b> Treatment will be used across the entire Memorial, wherever a stand of hardwood tree species exist.</p> <p><b>C. Design/Construction Specifications:</b></p> <ol style="list-style-type: none"> <li>All forested areas on the Memorial will be considered for treatments. Hardwood stands would be inventoried and located using GPS and mapped with GIS.</li> <li>Treatments will consist of removing all pine trees that are intermixed within stands of hardwood species.</li> <li>Hardwood areas are those that have mature hardwood trees and smaller regenerating hardwood trees. Pine trees removed can be cut and scattered or chipped on site or removed from site depending on the number of trees involved and accessibility. Consideration should be given to leave the uninfected wood on the ground, if it does not contribute to abnormal fuel loading, so that it can provide wildlife habitat and nutrients back into the soil.</li> <li>A 50 foot buffer from the edge of where hardwoods are located can be included to provide for further expansion of hardwood acreage.</li> <li>Cutting and removal should be done by mid April each year.</li> </ol> <p><b>D. Purpose of Treatment Specifications (relate to damage/change caused by fire):</b> The overall purpose of enhancing hardwood stands is to provide a greater level of forest diversity and reduce susceptibility to bark beetles.</p> <p><b>E. Treatment consistent with Agency Land Management Plan (identify which plan):</b> Treatment is consistent with NPS Management Guidelines.</p> <p><b>F. Treatment Effectiveness Monitoring Proposed:</b> Post treatment inspection of remaining hardwood stands. Yearly monitoring, for 5 years, for hardwood regeneration.</p>
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**LABOR, MATERIALS AND OTHER COST:**

<b>PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item):</b> Do not include contract personnel costs here (see contractor services below).	<b>COST / ITEM</b>
NPS, 6 person crew (GS-5), \$3180/week x 10 weeks/year x 5 FYs	\$159,000
1 GIS (GS-7), \$680/week x 2 weeks/year x 5 FYs	6,800
<b>TOTAL PERSONEL SERVICE COST</b>	<b>\$165,800</b>
<b>EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item):</b> Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	
Chainsaws	5,000
Chipper	20,000
<b>TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST</b>	<b>\$25,000</b>
<b>MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):</b>	
.	
<b>TOTAL MATERIALS AND SUPPLY COST</b>	<b>\$</b>
<b>TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):</b>	

2 GSA 4x4 vehicles \$6,000/year x 5 FYs	\$30,000
<b>TOTAL TRAVEL COST</b>	<b>\$30,000</b>
<b>CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):</b>	
<b>TOTAL CONTRACT COST</b>	

**SPECIFICATION COST SUMMARY**

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
2010	10/15/2010	4/15/2011	F	acres	\$2,208	20	\$44,160
2011	10/15/2011	4/15/2012	F	acres	\$2,208	20	\$44,160
2012	10/15/2012	4/15/2013	F	acres	\$2,208	20	\$44,160
2013	10/15/2013	4/15/2014	F	acres	\$2,208	20	\$44,160
2014	10/15/2014	4/15/2015	F	acres	\$2,208	20	\$44,160
<b>TOTAL</b>							<b>\$220,800</b>

**Work Agent:** C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

**SOURCE OF COST ESTIMATE**

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	
3. Estimate supported by cost guides from independent sources or other federal agencies	C
4. Estimates based upon government wage rates and material cost.	P
5. No cost estimate required - cost charged to Fire Suppression Account	

**P** = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

**RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:**

See Forest Health Assessment Appendix 1.
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**PART C - INDIVIDUAL TREATMENT SPECIFICATION**

<b>TREATMENT/ACTIVITY NAME</b>	Mark & Remove Infested Trees-Lop and Scatter	<b>Spec-#</b>	12
<b>FISCAL YEAR(S)</b>	2010-2014	<b>Spec Cost</b>	\$529,200

**WORK TO BE DONE** (describe or attach exact specifications of work to be done):

<p><b>A. General Description:</b> Marking and removing infested trees would be accomplished in close proximity to developed areas within the park to protect high-value trees in developed areas of the park and other areas that are accessible by vehicle and the wood removed. Sanitation involves the removal of currently infested trees. In this option, the infested trees will be treated on site, either by cutting the bole into 2 foot lengths or chipping or piling and burning.</p> <p><b>B. Location/(Suitable) Sites:</b> All vehicle accessible areas within the Memorial in developed areas.</p> <p><b>C. Design/Construction Specifications:</b></p> <ol style="list-style-type: none"> <li>All infested trees within the developed areas of the Memorial will be treated.</li> <li>Green, infested trees will be identified yearly in September and October after beetle flight. Trees will be marked for removal and located using GPS and mapped into GIS.</li> <li>Infested trees will be treated in place by felling and then either bucking into 2 foot lengths, chipping the bole, or piling and burning. Treatment of infested trees should be done by June.</li> <li>Wood that is lopped and scattered, chipped, or burned on-site should not produce fuel loads that are unacceptable to fire hazard.</li> </ol> <p><b>D. Purpose of Treatment Specifications (relate to damage/change caused by fire):</b> To reduce local beetle populations on site and reduce spread of mountain pine beetle into adjacent areas.</p> <p><b>E. Treatment consistent with Agency Land Management Plan (identify which plan):</b> Treatment is consistent with NPS Management Guidelines and the Memorial's Fire Management Plan.</p> <p><b>F. Treatment Effectiveness Monitoring Proposed:</b> Visually inspect treated areas in September/October for newly attacked trees and spread from previous years treatment areas.</p>
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**LABOR, MATERIALS AND OTHER COST:**

<b>PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item):</b> Do not include contract personnel costs here (see contractor services below).	<b>COST / ITEM</b>
NPS, 6 person crew (GS-5), \$3180/week x 28 weeks/year x 5 FYs	\$445,200
NPS, GIS (GS-7), \$700/week x 4 weeks/year x 5 FYs	14,000
<b>TOTAL PERSONEL SERVICE COST</b>	<b>\$459,200</b>
<b>EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item):</b> Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	
Chainsaws	5,000
Chipper	20,000
<b>TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST</b>	<b>\$25,000</b>
<b>MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):</b>	
Marking paint/flagging/saw parts/computer supplies	\$5,000
<b>TOTAL MATERIALS AND SUPPLY COST</b>	<b>\$5,000</b>
<b>TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):</b>	
2 GSA 4x4 vehicle \$8,000/year x 5 FYs	\$40,000

<b>TOTAL TRAVEL COST</b>	<b>\$40,000</b>
<b>CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):</b>	
<b>TOTAL CONTRACT COST</b>	

**SPECIFICATION COST SUMMARY**

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
2010	9/15/2010	4/15/2010	F	acres	\$118	900	\$105,840
2011	9/15/2011	4/15/2011	F	acres	\$118	900	\$105,840
2012	9/15/2012	4/15/2012	F	acres	\$118	900	\$105,840
2013	9/15/2013	4/15/2013	F	acres	\$118	900	\$105,840
2014	9/15/2014	4/15/2014	F	acres	\$118	900	\$105,840
<b>TOTAL</b>							<b>\$529,200</b>

**Work Agent:** C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

**SOURCE OF COST ESTIMATE**

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	
3. Estimate supported by cost guides from independent sources or other federal agencies	C, E
4. Estimates based upon government wage rates and material cost.	P
5. No cost estimate required - cost charged to Fire Suppression Account	

**P** = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

**RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:**

See Forest Health Assessment Appendix 1 and See Appendix IV, Beetle Risk Map.
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**PART C - INDIVIDUAL TREATMENT SPECIFICATION**

<b>TREATMENT/ACTIVITY NAME</b>	Mark & Remove Infested Trees - Whole Tree Removal	<b>Spec-#</b>	13
<b>FISCAL YEAR(S)</b>	2010-2014	<b>Spec Cost</b>	\$505,700

**WORK TO BE DONE** (describe or attach exact specifications of work to be done):

<p><b>A. General Description:</b> Based on a thorough and systematic search of the Memorial this treatment will cut and remove individual beetle-infested trees to stop insect spread and prevent further mortality in the area. This treatment will remove currently infested trees. In this option, the infested trees will be removed from the site after they are cut.</p> <p><b>B. Location/(Suitable) Sites:</b> Treatment potential across the entire Memorial.</p> <p><b>C. Design/Construction Specifications:</b></p> <ol style="list-style-type: none"> <li>All infested trees outside the developed areas of the Memorial will be surveyed.</li> <li>Green, infested trees will be identified yearly in September and October after beetle flight. Trees will be marked for removal and located using GPS and mapped into GIS.</li> <li>Infested trees will be cut and removed from site. After removal the infested logs will be treated by milling for lumber or removed to a site that has no live host trees nearby. Treatment of infested trees should be done by mid June.</li> <li>Removal could be done through land based equipment in accessible areas or by helicopter in more remote areas.</li> <li>Project Manager to oversee treatment and act as COTR. See Project Manager Specification.</li> </ol> <p><b>D. Purpose of Treatment Specifications (relate to damage/change caused by fire):</b> To reduce local beetle populations on-site and reduce spread in adjacent areas.</p> <p><b>E. Treatment consistent with Agency Land Management Plan (identify which plan):</b> Treatment is consistent with NPS Management Guidelines.</p> <p><b>F. Treatment Effectiveness Monitoring Proposed:</b> Visually inspect treated areas in September/October for newly attacked trees and spread from previous years treatment areas and enter GPS location information into GIS.</p>
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**LABOR, MATERIALS AND OTHER COST:**

<b>PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item): Do not include contract personnel costs here (see contractor services below).</b>	<b>COST / ITEM</b>
NPS, 6 person crew (GS-5), \$3180 x 8 weeks/year x 5 FYs	\$127,200
NPS, GIS (GS-7), \$700/week x 1 week/year x 5 FYs	3,500
<b>TOTAL PERSONEL SERVICE COST</b>	<b>\$130,700</b>
<b>EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item): Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.</b>	
<b>TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST</b>	
<b>MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):</b>	
Marking paint/flagging, saw supplies, computer supplies	\$5,000
<b>TOTAL MATERIALS AND SUPPLY COST</b>	<b>\$5,000</b>
<b>TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):</b>	

<b>TOTAL TRAVEL COST</b>	
<b>CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):</b>	
Treatment of 50 acres/year @ \$1200/acre x 5 FYs (use of helicopter)	300,000
On-the-ground crew \$1000/day x 14 days x 5 FYs	70,000
<b>TOTAL CONTRACT COST</b>	<b>370,000</b>

**SPECIFICATION COST SUMMARY**

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
2010	9/15/2010	6/15/2011	F,S	acres	\$2023	50	\$101,140
2011	9/15/2011	6/15/2012	F,S	acres	\$2023	50	\$101,140
2012	9/15/2012	6/15/2013	F,S	acres	\$2023	50	\$101,140
2013	9/15/2013	6/15/2014	F,S	acres	\$2023	50	\$101,140
2014	9/15/2014	6/15/2015	F,S	acres	\$2023	50	\$101,140
<b>TOTAL</b>							<b>\$505,700</b>

**Work Agent:** C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

**SOURCE OF COST ESTIMATE**

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	
3. Estimate supported by cost guides from independent sources or other federal agencies	C, E, T
4. Estimates based upon government wage rates and material cost.	P
5. No cost estimate required - cost charged to Fire Suppression Account	

**P** = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

**RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:**

See Forest Health Assessment Appendix 1 and See Appendix IV, Beetle Risk Map.
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**PART C - INDIVIDUAL TREATMENT SPECIFICATION**

<b>TREATMENT/ACTIVITY NAME</b>	Monitor and Treat for Non-native Plants	<b>Spec-#</b>	14
<b>FISCAL YEAR(S)</b>	2010-2014	<b>Spec Cost</b>	\$254,000

**WORK TO BE DONE** (describe or attach exact specifications of work to be done):

<p><b>A. General Description:</b> The non-native plant monitoring and control specification outlines control of populations of non-native plants within and adjacent to treatment areas. Non-native plants will be treated immediately so that they do not have the opportunity to become established.</p> <p><b>B. Location/(Suitable) Sites:</b> Treatments will be used across the entire Memorial, wherever treatments occur.</p> <p><b>C. Design/Construction Specifications:</b></p> <ol style="list-style-type: none"> <li>All forested areas on the memorial will be monitored and treated for non-native plants wherever treatments have been conducted.</li> <li>Treatments will consist of inspecting areas that have been treated for invasive species.</li> <li>If invasive plant species are located, appropriate management will occur, which could include cultural, mechanical, physical, and chemical treatments.</li> <li>Non-native plant management should occur on a yearly basis to detect infestations while they are small.</li> </ol> <p><b>D. Purpose of Treatment Specifications (relate to damage/change caused by fire):</b> Reduce impacts from non-native plants.</p> <p><b>E. Treatment consistent with Agency Land Management Plan (identify which plan):</b> Treatment is consistent with NPS Management Guidelines.</p> <p><b>F. Treatment Effectiveness Monitoring Proposed:</b> Post treatment inspection of stands. Yearly monitoring and treatment where needed.</p>
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**LABOR, MATERIALS AND OTHER COST:**

<b>PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item):</b> Do not include contract personnel costs here (see contractor services below).	<b>COST / ITEM</b>
NPS, 6 person crew (GS-5), \$3180 x 10 weeks/year x 5 FYs	\$159,000
<b>TOTAL PERSONEL SERVICE COST</b>	<b>\$159,000</b>
<b>EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item):</b> Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	
Spray equipment for use in backcountry areas	10,000
<b>TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST</b>	<b>\$10,000</b>
<b>MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):</b>	
Herbicides (annual acquisition) \$4000/year x 5 FYs	20,000
<b>TOTAL MATERIALS AND SUPPLY COST</b>	<b>\$20,000</b>
<b>TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):</b>	
2 GSA 4x4 vehicle \$8,000/year x 5 FYs	\$40,000

<b>TOTAL TRAVEL COST</b>	<b>\$40,000</b>
<b>CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):</b>	
Annual spray treatment in accessible areas \$5000/year x 5 FYs	\$25,000
<b>TOTAL CONTRACT COST</b>	<b>\$25,000</b>

**SPECIFICATION COST SUMMARY**

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
2010	10/1/2010	4/15/2011	F	acres	\$508	100	\$50,800
2011	10/1/2011	4/15/2012	F	acres	\$508	100	\$50,800
2012	10/1/2012	4/15/2013	F	acres	\$508	100	\$50,800
2013	10/1/2013	4/15/2014	F	acres	\$508	100	\$50,800
2014	10/1/2014	4/15/2015	F	acres	\$508	100	\$50,800
<b>TOTAL</b>							<b>\$254,000</b>

**Work Agent:** C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

**SOURCE OF COST ESTIMATE**

1. Estimate obtained from 2-3 independent contractual sources.	
2. Documented cost figures from similar project work obtained from local agency sources.	
3. Estimate supported by cost guides from independent sources or other federal agencies	C, E, M
4. Estimates based upon government wage rates and material cost.	P
5. No cost estimate required - cost charged to Fire Suppression Account	

**P** = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

**RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:**

See Forest Health Assessment Appendix 1 and See Appendix IV, Beetle Risk Map.
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**PART C - INDIVIDUAL TREATMENT SPECIFICATION**

<b>TREATMENT/ACTIVITY NAME</b>	Monitor for Treatment Effectiveness & Forest Health Conditions	<b>Spec-#</b>	15
<b>FISCAL YEAR(S)</b>	2010-2025	<b>Spec Cost</b>	\$63,000

**WORK TO BE DONE** (describe or attach exact specifications of work to be done):

**A. General Description:** This treatment will provide for overall monitoring of treatments to be sure that they are effective and also to monitor the forest health conditions. Inventory of forest stand conditions across the Memorial at regular intervals.

**B. Location/(Suitable) Sites:** Entire Memorial, focusing on treatment sites and general forest health conditions.

**C. Design/Construction Specifications:**

1. A regularly scheduled monitoring across the Memorial landscape to get information on effectiveness of treatments and current forest health conditions.
2. Monitoring should be based on a tiered approach of aerial and ground acquired data.
3. Every 3 years obtain high resolution aerial photography or satellite imagery to delineate stand boundaries.
4. After analysis of aerial imagery, a systematic ground validation of stand conditions through a series of fixed plots should be installed.
5. Aerial and ground data should be summarized to provide a current vegetation condition report.
6. A compilation of all monitoring conducted for the various treatments will be completed on an annual basis and entered into a computer program and mapped into a GIS.
7. Conduct analysis of the treatment effectiveness to determine if treatment modifications need to be made.
8. An annual report will be developed on the treatment effectiveness and forest health conditions. This report should be made available to Memorial cooperators in this activity, division chiefs, and the superintendent.
9. Develop a presentation and scientific articles for delivery to a resource management conference.
10. Project Manager to provide oversight and act as COTR. See Project Manager Specification.

**D. Purpose of Treatment Specifications (relate to damage/change caused by fire):** Determine effectiveness of treatments on long term changes to forest conditions.

**E. Treatment consistent with Agency Land Management Plan (identify which plan):** The specification is consistent with plan.

**F. Treatment Effectiveness Monitoring Proposed:** This will be used to monitor the current forest conditions on the Memorial.

**LABOR, MATERIALS AND OTHER COST:**

<b>PERSONNEL SERVICES: (Grade @ Cost/Hours X # Hours X # Fiscal Years = Cost/Item):</b> Do not include contract personnel costs here (see contractor services below).	<b>COST / ITEM</b>
<b>TOTAL PERSONEL SERVICE COST</b>	
<b>EQUIPMENT PURCHASE, LEASE AND/OR RENT (Item @ Cost/Hour X # of Hours X #Fiscal Years = Cost/Item):</b> Note: Purchases require written justification that demonstrates cost benefits over leasing or renting.	
<b>TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST</b>	
<b>MATERIALS AND SUPPLIES (Item @ Cost/Each X Quantity X #Fiscal Years = Cost/Item):</b>	
<b>TOTAL MATERIALS AND SUPPLY COST</b>	
<b>TRAVEL COST (Personnel or Equipment @ Rate X Round Trips X #Fiscal Years = Cost/Item):</b>	



# Mount Rushmore National Memorial Mountain Pine Beetle Resources Assessment & Action Plan

## APPENDIX I RESOURCE ASSESSMENTS

- FOREST HEALTH
- CULTURAL RESOURCES
- FIRE MANAGEMENT
- COMPLIANCE
- EDUCATION AND OUTREACH

Slash pile burning (NPS file photo)



Mount Rushmore during construction (NPS file photo)



Mount Rushmore landscape (Peter Brown)

**MOUNT RUSHMORE NATIONAL MEMORIAL  
MOUNTAIN PINE BEETLE  
RESOURCE ASSESSMENT AND ACTION PLAN**

**FOREST HEALTH ASSESSMENT**

**I. OBJECTIVES**

- Evaluate and assess Mountain Pine Beetle (MPB) impacts to forests of Mount Rushmore National Memorial (Memorial).
- Determine the strategy and tactics necessary to lessen the impacts of MPB.
- Evaluate the potential for noxious/non-native plant invasion into native plant communities within the Memorial as a result of treatment activities.
- Develop both short and long-term treatment strategies for MPB.
- Provide for long-term sustained healthy forest ecosystems.

**II. ISSUES**

- Saving trees in developed areas, especially cultural trees and old growth forest from MPB.
- Provide for visitor safety as a result of treatment activities and from hazard trees.
- Prevent noxious/non-native plant invasion.
- Prioritize treatment prescriptions and methods.
- Coordinate treatment actions within the Memorial, with surrounding agencies, and neighbors.
- Minimize fire danger to visitors and neighboring communities.
- Protect dependent wildlife species and habitats.

**III. OBSERVATIONS**

**A. Background**

The purpose of this assessment is to address the potential impacts of the mountain pine beetle and the strategy and tactics necessary to minimize their impact to the forested landscape of the Memorial.

The mountain pine beetle (*Dendroctonus ponderosae*) is the number one insect killer of pine trees throughout the western United States. The mountain pine beetle (MPB) is native to the forests of western North America and to the Black Hills region of South Dakota and attacks most pine species including ponderosa pine in the Black Hills.

MPBs develop under the bark of pines, particularly ponderosa, lodgepole, Scotch, and limber. Adult flight typically occurs in July and August, with the peak flight around the first week of August. During this flight, adult beetles leave previously infested trees and attack new large-diameter host trees. However, under epidemic or outbreak conditions, small diameter trees may also be infested. The adults attack green trees, chew through the bark and construct galleries, along which eggs are laid. Larvae hatch from the eggs and begin feeding on the phloem of the tree in late summer to early fall. Larvae, pupae or callow adults overwinter under the bark of the infested tree. In the spring, the beetle finishes its maturation process under the bark of the tree.

Populations of mountain pine beetle are typically found at an endemic level, killing and reproducing in stressed or weakened trees, including lightning struck and root diseased trees. At times, beetle populations increase dramatically. In the increasing and outbreak stages, any host trees, healthy or stressed, are attacked and often killed.

Mountain pine beetle are native to the Black Hills forest ecosystem, with outbreaks occurring periodically. The first recorded outbreak in the Black Hills occurred from the late 1890's through the early 1900's and killed an estimated 1-2 billion board feet of timber. Outbreaks also have occurred in the 1930's, 1940's, 1960's and 1970's, each lasting 8-13 years with the 1970's outbreak being larger and causing more mortality than any of the others, except for the turn of the century outbreak.

In the mid 1990's, beetle-caused mortality was at low, endemic levels across the forest. Starting in the late 1990's large beetle epidemics started and over the past 10 years there have been outbreaks in Beaver Park in the northern Hills and a large outbreak occurring in the central Hills from Deerfield Reservoir down to Bear Mountain and east to the Black Elk Wilderness. The outbreak in the central Hills is one that is causing landscape level changes in the forest. The first significant signs of beetle mortality started occurring in Black Elk Wilderness in about 2003, and have continued to grow since then.

Outbreaks of the beetle can cause considerable changes in forested stands, including a reduction in average stand diameter and stand density. Tree mortality levels of 25% can be expected throughout the landscape surrounding outbreak areas and levels of up to 50% or more can occur in heavily attacked stands. Outbreaks can conflict with land management objectives: they reduce tree density, affect wildlife habitat, increase short-term fire risks, and can negatively affect visual and recreation values (Allen and Long, 2008).

Signs and symptoms of MPB attack include:

- Popcorn-shaped masses of resin, called "pitch tubes," on the trunk where beetle tunnelling begins. Pitch tubes may be brown, pink, or white;
- Boring dust in bark crevices and on the ground immediately adjacent to the tree base;
- Evidence of woodpecker feeding on the trunk. Patches of bark are removed and bark flakes lie on the ground or snow below the tree;
- Foliage turning yellowish to reddish throughout the entire tree crown. This usually occurs eight to 10 months after a successful MPB attack;
- Presence of live MPB (eggs, larvae, pupae and/or adults) as well as galleries under bark. This is the most certain indicator of infestation;
- Blue-stained sapwood is present.

Ponderosa pine stands in the Black Hills differ in their susceptibility to the mountain pine beetle. Generally stands are considered to be most susceptible when 75% of the stand is in the 7-13 inch diameter range and the stand density is over 120 square feet of basal area per acre. It should be noted that these are general hazard rating guidelines and most stand inventory data are based on stand averages; small pockets that have high stocking levels within a low density stand can provide a focal point for beetle build-up. Stand hazard ratings give an indication of which stands are most likely to have initial beetle infestations. Once an outbreak has started, any stands containing suitable host material are likely to have damage. These ratings also give no indication of local beetle pressure. However, hazard ratings can help to prioritize what stands can be treated to minimize beetle susceptibility. It also points out that the best approach to reducing losses to the mountain pine beetle for the long-term is forest management to reduce stocking densities. Decreases in stocking densities will lower the probability that beetle outbreaks will be initiated, but it is a continual process to keep stands at a lower hazard. Recent work has shown that areas treated to 60 ft<sup>2</sup>/acre basal area can be expected to reach high hazard (120 basal area) again in about 25-50 years. Stands treated to 80 ft<sup>2</sup>/acre basal area can reach 120 ft<sup>2</sup>/acre basal area in 13-36 years, and stands treated to only 100 ft<sup>2</sup>/acre basal area will be back to 120 basal area in 9-16 years.

Generally, when beetle populations reach outbreak proportions, natural enemies, such as birds and predaceous or parasitic insects, are not numerous enough to have a noticeable effect on the outbreak. Natural enemies are more important in limiting mountain pine beetle populations that are in the endemic phase. Likewise, environmental factors cannot be counted on to mitigate the outbreak. For example, temperatures of -10° F can kill beetles in October but temperatures of -25° are needed by February.

These temperatures need to be reached under the bark, in the phloem, as opposed to air temperatures. Beetles survive low temperatures by removing water from within their cells and replacing it with glycoproteins, which act as a type of anti-freeze. This is a process known as cold hardening. Beetles have supercooling points, the temperature at which ice crystals start to form in body tissues, as low as -32° F in January. Phloem temperatures become equal to air temperatures only when they persist for 24 hours or more. Generally, phloem temperatures are found to be 5 to 10° F warmer than air temperature.

## **1. Mountain Pine Beetle Current Conditions**

There is currently a landscape level mountain pine beetle epidemic occurring in the central Black Hills. The most active area of population growth and most concentrated tree mortality in the past 3 years has been in and around the Black Elk Wilderness. The wilderness borders the west and south sides of the Memorial. Most of the mortality in the wilderness to date has occurred in the south and west portions of the wilderness. Tree mortality has reached close to 100% in much of the affected area and the beetles have begun attacking small diameter trees (3-4") and non-host trees such as spruce as the preferred host supply has been depleted. The area north and east of Harney Peak was only lightly infested in 2008, but in the summer of 2009, there was considerable tree mortality beginning to occur in the Elkhorn Ridge, Upper Pine Creek area, and the ridges above Horsethief Lake. See Appendix IV, Mountain Pine Beetle progression map which shows beetle activity, based on aerial surveys, over the past 4 years in the Norbeck/Mount Rushmore area.

Ground surveys in the fall of 2009 in the northeast part of the wilderness (roughly from Willow Creek/Palmer Gulch KOA to Iron Mountain Picnic Ground and points north and east) were done to assess the conditions that were present. In this area there were about 10 trees per acre killed over the past 3 years (trees currently infested in '09, 1 year old dead trees killed in '08 and 2 year old dead trees killed in '07). Of these, 83% were currently infested, 13% were 1 year old dead trees, and 4% were 2 year old dead trees. Already roughly 10% of the trees per acre have been killed over the past 3 years. This affirms the picture that this area at lower elevations on the northeast side of Harney Peak has not had much activity until the past year or 2 and that the beetles are rapidly moving into the area. The increase in currently infested trees compared to those killed in 2008 indicates a 4 times increase in newly attacked trees to those attacked the previous years in this part of the wilderness. There are typical spots of 20-50 green attacked trees showing up in this area, with very few previously killed red trees, again indicating that the beetles are rapidly moving into this area from upslope.

The stand conditions throughout the entire wilderness and most of the natural forest of the Memorial are highly susceptible to continued beetle mortality and expansion. This is the case in the northeast part of the wilderness where average stand diameters are about 14.5 inches DBH and stand densities average around 130 ft<sup>2</sup> per acre of basal area. With stands that are high hazard such as this and the large resident mountain pine beetle population this creates an area of high risk.

### **Mountain Pine Beetle Hazard**

Stands of ponderosa pine can be hazard rated for initiation and sustaining beetle epidemics based on stand conditions. Stands that have an average diameter of over 7 inches are rated as being high or low hazard based on stand density. Beetle risk is an indication of whether there are beetles in the area that could infest stands. Overall, stand hazard is high and beetle risk is high for the Memorial creating a high likelihood of significant beetle infestation over the next 3-5 years. Appendix IV shows the map of estimated beetle hazard for the stands at the Memorial. There is only one stand that is rated as low hazard based on its basal area. It is in the rocky area at the very northern edge of the park. This map, (See Appendix IV, Pine Beetle Infestation), also indicates a very conservative rate of beetle infestation spread over the next 2 years. The rate of spread is estimated at 300 feet per year based on currently mapped beetle locations. This does not take into consideration longer range dispersal of new beetle-infested trees in this time frame, which is likely to occur.

## 2. Vegetation Communities

The flora of the Memorial includes 425 species of vascular plants in eight vegetation associations (Natural Resource Condition Assessment of MORU, 2009), see Vegetation Classes/Land Use Map, Appendix IV. Ponderosa pine (*Pinus ponderosa*) forest is the dominant vegetation type in the Memorial and throughout the Black Hills (NRCA). It is found from low to high elevations and in all soil types. This forest type was shaped by small-scale, patch-replacing fires and by low-intensity ground fires, both of which have been suppressed since the late 1880s. The most common understory shrub of the ponderosa pine forest in the Memorial is common juniper (*Juniperus communis*), followed by snowberry (*Symphoricarpos occidentalis*), currant (*Ribes* spp.), and chokecherry (*Prunus virginiana*). The herbaceous layer consists of Kentucky bluegrass (*Poa pratensis*), sedges (*Carex* spp.), Junegrass (*Koeleria macrantha*), rough-leaved ricegrass (*Oryzopsis asperifolia*), bluejoint reedgrass (*Calamagrostis canadensis*), poison ivy (*Toxicodendron radicans*), bearberry (*Arctostaphylos uva-ursi*), harebell (*Campanula rotundifolia*), timothy (*Phleum pratense*), and pinedrops (*Pterospora andromedea*) (National Park Service 2003).

Quaking aspen (*Populus tremuloides*) is an important component of the vegetative cover of the Memorial and region, occurring mostly along streams in cool, moist sites. Aspen is the first tree to regenerate after fire, but the lack of this disturbance is causing existing stands to be lost to pine encroachment. White spruce (*Picea glauca*) and bur oak (*Quercus macrocarpa*) also occur in the Memorial. Bur oak is typically found in the stringer bottoms and in lowland riparian plant communities with other deciduous trees or as a shrub under ponderosa pine stands. White spruce is found at high elevations and in cooler drainage bottoms (NRCA, 2009).

At medium to high elevations in the Black Hills, a dense shrub zone occurs along streams and around the edge of wet meadows and beaver dams. The vegetation consists of a mixture of several willow species, including *Salix bebbiana*, *Salix lutea*, and *Salix interior*. Shrubs include red osier dogwood (*Cornus stolonifera*), wild rose (*Rosa* spp.), raspberry (*Rubus* spp.), and currant (*Ribes* spp.). The wet meadows are dominated by several species of sedge, including *Carex aurea* and *Carex rostrata*. In better drained meadows, grasses such as tufted hairgrass (*Deschampsia caespitosa*) and northern reed grass (*Calamagrostis inexpectata*) also occur along with many wildflowers, particularly asters (*Aster* spp.) and sunflowers (*Helianthus* spp.). Most of these plant communities have been disturbed by clearing, burning, and spraying. In the Memorial, relatively intact but small (<0.1 ha) wet meadows are found along the creeks, especially Beaver Dam Creek in Starling Basin (NRCA, 2009).

In the Black Hills a ponderosa pine forest is the climax forest community. A climax community is the final stage of biotic succession attainable by a plant community. If there is a disturbance in the ponderosa community, forest succession will start again from an earlier stage. A blow down or mountain pine beetle infestation in an area can cause a break in the ponderosa climax community. In this newly opened area other species of trees and plants will start to grow. Grasses, shrubs and quaking aspen are introductory species. They are the first plant species to colonize a disturbed area. The quaking aspen is a short-lived tree. Individual trees may only live 30 to 50 years before they decline. The aspens will continue to reproduce until the ponderosas begin to reseed. The aspen seedlings can not tolerate the shade created by the ponderosas. Soon the ponderosas take over the area and a climax forest is developed again and will maintain until the next major disturbance.

## 3. Non-native Plants

It is unknown as to the extent or distribution of non-native plants within the Memorial. However, non-native plants do exist within the Memorial. Musk thistle (*Carduus nutans*), Canada thistle (*Cirsium arvense*), St. Johnswort (*Hypericum perforatum*), and yellow toadflax (*Linaria vulgaris*) have been found in the Memorial. In addition, disturbed lands will see the short-term invasion of invasive plants i.e., houndstongue (*Cynoglossum officinale*), Canada thistle (*Cirsium arvense*), and mullein (*Verbascum thapsus*).

## 4. Threatened & Endangered and Sensitive Flora and Fauna

According to the U.S. Fish and Wildlife Service website for South Dakota, Pennington County, there are no threatened or endangered plant species listed in the county. In addition, no federally endangered or

threatened or state-listed plant is known to occur in the Memorial. However, one plant, Selkirk's violet (*Viola selkirkii*), is listed by the Black Hills National Forest as sensitive and does occur in the Memorial (NRCA, 2009). Two vegetation associations, bur oak/ironwood forest and paper birch/beaked hazelnut, occur in the Memorial but are considered rare in the Black Hills (NRCA, 2009).

Also, according to the website, there are three species listed as endangered or proposed for listing within the county. They are: Whooping Crane (*Grus Americana*) and Least Tern (*Sterna antillarum*) both listed as endangered and Black-footed Ferret (*Mustela nigripes*) listed as proposed. However, no federally endangered or threatened or state-listed fauna is known to occur in the Memorial.

## **B. Findings**

Mountain pine beetle is at epidemic proportions in the Norbeck Wildlife Preserve. Significant changes on the landscape have already occurred and these changes will continue to occur into the future. In ponderosa pine in the Black Hills, it was estimated that around 80% of susceptible trees had been killed in portions of the Bear Mountain area in the late 1980's and early 1990's and 100% of susceptible trees had been killed in some stands in the Beaver Park area in the late 1990's through 2000. The final totals for mortality in the Norbeck Wildlife Preserve have already equaled or surpassed the 50% level in moderate or high risk stands, some reaching 100% mortality, and the mortality is still growing and expanding.

There is a growing mountain pine beetle outbreak occurring in areas surrounding Mount Rushmore National Memorial. At the present time, infested trees have been identified within the Memorial. However, rapidly increasing populations are now very close, at the edge of the Memorial boundary within the Black Elk Wilderness and the Norbeck Wildlife Preserve. It appears that increased mortality in the Memorial is imminent and that starting in the summer of 2010 tree mortality could start rising dramatically within the Memorial. The beetle outbreak is no longer over the ridge or up the hill, but is on the doorstep.

The mountain pine beetle does play an important regulatory role in fire ecology. In the first few years after an outbreak, the dead needles provide a highly combustible source of fine fuels. The stand conditions resulting from beetle mortality probably won't sustain crown fire. Then, as the killed trees begin to fall, the accumulated dead vegetation provides the high fuel load required to carry stand-replacing fire. Finally, as the downed trees decay and rot, they provide a source of ignition for lightning strikes. Once ignited, decaying logs are capable of smoldering for weeks or even months, waiting the time when prevailing conditions (hot, windy, and dry) are conducive for expansion into a full-blown forest fire.

The only effective long-range strategy to minimize beetle-caused mortality is promoting forest health over large landscapes and monitoring for areas of beetle build-up. Treating large landscapes does not mean every stand needs to be treated. Denser stands can be left for other objectives and should be afforded some protection from beetles if the surrounding area has been treated to reduce stand density and beetle hazard. Denser stands will require more intense monitoring, as they are still more susceptible to beetles. If beetles are found in these stands, then there should be a contingency plan guiding whether they will be treated or not. Creating diverse stand conditions across the landscape will result in an overall forest that is less susceptible long-term to landscape level beetle events.

A sustained cold spell during the winter can kill pine beetles and may signal the end of an infestation. If temperatures below zero degrees Fahrenheit have been sustained over a period of several days during the winter, several trees should be checked the following spring to determine if they contain live bark beetles. If the mountain pine beetles have succumbed to the weather, infested trees need not be removed.

### **Tree Hazards**

As a result of trees being killed by mountain pine beetle these trees will become hazardous if they are in proximity of developed areas, roads, and trails. There is no time frame as to when trees killed by MPB will fail. The tree is weakened and the root systems will fail in wind storms. Tree hazards are defined to

be trees that are structurally unsound such that they may fail at any time in the next year and poses a threat to public safety or property should a failure occur. Identified tree hazards will be marked with flagging or other means and felled to minimize threats to the public. Priority areas for tree hazard survey and removal include all developed areas within the Memorial that have trees killed by mountain pine beetle.

#### **Non-native Plants**

As a result of soil disturbance there will be the opportunity for non-native plants to invade and/or spread within the Memorial. It is not known as to the extent or distribution of non-native plants currently within the Memorial, but disturbed lands will see the short-term invasion of non-native plants i.e., houndstongue (*Cynoglossum officinale*), Canada thistle (*Cirsium arvense*), and mullein (*Verbascum thapsus*).

### **IV. RECOMMENDATIONS**

#### **Beetle Management Strategies**

Mount Rushmore National Memorial proposes a proactive approach in managing bark beetles within the Memorial. There are a number of actions that can be used to reduce the impacts of mountain pine beetle. These actions fall into three categories: prevention, control, and monitoring. Prevention is an indirect action that addresses general forest health and also protects trees from attack that are considered to be high-value. Control is a direct action that deals with the symptoms, too many beetles, and is aimed at directly reducing the number of beetles present. Monitoring is an action that reveals the effectiveness of either direct or indirect actions.

There are a variety of treatments that the Memorial can prioritize and implement beginning this spring. Use of preventative sprays to protect high-value trees in the developed areas of the park infrastructure, along the Presidential Trail, and along Highway 244 should be considered as a high priority. Many of the trees in the developed areas are large diameter and will be very attractive to beetles. Mortality of these trees in the developed areas would cause a significant change in the feel visitors have when at the Memorial. As this is the beginning stages of the outbreak reaching the Memorial, it is likely that any trees to be protected with insecticide would have to be sprayed every year for the next 4-5 years until the beetle outbreak has passed. Preventative sprays are a high priority, it should be started prior to beetle flight (April-June) in 2010. Trees sprayed should be marked with metal tags and mapped with GIS using GPS locations.

In addition to protecting high value areas, the Memorial should continue its ongoing thinning practice of hazard fuel reduction. Infested trees have been felled and bucked the past few years as they have been located. This has certainly helped reduce the number of beetles coming out of the trees within the Memorial itself but it has not reduced the risk. This task is going to get much larger and harder to accomplish as beetle mortality increases in the coming years.

The use of thinning alone is not going to be effective in preventing beetles from infesting stands of pine. Treatments to promote a healthy forest are a highly recommended alternative for managing mountain pine beetle. Forest management, changing the condition of the forest, is the only way to minimize extensive losses to the beetle over long periods of time. These include maintaining a diversity of age classes, diversity of species where possible, and reducing basal area. Thinning of stands should proceed prior to beetle infestations, where possible. As pointed out above, the stand density may need to be reduced significantly to minimize beetle mortality considering the high level of beetle activity.

The use of pheromones is somewhat problematic. With the large beetle population nearby, it is not recommended to use the tree baiting method. Beetles are already moving into the Memorial and baiting will increase that. Also, with a relatively small amount of area to work with, finding areas that would be used as sacrifice areas where the trees are baited and thereby intentionally killed would be difficult. The use of lures and traps has not been shown to be an effective technique for significantly reducing beetle caused mortality. Traps that are hung on or near host trees will cause a spill-over attack and those

nearby hosts will become infested by beetles drawn to the traps, creating a similar situation as with the tree baits. The use of verbenone is not generally recommended. Past trials of verbenone with mountain pine beetle/ponderosa pine in the Black Hills have shown that it is ineffective in reducing beetle attacks. Since those trials, there have been improvements in the way verbenone is packaged and it is now used at a higher dose. Whether these differences would cause it to be more effective is questionable. While it is not recommended to use verbenone as a protective measure, because of the change in dose, an experimental use can be tried to test its current effectiveness.

This plan provides the Memorial the necessary response to the escalating mountain pine beetle epidemic in cooperation with its neighbors by providing for visitor safety, minimizing fire danger to visitors and neighboring communities, protecting dependent wildlife species and habitats, and providing for long-term sustained healthy forest ecosystems.

## **A. Prevention**

### **1. Preventative Spray – In Developed Areas**

This treatment is preventative only and will help protect high-value trees. Identify all non-infested, high-value trees within the developed areas of the park and along park roads and trails. These include historic and/or scientifically/culturally significant trees or stands of trees; trees that have high aesthetic importance in the visual aspect, or are deemed important within the context of the Memorial sculpture.

Spray these non-infested, high-value, potential brood trees with carbaryl as soon as snow is gone and before MPBs fly, generally from April to the end of June for the Memorial area. The trees sprayed should be marked with metal tags and located with GPS and mapped in GIS. Each year following the first spraying the tree should again be sprayed until the epidemic has passed. Carbaryl is generally considered to be the product of choice for controlling MPBs and has a very high efficacy (but not 100%) against mountain pine beetle. Trees in this category should be sprayed on their trunks and as high into the upper reaches until the tree reaches 6" in diameter. The spraying activity will be conducted from the ground using truck or ATV-mounted tank units. Safety is a primary objective of this treatment and care should be taken when moving into more rugged terrain. The effective range of one of these units is typically no more than 150 feet using hose.

Other insecticide options include the use of pyrethroids, such as "Astro," or a biphenthrin product, such as "Onyx." However, carbaryl is the most commonly used and effective insecticide.

This treatment would also include monitoring for treatment effectiveness as well as groundwater and water quality.

### **2. Mark and Remove Trees within Hardwood Areas**

The purpose of this treatment is to remove pines from hardwood stands to provide a greater level of forest diversity and reduce susceptibility to mountain pine beetle. Trees identified for removal can be cut and scattered or chipped on-site or removed from the site depending on the number of trees involved and accessibility. It would be best if this was done prior to beetle infestation so that there are more options available for the disposal of the wood. Consideration should be given to leave the uninfested wood on the ground, if it does not contribute to abnormal fuel loading, so that it can provide wildlife habitat and nutrients back into the soil.

### **3. Thin Forest at a Variable Density**

This thinning would substantially open the forest allowing the remaining trees open to more sun and nutrients thereby providing for a mosaic of forest stands making for a more sustainable and healthy forest which will be more insect and fire resistant. This thinning is done to trees that are not currently infested with mountain pine beetle. Selectively removing trees to increase the vigor of the remaining trees and their ability to withstand mountain pine beetle attacks also promotes the goal of a healthy forest. Thinning would occur in conjunction with and ancillary to hazard fuel

reduction projects. The sap from freshly-cut ponderosa pine trees contains turpentine, which can attract mountain pine beetles. The slash piles themselves can become infested, which can lead to the spread of mountain pine beetles. For this reason, tree thinning should occur when trees are driest (August through December). To prevent the spread of mature beetles, burning must occur before the beetles fly, usually in early July. If the cut wood has not dried sufficiently then the logs should be laid flat on the ground or removed. Fuels reduction projects are not specifically designed to address mountain pine beetle management, but can help to reduce the spread of beetles. Within developed areas of the Memorial, thinning should remove trees that are 6" diameter and smaller depending on aesthetics, fuel loads, and viewsheds.

#### Mountain Pine Beetle and Fire Buffer

As a part of this treatment specification it is recommended that a buffer be developed along the boundary of the Memorial and the Black Elk Wilderness. This buffer would consist of a 300' thinning buffer along the Memorial boundary on the west and south sides. The thinning would follow forest health practices and be thinned to a 40-60 basal area density. This buffer would be a preventative against mountain pine beetle attack and it would also be a benefit as a fire buffer.

### **B. Control**

The treatment specifications listed below are those activities that will directly manage infested mountain pine beetle trees. The treatments essentially cut down infested trees and then either remove them from the area to a safe place or buck the tree up into firewood lengths to facilitate the drying of the tree thereby killing the beetles. The best method to kill the beetles is to remove the bark to expose the beetle to the sun and drying the wood. Once cut the tree should be removed or if left in place then the wood should be burned or the bark removed before beetle flight in early July.

#### **1. Mark and Remove Infested Trees – Lop & Scatter**

Based on a thorough and systematic search of the Memorial this treatment will cut and remove individual beetle-infested trees to stop insect spread and prevent further mortality in the area. Beetles can bore into a tree just above the soil line, so trees must be cut flush with the ground whenever possible. This technique will be used in close proximity to developed areas within the park to protect high-value trees in developed areas of the park and other areas that are accessible by vehicle and the wood removed. This technique would not ordinarily be used in fuels management areas, but can be employed when the extent of the infestation, proximity to developed areas, tree density and other factors warrant. In more inaccessible areas this technique would be used when live insects are present, and therefore tree felling, lopping and scattering, chipping, burning, or stripping the bark can be used if the cut wood is left on-site.

Trees marked for removal should be located using GPS and mapped in GIS. Tree parts left for burning should also be mapped using GPS.

It is necessary in order to mark infested trees for removal that mountain pine beetle infestations be recognizable. Here are the signs to look for if a tree is infested:

Trees larger than 8 inches DBH should be carefully evaluated. The mountain pine beetle begins attacking most pine species on the lower 30 feet of the trunk. There are several signs to look for when surveying trees to determine if they are infested with live mountain pine beetles.

- **Pitch Tubes** – When trees are not under stress, they will generally respond to a beetle attack by producing moderate to copious amounts of resin or pitch which flows out of the bark from the entrance holes produced by attacking beetles. Attacking beetles are often able to work their way through the pitch and to successfully attack the tree. Evidence of a successful attack is often a hole (or tube) that passes through the pitch to the tree. Pines under stress or suffering from drought may produce no pitch at all. Pitch tubes should not be used as a sole indicator of an infested tree.

Upon careful examination, pitch tubes may reveal the presence of adult beetles, which indicate that the tree was able to dispel at least some of the attackers. Depending on the health of the tree and number of attacking beetles, a tree may be successful in warding off an attack. A tree can be attacked over several years and still be successful in warding off these multiple attacks. This can be seen in different ages of pitch tubes. If there are a large number of fresh pitch tubes on the trunk of a tree there is a high probability that the tree will die from the attack.

If pitch tubes are hard to the touch and crumble when crushed in the hand, the tree has not been recently attacked. If the tree's foliage is still green in early summer, then the attack may have been unsuccessful (i.e., the beetles failed to kill the tree), particularly if the pitch tubes are hardened.

- **Boring dust (frass)** – Frass in bark crevices and around the base of a tree is often the sign of a bark beetle attack. A large amount of frass is an indication of a successful attack. However, frass does not necessarily mean the tree contains live bark beetles, and other symptoms should be checked to verify if live bark beetles exist. Also, frass can be created by other species of beetles. Trees that contain other species of beetles should not be removed.
- **Holes in the bark of the tree** – Adult beetles entering a tree will bore a hole through the bark to reach the phloem. These holes are typically located in cracks and crevasses between bark plates where the bark is thinnest. In healthy trees, these holes will usually include pitch tubes.

Adult beetles feed within the tree before they emerge; when several feeding chambers coalesce, adults occur in groups under the bark. One or more beetles will then make an exit hole from which several adults will emerge. Exit holes are about 3/32 inch in diameter, they do not exude pitch and can occur anywhere on the trunk of the tree. Holes located on the bark surface and not between bark plates are almost always exit holes. The presence of exit holes is a sign that the adult beetles have left the tree and the tree may no longer be infested.

- **Foliage** - A healthy tree will have dark green needles whereas a tree that is dying will have light green to yellow needles. In late spring or early summer, trees with pitch tubes, boring dust and yellowing needles are usually infested and contain live beetles. Trees with brown needles and no green foliage may no longer contain live beetles. Further evaluation, such as debarking a small part of the tree, will verify if there are live beetles.
- **Debarking** - If there is still uncertainty if a tree contains live bark beetles, a hatchet, machete or drawknife can be used to remove a piece of bark to check for eggs, larvae, pupae and/or adults in the phloem layer of the tree and also look for the blue stain indicating the tree is infected with blue stain fungus and will die.
- **Blue Stain** – An associate of pine bark beetles is a fungal microorganism better known as "blue stain." During colonization, female beetles tunnel throughout the phloem tissue of the tree where they lay their eggs. As carriers of blue stain, the beetles induce thousands of low dosage fungal inoculations over a large portion of the tree bole allowing the fungus to become well established throughout the phloem before invading the sapwood (xylem). Sapwood occlusion by the blue stain fungus contributes to the quick death of beetle-attacked trees. Trees containing blue stain fungus will usually die within one year of being infected.

The presence of eggs, larvae, pupae and/or adults and blue stain fungus under the bark are definite signs that a tree has been successfully attacked by bark beetles and will not

survive. The presence of blue stain fungus alone does not warrant the removal of a tree, as the beetles may have already emerged.

## **2. Mark and Remove Infested Trees – Whole Tree Removal**

This treatment involves the removal of the infested whole tree. The reason for removing the whole tree is because the cutting and subsequent lopping and scattering would put too much fuel loading onto the site. This treatment would reduce the local beetle population on-site and reduce the spread of mountain pine beetle to adjacent areas. The trees would need to be removed to a “safe” site for treatment to kill the beetles. Removal can be made by either a truck if the area is accessible or by air if the area is not accessible by vehicle.

## **3. Verbenone Experimental Treatment**

Verbenone is a pheromone, which are message-bearing chemicals emitted by mountain pine beetles, which can be artificially synthesized and are commercially available as lures to repel mountain pine beetle. It is an anti-aggregation pheromone. In addition, artificial pheromones can be used to bait a tree. These are aggregation pheromones. Mountain pine beetles concentrated within the baited trees can then be removed or destroyed. Pheromone traps can also be used to capture flying beetles. Presently there is no effective anti-aggregation pheromone for the mountain pine beetle in the Black Hills. Working with the USFS and others this treatment will explore the use of Verbenone and other pheromones to determine the feasibility of the use of pheromones within the Black Hills and the Memorial.

## **C. Monitoring**

### **1. Monitor for Treatment Effectiveness and Forest Health Conditions**

Monitoring is essential in evaluating control techniques. The Memorial will monitor mountain pine beetle infestations and control techniques. Techniques to be monitored include spraying, thinning, and prescribed fire techniques to determine if treatments are effective in protecting high-value trees and managing the spread of mountain pine beetle.

### **2. Monitor and Treat for Non-native Plants**

The non-native plant monitoring and control specification outlines control of populations of non-native plants within and adjacent to treatment areas. Non-native plants will be treated immediately so that they do not have the opportunity to become established. Non-native plant control will help to maintain the ecological integrity and site productivity of native floristic communities. The Memorial should implement a “Good Neighbor” policy and control non-native plants on private lands in the public/private interface. The areas to be monitored include all of the treatment areas that disturbed the soils as a result of the treatment. These include those areas that will be mechanically thinned as well as those areas that will be burned by prescribed fire. The total acreage to be monitored for non-native plants are those acres that have been treated by thinning. The approximate acreage to be thinned is 975 acres and that is the acreage that should be monitored for non-native plants. In addition, the Memorial will burn a total of 1190 acres in prescribed burns. See the Fire Management Assessment, Appendix I. Lands disturbed by thinning activities will see the short-term invasion of non-native plants i.e., houndstongue (*Cynoglossum officinale*), Canada thistle (*Cirsium arvense*), and mullein (*Verbascum thapsus*). Areas monitored and treated should be documented using photography, topographic maps, and GPS/GIS technology. Control methods for treating non-native plants will use Integrated Pest Management techniques including physical, mechanical, and chemical methods based on the non-native plants discovered.

## V. CONSULTATIONS

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**Mount Rushmore National Memorial  
Mountain Pine Beetle  
Resources Assessment & Action Plan**

**CULTURAL RESOURCE ASSESSMENT**

**I. OBJECTIVES**

- Assess potential affects to cultural resources, including historic and archaeological sites and properties significant to Tribes, affected by Mountain Pine Beetle (MPB) infestation or treatment of the infestation.
- Meet legal compliance including tribal consultation.
- Avoid or minimize adverse effects to cultural resources that may occur due to recommended treatments, and mitigate adverse effects that are not avoidable.

**II. ISSUES**

- Cultural resources may potentially be affected by MPB infestation, including increased threat of fire damage and damage to viewsheds within the cultural landscape.
- Cultural resources, including the landscape, archaeological sites and sites of tribal concern, may potentially be affected by recommended treatments.

**III. OBSERVATIONS**

**A. Background**

Many cultural groups have lived in and utilized the Black Hills. Earlier groups that were more nomadic tended to use the hills as a seasonal hunting area. Later groups utilized the hills with more frequency and many have a spiritual and or religious connection to the area.

Of the cultural groups known to have existed on the Plains, the earliest are those of the Paleo-Indian Tradition: These are the nomadic tribes who occupied the region from 13,000 to 4,000 B.C. Their movements followed the large game animals they hunted on the open plains and through the seasonal migration.

The period after about A.D. 900 marks the coming of the Plains Village cultures into the region. These are characterized by sizable populations located in sedentary villages where they planted corn, practiced horticulture, and made many varieties of ceramic wares. These groups were primarily centered on the major rivers where a good source of farmland could be found. The use of the Black Hills by these groups is known, but the full extent has not yet been determined.

By the 16th and 17th centuries, many of the village groups were displaced by nomadic groups. Of these groups known to have laid claim to the Black Hills region were the Plains Apache, Kiowa, Comanche, Kiowa-Apache, Arapaho, Arikara, Cheyenne, and finally the Lakota, or Teton Sioux, who inhabited the Black Hills region at the time of the Euro-American migration in the mid to late 19th century.

The Lakota entered the Black Hills near the end of the 18th century. The original Sioux nation ranged from Canada to Missouri and from Minnesota to Montana. Forced east from Minnesota by advancing white settlement and other tribes, the greater Sioux nation abandoned their culture as a woods-dwelling, agricultural society and thrived on the Plains. Their use of the forest is recorded only as transient shelter; as a result there is little evidence of persistent historical occupation by the Sioux in the area.

The Sioux called the hills Paha Sapa (black hills) or Khe Sapa (black mountains) because they were so heavily wooded with dark pine and spruce that from a distance they looked black. They were also called Wamakaognaka E'Cante, meaning the "Heart of Everything That Is" and O'onakezin, Place of Shelter. For the Sioux, the Black Hills are the dwelling place of the Great Spirit, Wakan Tanka, who is said to have declared the Hills the "Heart of the Earth". They continue to use them for spiritual renewal and for tribal ceremonies as well as historical uses as a means of transient shelter from severe weather, for providing water and food, lodge poles for tipis, and medicinal plants for healing.

In the middle of the nineteenth century, encroachment by white people into Sioux territory encouraged by the Homestead Act of 1862 brought a flood of settlers to the West and led to many protracted and bloody confrontations.

The Treaty of Fort Laramie in Wyoming, signed in 1868 between the federal government and the Sioux, was intended to put a stop to these confrontations and established a permanent Great Sioux Reservation. The original terms of the treaty declared the reservation to be 26 million acres in the Dakota Territory west of the Missouri River including the Black Hills and specified hunting rights on an additional 30 million "unceded" acres extending south to the North Platte River in Nebraska and west to the Big Horn Mountains in Wyoming. The treaty ended hostilities between the Sioux and the United States Government. However, almost from the moment it was signed, the treaty was violated on multiple occasions until it was completely disregarded by the United States.

The pressures of white settlement and the discovery of gold in the Black Hills in 1874, however, led the government to try to purchase or lease the Black Hills. In 1877, Congress ratified the Manypenny Agreement, which transfers ownership of the Black Hills to the Federal Government without compensation to the Sioux and decreed that any Indian found off the reservation be considered "hostile". The agreement insisted that the Sioux shift to a farming economy on the poor soil of the reservation lands left to them. This left the Sioux totally dependent on the government for rations of food and clothing in order to survive.

The Dawes Act, also known as the General Allotment Act, of 1887 created further physical and spiritual divisions for the Sioux by fragmenting reservation land. The act divided the Sioux territory into six smaller, isolated reservations (called 'agencies' at the time) and forced them to hold land as individuals rather than as a tribe. Unfortunately, most of the land allotted through the act was not agriculturally viable. This same land was also to be held in trust for twenty-five years ensuring that the Indians could not sell their land. The Burke Act of 1906 was offered as an amendment to the Dawes Act. It allowed those Indians deemed "competent" by the government to be granted titles and allowed to sell their land as they wished. Ultimately, under this act, whites took more native land.

Twentieth century legislative treatment of the Sioux by the federal government began in 1903 with the Supreme Court decision of *Lone Wolf v. Hitchcock*, which upheld the violation of the 1868 Ft. Laramie treaty. The Sioux followed with multiple attempts through the legal system to regain the Black Hills. Congress created the Indian Claims Commission in 1946 to hear tribal claims against the U.S. Government. In 1975, the ICC ruled unconstitutional Congress's law of 1877 which took much of the land (including the Black Hills) of the Great Sioux Reservation from the Sioux Nation. The commission offered monetary compensation as settlement but it was refused by the Sioux and this amount has been held in trust since the decision. The Lakota leaders continue to demand the return of the Black Hills to the Sioux and various legislative attempts have been made such as the Bradley Bill, authored by New Jersey Senator Bill Bradley, in 1985.

In 1971, as part of a non-violent protest by the American Indian Movement (AIM), Mount Rushmore became an occupied site by twenty protesters demanding that the U.S. Government honor the terms of the 1868 Fort Laramie Treaty. The occupation lasted a week and was peacefully resolved between the Native Americans and National Park Service personnel.

Sites found during an archaeological survey within the Mount Rushmore National Memorial (Memorial) demonstrate the ongoing use and presence of Tribal people in the vicinity for

thousands of years.

#### *History and significance of Mount Rushmore National Memorial*

The following is taken from the Mount Rushmore National Memorial National Register nomination (1985) and Cultural Landscape Inventory (1999 revised 2008):

Sculpting a monument in the Black Hills was the brainchild of South Dakota State Historian Doane Robinson as a promotional effort for the State of South Dakota. Gutzon Borglum was chosen to carry this grand work out. At the time Borglum was in Georgia, carving a Confederate memorial on Stone Mountain. The historian enticed the sculptor with the proposal that the Black Hills offered 'opportunities for heroic sculpture of unusual character'.

Borglum had already enjoyed nearly forty years as a successful artist and sculptor by 1924. The evolution of his work shows the development of his nationalism and ideology, his increasingly larger concepts of the nation and its new role in the world. Gutzon Borglum's career began in California in the 1880s, where he produced landscapes idealizing the West. His work was typical of the late 19th century in which the West embodied values of resilience, bravery, and self-reliance. From 1889 to 1900, he and his wife Lisa (also an artist) traveled to Europe, where Borglum encountered French sculptor Auguste Rodin and symbolism.

Borglum's tours of Europe also impressed upon him the need to create gigantic American art. In 1901 he concluded that 'the amazing and expanding character' of American civilization 'clearly demands an enlarged dimension-anew scale'. Thinking in these terms, Borglum derisively observed by 1916: "There is not a monument in this country as big as a snuff box". He would eventually state that the United States was living in an age of the colossal. 'Our age will some day ... be called the 'Colossal Age'.'

The opportunity to create a monumental sculpture meant the attainment of Borglum's dreams. He was invited to create an enduring monument to America in the Black Hills, placed high in the western heartland of the continent, hewn from the stone itself. The work would be more than a mere portrait gallery of great United States Presidents. It would represent Borglum's vision of the spirit of those men, and the spirit of the country.

Mount Rushmore National Memorial was established on October 1, 1925. Work began in 1927 and was completed in 1941. The Memorial was established to commemorate and "symbolize the spirit and ideals of the westward expansion of America and the growth of democratic ideals and institutions."

The sculpture also illustrates the importance of the four presidents represented to the forming and growth of our nation. Mount Rushmore National Memorial is significant at the national level for: 1) its illustration of an important theme in our nation's history; 2) its important association with the lives of the four presidents represented; and 3) its representation of the work of a master and artistic value.

The sculpture is the key element of the historic district. Other resources include the facilities developed to create the sculpture, including the sculptor's studio, and office/residence. Other character defining features of the site include historic retaining walls, culverts, walkways and stairways.

#### **B. Findings**

Field reconnaissance, records searches, and review of national register and cultural landscape inventory documentation resulted in the following findings:

- MPB infestation could result in heightened fire danger which could cause a direct adverse effect on irreplaceable, nationally significant resources at Mount Rushmore National Memorial, primarily the developed area from which the planning and staging for the sculpture was carried out
- MPB infestation could result in major loss of ponderosa pine trees that form a significant

part of the cultural landscape of the Memorial. This would dramatically and adversely affect historic view sheds

- 43 archaeological sites were inventoried during an archaeological survey undertaken in 2006-7. It is anticipated that no adverse effects would occur to these sites based on recommended treatments
- Cultural Resource personnel will need time to demarcate areas where extra care is necessary. These areas will include but not be limited to archaeological sites, view sheds and within the vicinity of historic resources

#### IV. RECOMMENDATIONS

##### A. Recommendations

The Project Manager for recommended actions will ensure archaeological sites are monitored for disturbance after thinning is complete. See specification on this position.

##### B Management Recommendations – Non-Specification Related

- Prior to carrying out thinning activities a single point of reference photographic record of each National Register (NR) eligible archaeological site should be acquired.
- After carrying out thinning activities and annually thereafter each NR eligible site should be monitored for disturbance, including a new photograph taken from the original point of reference.
- Trees removed during thinning activities should be removed from areas that have been demarcated as sensitive areas by cultural resource personnel.
- Pesticide spraying should be conducted without vehicles being driven across NR eligible sites.
- Thinning within demarcated areas should be carried out without the use of heavy equipment that may damage the resources.
- Prior to thinning within the developed area, the Midwest Regional Office-Cultural Resources Division-Cultural Landscapes Program should be consulted to ensure historic view sheds are not adversely affected.
- Complete consultation with Tribes and SHPO under Section 106 of the National Historic Preservation Act.

#### V. CONSULTATIONS

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Bill Hunt	NPS MWAC	Initiate Section 106 compliance with regional office
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DRAFT

**Mount Rushmore National Memorial**  
**Mountain Pine Beetle**  
**Resources Assessment & Action Plan**

**FIRE MANAGEMENT ASSESSMENT**

**I. OBJECTIVES**

- Evaluate and assess Mountain Pine Beetle (MPB) impacts on fire hazard/crown fire potential in forests of Mount Rushmore National Memorial (Memorial).
- Determine the strategy and tactics necessary to lessen the potential for stand-replacing wildfire in the Memorial.
- Develop both short and long-term treatment strategies for hazard fuel reduction.

**II. ISSUES**

- Increasing potential for crown fire in Mount Rushmore forests as a result of high tree densities and ladder fuels.
- Increasing potential for crown fire in Mount Rushmore forests as tree mortality increases resulting from MPB infestation.
- Visitor safety as a result of treatment activities and from hazard trees.
- Prioritizing treatment prescriptions and methods based on susceptibility to MPB infestation and proximity to current outbreak.
- Coordinating treatment actions with surrounding agencies, work groups, and neighbors.
- Protecting developed areas in the memorial from wildfire, especially visitor areas and historic sites.
- Fire suppression planning
- Fire prevention
- Impacts of broadcast chipping on vegetation and soils
- Difficulties associated with burning hand piles during winters with unreliable snow cover.

**III. OBSERVATIONS**

**A. Background**

Ponderosa pine (*Pinus ponderosa*) forests have changed considerably during the past century, partly because recurrent fires have been absent for a century or more. Exclusion of episodic surface fires in ponderosa pine forests in the Black Hills has resulted in changes in forest structure, including increased tree densities and ladder fuels. These changes have increased the likelihood for widespread, catastrophic crown fires (Sheppard and Battaglia 2002, Brown and Cook 2006). The last widespread wildfire to burn through the Memorial occurred in 1893. An extensive crown fire at Mount Rushmore would severely impact the ecological and aesthetic setting of the sculpture. These conditions also make the forests of the Memorial very susceptible to mountain pine beetle infestation. If significant tree mortality were to result from MPB attack, increased crown fire potential would exist for one to two years while dead needles remained on the trees. Once the dead snags begin to fall, surface fuel loads would increase dramatically, further increasing the potential for catastrophic wildfire.

The historical fire regime at Mount Rushmore is best characterized as one of low-severity surface fires with occasional small patches of passive crown fire. The historical fire frequency at the Memorial was approximately 15-17 years, with a range of 3-39 years (Brown et al. 2008). This resulted in a forest with approximately 110 trees per acre and a basal area of 100 ft<sup>2</sup>/acre. The ponderosa pine stands of the Memorial maintain many old growth characteristics, however, their structure has changed significantly over the past century. A

lack of fire and protection from timber harvest has resulted in an abundance of smaller diameter trees throughout the Memorial (Appendix 3). Today's forest has more than 1000 trees per acre and a basal area over 120 ft<sup>2</sup>/acre. This has largely been the result of an explosion of small, young trees and the loss of large, old trees across the landscape. These conditions make the forest susceptible to severe wildfires and insect outbreaks (Shepperd and Battaglia 2002, Brown and Cook 2006).

## **B. Findings**

### Fuels Management

To date there have been no prescribed fires within the Memorial boundary, because fuel loads and tree densities are too high to safely manage prescribed fire. A mechanical hazard fuel reduction program was established in 1990. The program included thinning forest stands and stacking debris along road corridors. Approximately 190 acres were thinned between 1990 and 1997. The program was expanded to "backcountry" areas in 2003 and an additional 240 acres have been treated (Appendix 4). A series of fire management projects have been implemented in an attempt to restore the historic structure to the forest stands of Mount Rushmore and make them less susceptible to stand-replacing disturbances, such as high intensity fire and mountain pine beetle epidemic (Appendix 3).

A portion of the Memorial has been thinned and application of prescribed fire is planned over a large portion of the Memorial once thinning is completed. The goal is to restore the old-growth structural characteristics of the forest, which would lead to an increase in the abundance and diversity of understory vegetation and provide benefits for wildlife and other species. This would also make the stand less susceptible to intense, stand replacing fires and more resilient to mountain pine beetle outbreaks (Shepperd and Battaglia 2002, Brown et al. 2008).

The traditional approach to thin ponderosa pine stands has included mechanically removing smaller trees, piling the resulting material, and burning slash piles when adequate snow cover allows. Since winter snow cover is unreliable in the central and southern Black Hills, managers are interested in exploring alternatives to this method. Chipping the thinned material and broadcasting the chips on site is an alternative that has been used in other western forests (Appendix 3). Because of uncertainties about impacts of this type of treatment to herbaceous vegetation and the soil, there has been hesitation to use this treatment in National Park Service units. A research project was initiated in 2008 at the Memorial to assess the impacts of thinning, chipping, and use of heavy machinery on vegetation and soils, and to determine the validity of landscape scale chipping treatments.

### Fire Suppression

Due to the small size of the Memorial, the Mount Rushmore FMP directs that all wildfires within the Memorial will be suppressed. Wildfire occurrence has been low over the past several decades, with 22 wildfires reported in the Memorial since 2000, the majority of which have been less than 2 acres in size. Ten of these fires have resulted from fireworks displays, and the largest, at 96 acres, occurred in February 2006 following the burning of piles created during a mechanical thinning project. The absence of periodic, low intensity natural fire has increased fuel loads, which elevates the potential for catastrophic wildfire.

A cooperative interagency agreement for fire management exists between federal agencies and the State of South Dakota. Local cooperating agreements also exist with the Keystone Fire Department. The Northern Great Plains Interagency Dispatch Center provides fire dispatch service for Mount Rushmore under the closest forces concept. That is, the closest fire suppression resources, regardless of agency, will respond to incidents in the Memorial. Recently, a response plan has been developed to manage evacuations and notifications for the Memorial and local communities in the event of a wildfire in the Black Elk Wilderness.

### Fire Prevention

Fire prevention activities include all activities designed to reduce the number of human-caused wildfires that could occur within the Memorial. These include prevention discussions

with Memorial employees, posting signs in high visitation areas in times of high or extreme fire danger, and prevention patrols during high and extreme fire danger (Staffing Classes 4 and 5). The entire Black Hills area is a No Open Fire Zone, so additional warnings are posted in the Memorial during high and extreme conditions. No smoking bans are put in place within the boundaries of the Memorial during extreme fire danger, applying to both visitors and employees.

**IV. RECOMMENDATIONS**

**B. Recommendations**

- **Mechanical Thinning**  
Four areas within the Memorial have been identified to receive mechanical fuel reduction (Appendix 4). In these stands, trees less than 10" DBH should be removed. Trees 6" DBH and less can be cut and chipped on site, and trees 7-10" DBH would be cut to 4 foot lengths and piled for burning when there is adequate snow cover. In areas where it is feasible to remove the material from the site, that would be considered. A summary of the Symstad and Bynum (2005) stand exam data was completed and is included in Appendix V. It appears that thinning trees less than 10" DBH would result in a mosaic pattern of stand structure across the thinning units. A summary such as this can be used to refine the thinning treatment prior to application.
- **Prescribed Fire**  
The Memorial has been divided into five treatment units (Appendix 4), which have been prioritized to receive prescribed fire treatments. Prescribed fire can be applied after piles resulting from mechanical thinning have been burned. Prior to application of prescribed fire, burn plans will be developed that meet interagency guidelines.
- **Thinning Along Hwy 244 Corridor**  
The Black Hills National Forest has been actively thinning along highway 244 up to the west boundary of the Memorial (Appendix 4). This has been done to create a fuel break for fire suppression efforts in the event of a wildfire in the Black Elk Wilderness. This would be continued in the Memorial to coincide with the work that has been done by the BHNH. Trees 10" and smaller should be cut and removed from the area. As long as the trees are not infested with MPB, cut trees could be hauled off site for use as firewood. Chipping and hauling the material would also be an option. Remaining trees would be pruned up to 10 feet off the ground to eliminate ladder fuels.
- **Monitor Treatment Effectiveness**  
It is critical to continue and expand monitoring of fuels treatment effectiveness. Protocols are in use to monitor changes in vegetation composition, forest structure, and downed woody fuel load. Particular attention should be placed on changes in non-native plant populations, tree densities, and fuel loads.

**B. Management Recommendations – Non-Specification Related**

- Update the Mount Rushmore Fire Management Plan to reflect new terminology in wildland fire and changes in national fire policy (Five year revision). Use the new approved Interagency Fire Management Template that was recently approved in the fall of 2009.
- Develop interagency unified command delegation of authority

**V. CONSULTATIONS**

Name	Contact Info
Mike Battaglia	USFS, Rocky Mountain Research Center
Todd Pechota	Black Hills National Forest

Joe Lowe	State of South Dakota, Department of Agriculture Division of Wildland Fire Suppression
Eric Allen	NPS, Northern Great Plains Fire Management
Peter Brown	Rocky Mountain Tree-Ring Research
Amy Symstad	USGS, NPWRC Black Hills Station

**VI. REFERENCES**

Brown, P.M., C.L. Wienk, A.J. Symstad. 2008. Fire and forest history at Mount Rushmore. *Ecological Applications* **18**(8):1984-1999.

Brown, P.M. and B. Cook. 2006. Early settlement forest structure in Black Hills ponderosa pine forests. *Forest Ecology and Management* **223**:284-290.

DOI NPS. 2003. Fire Management Plan for Mount Rushmore National Memorial.

Shepperd, W.D. and M.A. Battaglia. 2002. Ecology, silviculture, and management of Black Hills ponderosa pine. General Technical Report RMRS-GTR-97. USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO.

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Jim McMahon, NPS, Midwest Regional Office, Omaha, NE 68102 (402) 661-1754  
Cody Wienk, NPS, Midwest Regional Office, Omaha, NE 68102 (402) 661-1770

DRAFT

**Mount Rushmore National Memorial**  
**Mountain Pine Beetle**  
**Resources Assessment & Action Plan**

**COMPLIANCE ASSESSMENT**

**I. OBJECTIVES**

- Assure recommended actions comply with applicable laws and regulations
- Complete necessary NEPA review for actions occurring within the Memorial involving the Mountain Pine Beetle (MPB) epidemic
- Complete necessary Section 106 review. Consult with MWRO, SD SHPO, and THPOs/Tribes

**II. ISSUES**

- Environmental effects from park actions on MPB
- Affects to cultural resources within the park, including cultural landscapes and viewsheds
- Monitoring and mitigating issues surrounding archeological sites
- Affects to areas of tribal cultural sensitivity
- Water quality effects from actions
- Old growth forest effects from MPB and treatments

**III. OBSERVATIONS**

**A. Background**

Mount Rushmore National Memorial consists of 1,278 acres containing ponderosa pine forests, granite outcrops, and cultural sites including archeological sites and historic resources associated with the sculpture carving. Management of the natural and cultural resources are included in park policies including the 2003 Fire Management Plan, a General Management Plan (GMP) that is currently being developed as well as other natural resource management plans and reports. According to the pending GMP, "The purpose of Mount Rushmore National Memorial is to commemorate our national history and progress, and to preserve and protect the sculpture and the historic, cultural, and natural setting while providing for the education, enjoyment, and inspiration of the public." The pending General Management Plan also identifies fundamental resources of the memorial to include the forest setting, the sculpture, the old growth forest, and unimpeded views of the sculpture. These resources and values maintain the park's purpose and significance, and if these resources are allowed to deteriorate, the park purpose and/or significance could be jeopardized.

The natural resources of Mount Rushmore have been managed to maintain the natural setting. Forest thinning for fire protection as well as removal of hazard trees have occurred at the Memorial. The memorial conducted an archeological survey in 2006-2007 that provided a 100% survey of the park and identified prehistoric and historic archeological sites. Other historic resources, including cultural landscapes and classified structures, are monitored and maintained for the preservation of the park's historic assets.

There is currently a landscape level mountain pine beetle epidemic occurring in the central Black Hills. The most active area of population growth and most concentrated tree mortality of the past 3 years has been in and around the Black Elk Wilderness. This area borders the park on three sides and increases the chances of tree mortality and fire danger within the Memorial. The pine beetle infestation has the potential of affecting some of the fundamental resources of the park and altering the historic viewscape of the memorial. Old growth ponderosa pine and the forest as a whole is visually significant for the visitor

experience as well as culturally significant for the history of the landscape.

## **B. Findings**

With a high mortality rate of ponderosa pines on neighboring Forest Service lands, Mount Rushmore needs to implement proactive preservation and protection measures to limit and mitigate an impending epidemic within the park. Measures to be considered include:

- Preventative spray of high profile trees within the Memorial
- Mark and remove dead trees in developed areas to reduce tree hazards
- Lop and scatter infested trees
- Mark and remove whole trees via truck or helicopter
- Search, mark and monitor Memorial forests for infested trees
- Thinning the Memorial forest to specifications laid out in the current Fire Management Plan
- Thinning the Memorial forest to specifications identified as preventative to pine beetle inhabitation
- Thinning the forests around the Memorial boundary on the south and western sides to approximately 40 basal area to create a buffer from the current pine beetle epidemic encroaching from the west.
- Conduct verbenone experimental treatment
- Monitor for treatment effectiveness and forest health conditions
- Monitor and treat for non-native plants

The increase in pine beetle infested trees increases the likelihood and danger of possible forest fires. Dead standing trees could also result in damage to facilities and possibly loss of life.

The spraying, marking, and removal of trees from the Memorial would have no adverse affect on archeological sites or other historic resources. Archeological sites should be monitored during the project to ensure protection. Low impact actions, including the use of helicopters, would reduce effects on the land and cultural resources.

The chemicals used in spraying would be applied in a manner consistent with the manufacturer's recommendations. Visitor and staff education should include clear communication about the sprayed trees, proper signage to avoid contact, and other measures to mitigate contact with the treated trees.

Water sources should be monitored in the short term and long term during spraying treatment to ensure water has not been affected by the spraying.

All actions would be considered and reviewed under current NEPA and NHPA policies. These actions would be considered for both their short-term impact as well as their long term impacts. They also would be considered for their cumulative effects.

An amendment to the 2003 Healthy Forests Restoration Act is currently being discussed by Congress to increase federal forest management tools to proactively address the threat of wildfire, disease and insect infestation to forests. It also allows federal land managers to use a categorical exclusion under NEPA to conduct necessary actions connected with the aforementioned topics. Thinning actions outlined in this MPB Assessment and Action Plan would fall under the guidelines outlined in the new amendment and would qualify under the new categorical exclusion.

## **IV. RECOMMENDATIONS**

### **Recommendations**

- If an environmental assessment (EA) is determined appropriate, design specifications to contract

the development of a Mountain Pine Beetle EA to analyze the long term impacts from mitigation.

**Management Recommendations – Non-Specification Related**

- Determine appropriate compliance process for each action within the plan
- Complete compliance paperwork on the short-term and long-term actions
- Perform necessary consultations with associated Tribes, SHPO, THPOs
- Maintain and complete NEPA review through PEPC website
- Revise the Fire Management Plan to reflect current research and plans laid out in a pine beetle EA.
- Complete an integrated pest management permit of the use of chemical sprays through the Pesticide Use Proposal System (PUPS)

**V. CONSULTATIONS**

<b>Name</b>	<b>Contact Info</b>	<b>Purpose of Contact</b>
Nick Chevance	NPS MWRO (402) 661-1844	NEPA consultation
Sandra Washington	NPS MWRO	NEPA consultation
Paige Hoskinson Olson	SD SHPO (605) 773-6004	Section 106 Consultation

**VI. REFERENCES**

Allen, Kurt. 2009 Mount Rushmore Mountain Pine Beetle Forest Health Evaluation

2008 Section 106 Programmatic Agreement, NPS and ACHP and NCSHPO

NPS Director's Order 12 and accompanying manual

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Amy Bracewell, Mount Rushmore National Memorial, National Park Service, (605) 574-3114

**Mount Rushmore National Memorial**  
**Mountain Pine Beetle**  
**Resources Assessment & Action Plan**

**EDUCATION AND OUTREACH RESOURCE ASSESSMENT**

**I. OBJECTIVES**

- Provide educational and interpretive information to Mount Rushmore National Memorial visitors regarding Mountain Pine Beetle (MPB)
- Inform neighbors, surrounding communities and the public about issues related to the MPB
- Provide continuing public information, press releases and updates regarding actions being taken, i.e. spraying, tree thinning, and prescribed burns
- Inform sensitive groups about upcoming chemical applications
- Close and post areas where insecticides are to be applied, as necessary

**II. ISSUES**

- Public information and education about efforts to slow the advance of the MPB infestation
- Safety measures and risks regarding spraying and related ground water quality
- Public knowledge and understanding about forest management strategies such as fire suppression and thinning
- Public knowledge and understanding of National Park Service policies regarding management of natural resources, wildlife and native species
- Public information about partnership efforts and actions with cooperating agencies, political leaders, private land owners and business

**III. OBSERVATIONS**

**A. Background**

The purpose of this assessment is to address the opportunities for education outreach about the natural history, entomology, and ecological impacts of the MPB and strategies and tactics necessary for effective management of the forest for the future. Education opportunities will be developed to cultivate interest and promote curiosity, build scientific knowledge and understanding and promote partnerships and civic engagement geared toward the preservation and stewardship of our natural resources.

The memorial hosts approximately 2.5 million visitors each year. Visitation includes individuals, family and group recreation/vacation, organized tour groups, special interest groups, and education source groups from all states, various cultures, and international visitors. Park visitation and relationships (both formal and informal) with other entities and agencies present unique interpretation, outreach and public information opportunities to educate and inform the public about specific park operations and projects regarding the MPB.

Park management, interpretive programs, and park publications adhere to and promote the National Park Service *Organic Act* as well as the park service's mission statement. The *Organic Act* states that "The service thus established shall promote and regulate the use of the Federal areas known as national

parks, monuments, and reservations hereinafter specified by such means and measures as conform to the fundamental purposes of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.” The mission statement outlines that the National Park Service, “preserves unimpaired the natural and cultural resource and values of the national park system for the enjoyment, education, and inspiration of this and future generations. The National Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.”

These fundamental guidelines outline clear goals of resource management and opportunities for education. While the *Organic Act* and the mission seek to preserve the natural resources of the park service as unimpaired, the increase in tree mortality from the MPB epidemic is causing an imbalance in the forest ecosystem that may negatively impact the fundamental resources and values of Mount Rushmore. The Memorial is an active member of the Black Hills forest community that is tackling management issues surrounding the MPB epidemic. Vast areas of Ponderosa pine to the west of the Memorial on U.S. Forest Service lands have already been attacked and some areas have seen 100% mortality of the forests. Pine beetle infested trees have also been identified within the Memorial forest. The mortality of trees infested by the pine beetle increases fire danger within the forest community and creates fire danger concerns for visitor health and safety at the Memorial.

Natural history and the history of the Black Hills have traditionally played a minor role in exhibits and programs at the Memorial. Interpretive programs, exhibits, and publications at the Memorial have predominantly focused on the sculpture carving history and American history. A few site bulletins and other visitor publications have been distributed in the past with general information on the wildlife in the park. Over the past two years, natural history topics have been integrated into the newly created Kid’s Exploration Area at the park that provides hands on activities for young visitors on a variety of thematic topics. The „Rangers in the Classroom’ program has also provided curriculum programs on wildlife adaptation to local school groups.

## **B. Findings**

Discussions on the National Park Service’s perspective on natural resource management as well as the proposed actions to address the MPB epidemic lead to educational opportunities to increase visitor understanding and engagement about park resources and actions needed to protect and preserve the natural setting. Education outreach is necessary to inform park staff, visiting public, park neighbors, education communities, and partner groups about forest health and the challenges of forest management in order to promote public understanding, support and assistance. Opportunities for educational exploration include:

- The development of a communications plan to help direct public information operations
- Continue ongoing programs on the significance of the cultural landscape of the sculpture and the surrounding forest
- Implement the NPS mission as it pertains to MPB management at the Memorial
- Integrate ideas of the significance of unlogged, old growth forest at the memorial, the risks of catastrophic wildfire, and historic fire and forest management tactics into programs and publications

Memorial interpretation staff would be involved in developing communication, signage and educational programs throughout the various phases of this plan. Appropriate signage and visitor communication would occur during necessary park closures. Front line interpreters would provide formal and informal interpretation opportunities during the project and communicate directly with the public. Interpreters would communicate safety messages, the goals and purpose of the proposed actions, and engage in discussions concerning the diverse perspectives on forest management.

Increased focus on natural resources in interpretive programs and publications would also help bring

greater focus and engagement to the issues surrounding the MPB epidemic. Memorial interpretive themes and programs would incorporate topics and issues of forest management and the natural history of the Black Hills.

These topics would be explored through specific, targeted measures designed to develop, implement and sustain interpretive and public information capabilities at the memorial. Effectiveness will depend upon the quality of deliberate planning, resource advocacy, authorization and funding of capacity-building measures, and implementation of proposed measures.

Public information and media affairs are also integral tools in public understanding and engagement. An NPS Public Information Officer devoted to this project would produce press releases updating the news and the public on weekly developments. Media events, briefings and meetings with interested parties would also help facilitate communication and awareness of the project. Active communication with media outlets would help manage community understanding and expectation about the actions carried out under this plan.

#### **IV. RECOMMENDATIONS**

##### **C. Recommendations**

- Employ one Teacher Ranger Teacher (TRT) to design education curriculum, lead education programming and train other education leaders
- Employ a temporary Public Information Officer devoted to the media affairs of this project
- Acquire education materials including back pack learning kits, GPS systems, and hand lenses

##### **B Management Recommendations – Non-Specification Related**

1. Provide staff training on the natural history, entomology, and ecological impacts of the MPB, forest history, health and management
2. Develop natural history themes related to the MPB and incorporate into education and interpretation programming
3. Develop and deliver on-site field education studies focusing on life cycle and short-term and long-term methods to inhibit infestation
4. Develop web-based curriculum resources for teachers and students
5. Engage educational institutions and civic organizations in education activities and events such as demonstrations, guest speakers and panel discussions
6. Create publications, kids' newspaper and multi-media to educate and inform
7. Include pine beetle information in park publications, web site postings and news releases
8. Comply with requirements to report or otherwise communicate information on chemical treatment type, locations, dates and treatment methods, application schedules and safety information
9. Integrate MPB management issues into current environmental education curriculum, as appropriate
10. Through press releases and media advisories, the park will notify local media about MPB control activities, dates, locations and treatment methods, as necessary
11. Develop and implement a communication plan for public information

#### **V. CONSULTATIONS**

Name	Contact Info	Purpose of Contact

**VI. REFERENCES:**

Mount Rushmore General Management Plan, Fire Management Plan, and Long Range Interpretive Plan

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Contacts: Navnit Singh, Blaine Kortemeyer, Rhonda Schier, MORU Interpretation.

DRAFT

**Mount Rushmore National Memorial  
Mountain Pine Beetle  
Resources Assessment & Action Plan**

**APPENDIX II ENVIRONMENTAL AND CULTURAL RESOURCE COMPLIANCE**



Inspection of green infested tree, 2/27/2010



## ENVIRONMENTAL SCREENING FORM (ESF) DO-12 APPENDIX 1

Date Form Initiated: 02/26/2010

Updated May 2007 - per 2004 Departmental Manual revisions and proposed Director's Order 12 changes

### A. PROJECT INFORMATION

**Park Name:** Mount Rushmore NMem  
**Project Title:** Mountain Pine Beetle Action Plan  
**PEPC Project Number:** 30488  
**PMIS Number:**  
**Project Type:** Implementation Plan (IMPL)  
**Project Location:** County, State: Pennington County, South Dakota  
**Project Leader:** Amy Bracewell  
**Administrative Record Location:**  
**Administrative Record Contact:**  
**Notes:**

### B. PROJECT DESCRIPTION/LOCATION

Mount Rushmore National Memorial is creating an action plan to address the Mountain Pine Beetle (MPB) epidemic that is causing ponderosa pine mortality throughout the Black Hills. Working with area agencies, the memorial is developing an aggressive plan to slow and hopefully mitigate the movement of the pine beetle into the memorial. This plan will identify the current forest conditions within and around the memorial as well as lay out a course of action to mitigate forest devastation from the MPB.

Preliminary drawings attached? **Yes No**

Background information attached? **Yes No**

Target compliance completion date: **04/01/2010**

Projected advertisement/Day labor start:

Construction start date:

Is project a hot topic (controversial or sensitive issues that should be brought to attention of Regional Director)? **Yes**

**C. RESOURCE EFFECTS TO CONSIDER:**

<b>Identify potential effects to the following physical, natural, or cultural resources</b>	<b>No Effect</b>	<b>Negligible Effects</b>	<b>Minor Effects</b>	<b>Exceeds Minor Effects</b>	<b>Data Needed to Determine/Notes</b>
1. Geologic resources – soils, bedrock, streambeds, etc.			Minor		
2. From geohazards	No				
3. Air quality		Negligible			
4. Soundscapes			Minor		The actions to mark, lop, and remove trees will be temporary in duration and will not permanently affect the soundscape.
5. Water quality or quantity					Effects to water quality are thought to be negligible or no effect. The plan proposes water quality monitoring before, during and after the action
6. Streamflow characteristics	No				
7. Marine or estuarine resources	No				
8. Floodplains or wetlands	No				
9. Land use, including occupancy, income, values, ownership, type of use	No				
10. Rare or unusual vegetation – old growth timber, riparian, alpine			Minor		Effects are thought to be minor or potentially beneficial to the old growth forest. Monitoring of the forest and old growth pines is a part of the plan.
11. Species of special concern (plant or animal; state or federal listed or proposed for listing) or their habitat			Minor		Effects are thought to be minor or potentially beneficial. Monitoring of all wildlife is included in the plan.

12. Unique ecosystems, biosphere reserves, World Heritage Sites	No				
13. Unique or important wildlife or wildlife habitat	No				Wildlife and habitat found within the park are consistent with the rest of the Black Hills.
14. Unique or important fish or fish habitat	No				
15. Introduce or promote non-native species (plant or animal)		Negligible			Exotic plant monitoring and control is included in the plan.
16. Recreation resources, including supply, demand, visitation, activities, etc.	No				
17. Visitor experience, aesthetic resources		Negligible			Effects are thought to be minor and may benefit visitor experience including views, old growth forest protection and sculpture landscape.
18. Archeological resources	No				Consultation with tribes and SD SHPO before the start of the project has begun and will continue through the duration of the project.
19. Prehistoric/historic structure	No				Consultation with tribes and SD SHPO before the start of the project has begun and will continue through the duration of the project.
20. Cultural landscapes	No				Consultation with tribes and SD SHPO before the start of the project has begun and will continue through the duration of the project.
21. Ethnographic resources	No				Consultation with tribes and SD SHPO before the start of the project has begun and will continue through the duration of the project.
22. Museum collections (objects, specimens, and	No				The actions would help protect museum collections from the

archival and manuscript collections)					loss from wildfire.
23. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	No				The project would provide new employment opportunities and will not affect visitor use of the park
24. Minority and low income populations, ethnography, size, migration patterns, etc.	No				
25. Energy resources	No				
26. Other agency or tribal land use plans or policies	No				
27. Resource, including energy, conservation potential, sustainability	No				
28. Urban quality, gateway communities, etc.	No				
29. Long-term management of resources or land/resource productivity	No				
30. Other important environment resources (e.g. geothermal, paleontological resources)?	No				

Comments:

**D. MANDATORY CRITERIA**

<b>Mandatory Criteria: If implemented, would the proposal:</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comment or Data Needed to Determine</b>
A. Have significant impacts on public health or safety?		N		
B. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands; wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (Executive		N		

Order 11990); floodplains (Executive Order 11988); national monuments; migratory birds; and other ecologically significant or critical areas?				
C. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources (NEPA section 102(2)(E))?		N		
D. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		N		
E. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		N		
F. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		N		
G. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office?		N		
H. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species?		N		
I. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		N		
J. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		N		
K. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		N		
L. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area or actions that may promote the		N		

introduction, growth, or expansion of the range of such species (Federal Noxious Weed Control Act and Executive Order 13112)?				
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For the purpose of interpreting these procedures within the NPS, any action that has the potential to violate the NPS Organic Act by impairing park resources or values would constitute an action that triggers the DOI exception for actions that threaten to violate a federal law for protection of the environment.

**E. OTHER INFORMATION**

Are personnel preparing this form familiar with the site? **Yes**

Did personnel conduct a site visit? **No** *(If yes, attach meeting notes or additional pages noting when site visit took place, who attended, etc.)*

Is the project in an approved plan such as a General Management Plan or an Implementation Plan with an accompanying NEPA document? **Yes**

If so, plan name:

**2003 Fire Management Plan**

Is the project still consistent with the approved plan? **Yes** *(If no, you may need to prepare plan/EA or EIS.)*

Is the environmental document accurate and up-to-date? **Yes** *(If no, you may need to prepare plan/EA or EIS.)*

**FONSI** Date approved:

Are there any interested or affected agencies or parties? **Yes**

Did you make a diligent effort to contact them? **Yes**

Has consultation with all affected agencies or tribes been completed? **No**

*(If yes, attach additional pages re: consultations, including the name, dates, and a summary of comments from other agencies or tribal contacts.)*

Are there any connected, cumulative, or similar actions as part of the proposed action? (e.g., other development projects in area or identified in GMP, adequate/available utilities to accomplish project)? **No**

*(If yes, attach additional pages detailing the other actions.)*

## **F. INSTRUCTIONS FOR DETERMINING APPROPRIATE NEPA PATHWAY**

First, always check DO-12, section 3.2, "Process to Follow" in determining whether the action is categorically excluded from additional NEPA analyses. Other sections within DO-12, including sections 2.9 and 2.10; 3.5; 4.5(G)(4) and (G)(5), and 5.4(F), should also be consulted in determining the appropriate NEPA pathway. Complete the following tasks: conduct a site visit or ensure that staff is familiar with the site's specifics; consult with affected agencies, and/or tribes; and interested public and complete this environmental screening form.

If your action is described in DO-12 section 3.3, "CE's for Which No Formal Documentation is Necessary," follow the instructions indicated in that section.

If your action is not described in DO-12, section 3.3, and IS described in section 3.4, AND you checked YES or identified "data needed to determine" impacts in any block in section D (Mandatory Criteria), this is an indication that there is potential for significant impacts to the human environment, therefore, you must prepare an EA or EIS or supply missing information to determine context, duration and intensity of impacts.

If your action is described in section 3.4 and NO is checked for all boxes in section D (Mandatory Criteria), and there are either no effects or **all** of the potential effects identified in section C (Resource Effects to Consider) are no more than minor intensity, usually there is no potential for significant impacts and an EA or EIS is not required. If, however, during internal scoping and further investigation, resource effects still remain unknown, or are at the minor to moderate level of intensity, and the potential for significant impacts may be likely, an EA or EIS is required.

In all cases, data collected to determine the appropriate NEPA pathway must be included in the administrative record.

## **G. INTERDISCIPLINARY TEAM SIGNATORIES**

*All interdisciplinary team members sign as directed or deemed necessary by the Superintendent. By signing this form, you affirm the following: you have either completed a site visit or are familiar with the specifics of the site; you have consulted with affected agencies and tribes; and you, to the best of your knowledge, have answered the questions posed in the checklist correctly.*

<b>Field of Expertise</b>	<b>Interdisciplinary Team Leader Name</b>
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Project Leader -	Amy Bracewell:
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<b>Field of Expertise</b>	<b>Technical Specialists Names</b>
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Superintendent -	Gerard Baker
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NEPA Specialist -	Amy Bracewell
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NHPA Specialist - Amy Bracewell  
 Chief of Maintenance - Duane Bubac  
 Other Advisor - Julie Gregg  
 Safety/Hazmat - Paul Hammett  
 Chief Ranger - Don Hart  
 Administrative Officer - Michelle Kerns  
 Chief of Interpretation - Navnit Singh  
 Chief of Resources - Bruce Weisman

**H. SUPERVISORY SIGNATORY**

*Based on the environmental impact information contained in the statutory compliance file and in this environmental screening form, environmental documentation for this stage of the subject project is complete.*

Recommended:

Compliance Specialist	Telephone Number
NEPA--Amy Bracewell	605-574-3114
NHPA--Amy Bracewell	605-574-3114

Approved:

Superintendent	Telephone Number

Date 02/26/2010

**MOUNT RUSHMORE NATIONAL MEMORIAL**

**ASSESSMENT OF ACTIONS HAVING AN EFFECT ON CULTURAL RESOURCES**

**A. DESCRIPTION OF UNDERTAKING**

1. **Park:** Mount Rushmore National Memorial, Pennington County

2. **Work/Project Description:**

a. Project name: Mountain Pine Beetle Action Plan

date: February 25, 2010

PEPC Project ID #: 30488

park project #(s): MORU-10-01

b. Describe project and area of potential effects (as defined in 36 CFR Part 800.2(c)); explain why work/project is needed.

Due to the outbreak of Mountain Pine Beetle (MPB) in the Black Hills of South Dakota over the past 10 years there is an increasing threat of this infestation spreading to Mount Rushmore National Memorial. Vast areas to the west of the Memorial on Forest Service lands have already been attacked and some areas have seen 100% mortality of the Ponderosa pine forests. An increased fire threat could lead to direct adverse effect to the resources within the memorial. The cultural landscape is also at risk due to this outbreak as it would adversely affect view sheds.

Planned actions to minimize and reduce the MPB threat include;

Preventative Spraying – This would occur in the developed areas of the memorial and protect the trees within the immediate view of the sculpture. While it would not include every tree it would provide protection for the trees vital to maintaining the significant view sheds.

Marking and Removing infested trees – Trees within the memorial boundary that are discovered to be infested will be felled and left in place (cut to two sections), chipped or removed from the park.

Thinning – Trees will be thinned to reduce food sources for the MPB, which prefers dense stands, and for fire protection. Areas will be thinned to 40 Basal Area (BA) and higher. Basal Area refers to forest density. A 40 BA would thin trees to approximately 20 to 25 feet between trees. Higher BA areas would retain greater density. The 40 BA areas would be used to create a buffer zone to the south and west of the memorial. Areas of forest would be thinned to retain a mosaic pattern to create a more natural forest ecology. Highest levels of thinning would utilize helicopter logging techniques.

Prescribed burns – After thinning, prescribed burning will be utilized to reduce fuel load within the forest.

The APE for this project includes the entire Mount Rushmore National Memorial

3. **Has the area of potential effects been surveyed to identify cultural resources?**

No

Yes Source or Reference 2006-2007 Archaeology survey

Check here if no known cultural resources will be affected. (If this is because area has been disturbed, please explain or attach additional information to show the disturbance was so extensive as to preclude intact cultural deposits.)

4. **Potentially Affected Resource(s):**

**Historical structures/resources affected? – *\*\*All resources within the memorial may be affected\*\****

Name and number(s): \_\_\_\_\_ LCS# \_\_\_\_\_ location:

NR status:

5. **The proposed action will:** (Check as many as apply.)

- Destroy, remove, or alter features/elements from a historic structure
- Replace historic features/elements in kind
- Add nonhistoric features/elements to a historic structure
- Alter or remove features/elements of a historic setting or environment (inc. terrain)
- Add nonhistoric features/elements (inc. visual, audible, or atmospheric) to a historic setting or cultural landscape
- Disturb, destroy, or make archeological resources inaccessible,
- Disturb, destroy, or make ethnographic resources inaccessible
- Potentially affect presently unidentified cultural resources
- Begin or contribute to deterioration of historic features, terrain, setting, landscape elements, or archeological or ethnographic resources
- Involve a real property transaction (exchange, sale, or lease of land or structures)
- Other (please specify)

6. **Measures to prevent or minimize loss or impairment of historic/prehistoric properties:**  
(Remember that setting, location, and use may be relevant.)

Actions to identify, lop, scatter, and remove trees will use the lowest impact methods so as not to disturb or destroy archeological sites and other historic resources. If any action leads to a discovery of a new site, all work will stop until the park's cultural resource specialist is contacted and MWAC and SHPO are consulted.

7. **Supporting Study Data:**

(attach if feasible; if action is in a plan, EA or EIS, give name and project or page number):

2010 Mount Rushmore National Memorial Pine Beetle Action Plan

Molyneaux, Brian

*2006 – 2007 A Park-Wide Cultural Resource Survey of Mount Rushmore National Memorial, Pennington County, South Dakota: Final Report of the Class III Reconnaissance and Intensive Archaeological Survey*

8. **Attachments:**  Maps  Archeological survey, if applicable  Drawings  Specifications  
 Photographs  Scope of Work  Site plan  List of Materials  Samples  
 Other

Prepared by Amy Bracewell Date 2/25/10 Telephone (605) 574-3114  
Historian

## B. REVIEWS BY CULTURAL RESOURCE SPECIALISTS

The park 106 coordinator requested review by the park's cultural resource specialist/advisors as indicated by check-off boxes or as follows:

SPECIALISTS: Your comments here (or attached) show that you have reviewed this proposal for conformity with requirements of Section 106, with the 2008 Servicewide PA (if applicable), and applicable parts of the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation, the NPS *Management Policies*, and the NPS *Cultural Resource Management Guideline*, and have given your best professional advice about this project and the

issues relevant to the Section 106 process, including identification and evaluation of historic properties and further consultation needs.

**[X] ARCHEOLOGIST**

Name: Bill Hunt

Date:

Comments:

*Check if project does not involve ground disturbance*  Assessment of Effect: \_\_\_\_\_ No Historic Properties Affected \_\_\_\_\_ No Adverse Effect \_\_\_\_\_ Adverse Effect \_\_\_\_\_ Streamlined Review

Recommendations for conditions or stipulations:

---

**[ ] CURATOR**

Name:

Date:

Comments:

*Check if project does not involve ground disturbance*  Assessment of Effect: \_\_\_\_\_ No Historic Properties Affected \_\_\_\_\_ No Adverse Effect \_\_\_\_\_ Adverse Effect \_\_\_\_\_ Streamlined Review

Recommendations for conditions or stipulations:

---

**[ ] ANTHROPOLOGIST**

Name:

Date:

Comments:

*Check if project does not involve ground disturbance*  Assessment of Effect: \_\_\_\_\_ No Historic Properties Affected \_\_\_\_\_ No Adverse Effect \_\_\_\_\_ Adverse Effect \_\_\_\_\_ Streamlined Review

Recommendations for conditions or stipulations:

---

**[X] HISTORIAN**

Name: Stephen Rogers

Date:

Comments:

*Check if project does not involve ground disturbance*  Assessment of Effect: \_\_\_\_\_ No Historic Properties Affected \_\_\_\_\_ No Adverse Effect \_\_\_\_\_ Adverse Effect \_\_\_\_\_ Streamlined Review

Recommendations for conditions or stipulations:

---

**HISTORICAL ARCHITECT**

Name:

Date:

Comments:

*Check if project does not involve ground disturbance*  Assessment of Effect: \_\_\_\_\_ No Historic Properties Affected \_\_\_\_\_ No Adverse Effect \_\_\_\_\_ Adverse Effect \_\_\_\_\_ Streamlined Review

Recommendations for conditions or stipulations:

---

**HISTORICAL LANDSCAPE ARCHITECT**

Name: Geoffrey Burt

Date:

Comments:

*Check if project does not involve ground disturbance*  Assessment of Effect: \_\_\_\_\_ No Historic Properties Affected \_\_\_\_\_ No Adverse Effect \_\_\_\_\_ Adverse Effect \_\_\_\_\_ Streamlined Review

Recommendations for conditions or stipulations:

---

**106 Advisor**

Name:

Date:

Comments:

*Check if project does not involve ground disturbance*  Assessment of Effect: \_\_\_\_\_ No Historic Properties Affected \_\_\_\_\_ No Adverse Effect \_\_\_\_\_ Adverse Effect \_\_\_\_\_ Streamlined Review

Recommendations for conditions or stipulations:

---

**C. PARK SECTION 106 COORDINATOR'S REVIEW AND RECOMMENDATIONS**

**1. Assessment of Effect:**

\_\_\_\_\_ No Historic Properties Affected \_\_\_X\_\_\_ No Adverse Effect \_\_\_\_\_ Adverse Effect

**2. Compliance requirements:**

A. STANDARD 36 CFR PART 800 CONSULTATION  
Further consultation under 36 CFR Part 800 is needed.

B. STREAMLINED REVIEW UNDER THE 2008 SERVICEWIDE PROGRAMMATIC AGREEMENT (PA)

The above action meets all conditions for a streamlined review under section III of the 2008 Servicewide PA for Section 106 compliance.

APPLICABLE STREAMLINED REVIEW Criteria  
(Specify 1-16 of the list of streamlined review criteria.)

Explanation: \_\_\_

C. PLAN-RELATED UNDERTAKING

Consultation and review of the proposed undertaking were completed in the context of a plan review process, in accordance with the 2008 Servicewide PA and 36 CFR Part 800.  
Specify plan/EA/EIS: \_\_\_\_\_

D. UNDERTAKING RELATED TO ANOTHER AGREEMENT

The proposed undertaking is covered for Section 106 purposes under another document such as a statewide agreement established in accord with 36 CFR 800.7 or counterpart regulations.  
Specify: \_\_\_\_\_

E. COMPLIANCE REQUIREMENTS SATISFIED BY USE OF NEPA

Documentation is required for the preparation of an EA/FONSI or an EIS/ROD has been developed and used so as also to meet the requirements of 36 CFR 800.3 through 800.6

F. STIPULATIONS/CONDITIONS

Following are listed any stipulations or conditions necessary to ensure that the assessment of effect above is consistent with 36 CFR Part 800 criteria of effect or to avoid or reduce potential adverse effects.

- No ground disturbing activities will occur
- Archeological sites will be flagged off with a buffer to prevent inadvertent destruction.
- Within demarcated areas trees will be flush cut.
- No slash will be stacked within demarcated areas.
- Vehicles used for spraying for MPB will be restricted to existing trails, paths, sidewalks and disturbed areas within the developed area of the Memorial
- Most staging will occur within existing parking and paved areas. All staging will take place within preciously surveyed areas containing no known cultural resources.

Recommended by Park Section 106 coordinator:

Name Amy Bracewell Title Historian\_

Date February 25, 2010

**D. SUPERINTENDENT'S APPROVAL**

The proposed work conforms to the NPS *Management Policies* and *Cultural Resource Management Guideline*, and I have reviewed and approve the recommendations, stipulations, or conditions noted in Section C of this form.

Name/Signature of Superintendent

\_\_\_\_\_

Date \_\_\_\_\_

DRAFT

## SUPPLEMENTAL GUIDANCE

The Section 106 process is described in regulations promulgated by the Advisory Council on Historic Preservation as 36 CFR Part 800. PLEASE SEE ESPECIALLY 36 CFR 800.4-6, 800.8, and 800.9. Additional guidance published by the Advisory Council includes *Section 106, Step by Step* and *Preparing Agreement Documents*. Both of these discuss information and documentation needs involved in Section 106. The following discussion is not a substitute for those documents, but a brief set of reminders.

This form may be used for actions that are undertakings as defined for purposes of Section 106. It is a model that may be altered to suit the needs of a particular park and its advisors. It may or may not be the most effective format for documenting Section 106 compliance, depending on the complexity and planning needs or history of the undertaking. It can be a starting point for the review process within NPS, and it may be used to document streamlined reviews under section III of the 2008 Servicewide Programmatic Agreement. For some cases, a memorandum, more detailed report, or NEPA document that includes information meeting documentation requirements in 36 CFR Part 800 may be necessary or preferable.

The form is designed to follow, in a condensed way, the basic questions that should be asked and answered in meeting responsibilities under 36 CFR Part 800. The basic questions are:

A. What is the project and how did the park identify it as an undertaking subject to Section 106?

(As defined in 36 CFR 800.2[o], an undertaking means a project, activity, or program that can result in changes in the character or use of properties listed or eligible for listing in the National Register of Historic Places. If in doubt about whether a project is an undertaking subject to Section 106 review, the park's Section 106 coordinator should consult the state historic preservation officer (SHPO) or others in the park's group of CRM advisors on Section 106.)

B. Does the park know whether the project's "area of potential effects" includes properties in or eligible for the National Register of Historic Places?

(Did the park define the area of potential effects in a comprehensive way? What historic properties will be affected by this undertaking? How did NPS identify those properties; did NPS make a reasonable and good-faith effort to ensure that no places that might be eligible for the National Register have been overlooked? Did NPS have enough information to evaluate the Register eligibility of properties in the area? Documentation may include descriptions of those properties and of efforts to identify them, such as National Register forms and reports or narratives summarizing the resources and survey efforts.)

C. How will the project affect any such eligible historic properties?

(How did the park and its advisors apply the criteria of effect and adverse effect in 36 CFR 800.9? How did the park get the advice of the SHPO, and of other interested persons, on this point?)

D. Did the park provide opportunities for comment by local governments, Indian tribes, other interested persons and the public that were appropriate to the scale and type of the undertaking and the known or expected public interests?

E. If the undertaking would have adverse effects, how did the park and its advisors consider alternatives that would avoid or mitigate the potential for adverse effects?

Generally, Section 106 consultation results in an agreement document of the types described in the Council's *Preparing Agreement Documents*. That booklet provides suggestions for writing agreement documents and sample formats, as well as some standard language for conditions and stipulations.

Decisions about which CRM disciplines and technical skills are relevant to the project at hand are important. This form should reflect information showing how the park made decisions about which CRM specialists should participate in and advise on individual projects. It should be used to indicate how CRM specialists have been involved in those decisions. This does not mean, however, that every one of the park's CRM advisors must comment on every undertaking.

#### ITEM BY ITEM:

No. 2: "Area of potential effects" is defined in 36 CFR 800.2(c) as "the geographic area or areas within which an undertaking may cause changes in the character or use of historic properties, if any such properties exist."

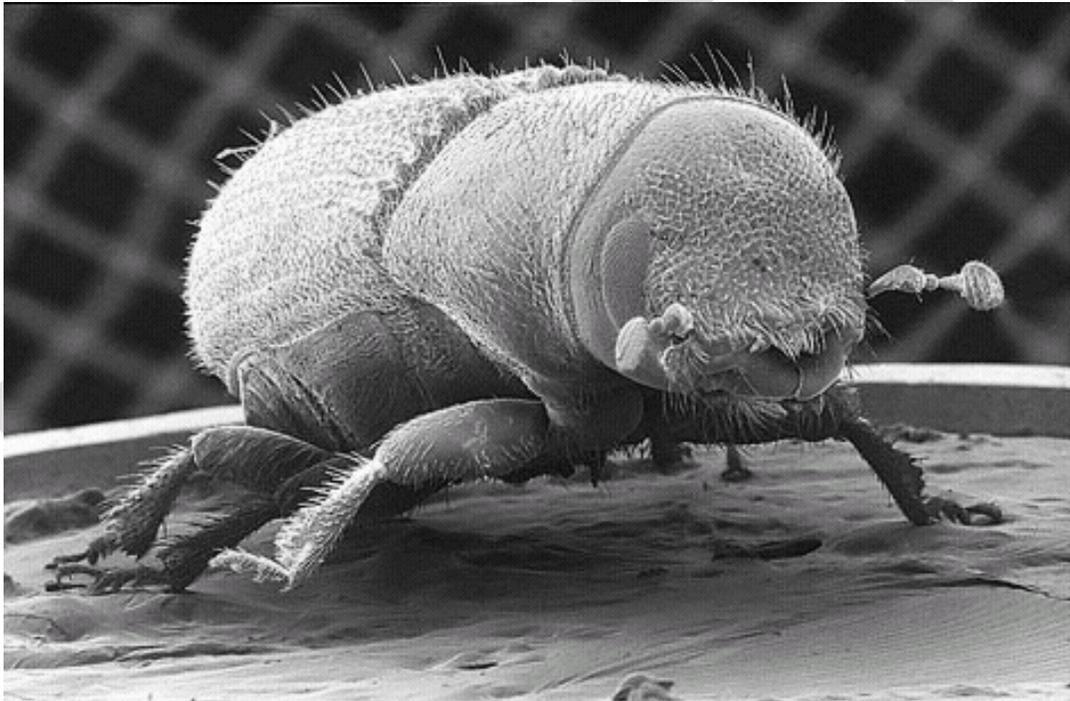
No. 4: In the first blank, please include applicable park facility or site numbers or IDLCS, IDCLI, ARI, & HABS/HAER numbers. For location, please note UTM coordinates, if available, or township, range, and section if applicable and available. If neither of these is readily available, other location description may be used. In the last blank, specify National Register status of affected resource(s), entering the appropriate number from the list below:

- (1) listed in Register and documented
- (2) listed but not documented
- (3) determined eligible by the Keeper of the Register
- (4) determined ineligible by the Keeper
- (5) found eligible for 106 purposes through consultation with the SHPO
- (6) found not eligible for 106 purposes through consultation with the SHPO
- (7) a designated National Historic Landmark
- (8) within a Register-eligible district please name district
- (0) status unknown by person completing Part A of the form

**Mount Rushmore National Memorial  
Mountain Pine Beetle  
Resources Assessment & Action Plan**

**APPENDIX III PHOTO DOCUMENTATION**

- **FOREST HEALTH**
- **CULTURAL RESOURCES**
- **FIRE MANAGEMENT**



Mountain pine beetle (FS photo)

Forest Health



Adult mountain pine beetle and larvae in beetle galleries



MPB infestation in Black Elk Wilderness



Photo showing thinned forest resistance to infestation



Carbaryl spraying in ponderosa pine forest



Truck or ATV mounted sprayer for Carbaryl treatments



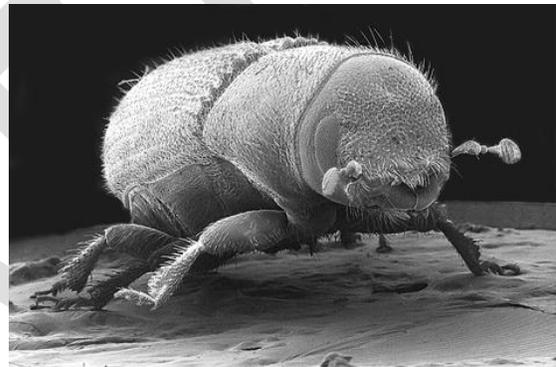
Pitch tubes showing successful beetle infestation



Black Hills ponderosa pine forest effectively thinned to mitigate MPB and fire hazards



Cut and chip fuel treatment in the Black Hills



Mountain pine beetle (*Dendroctonus ponderosae*)

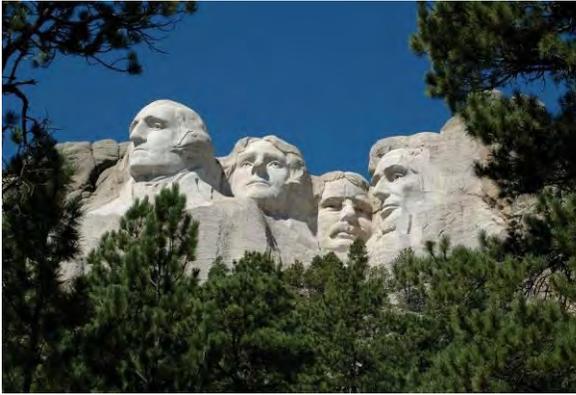


Verbenone pouch (repellent)

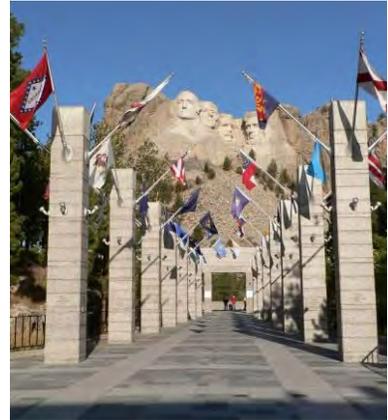


Blue stain  
MPB-induced "blue stain" fungus

Cultural Resources



Mount Rushmore National Memorial Sculpture



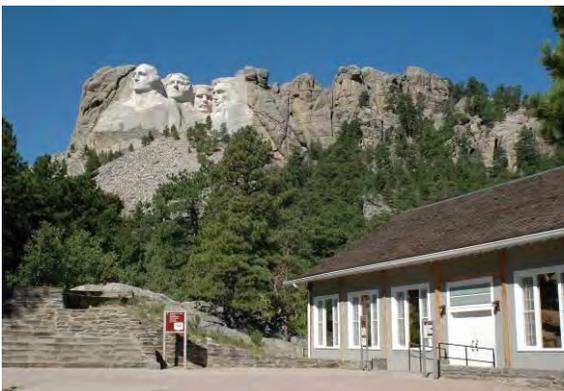
Avenue of Flags



Scenic View



View of Developed Area



Artist's Studio



Artist's Studio Interior

## Fire Management



Thinning project pre-treatment



Thinning project post-treatment



Chipper working at Mount Rushmore



Chips on the ground in thinning unit



Burning slash piles at Mount Rushmore

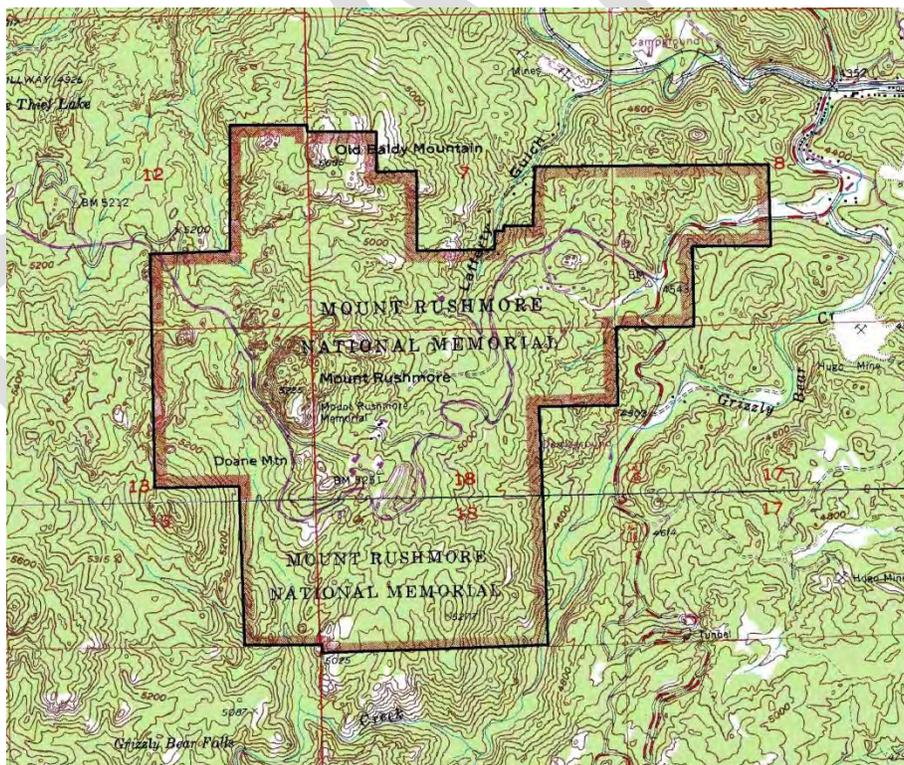


Prescribed fire in Black Hills ponderosa pine

# Mount Rushmore National Memorial Mountain Pine Beetle Resources Assessment & Action Plan

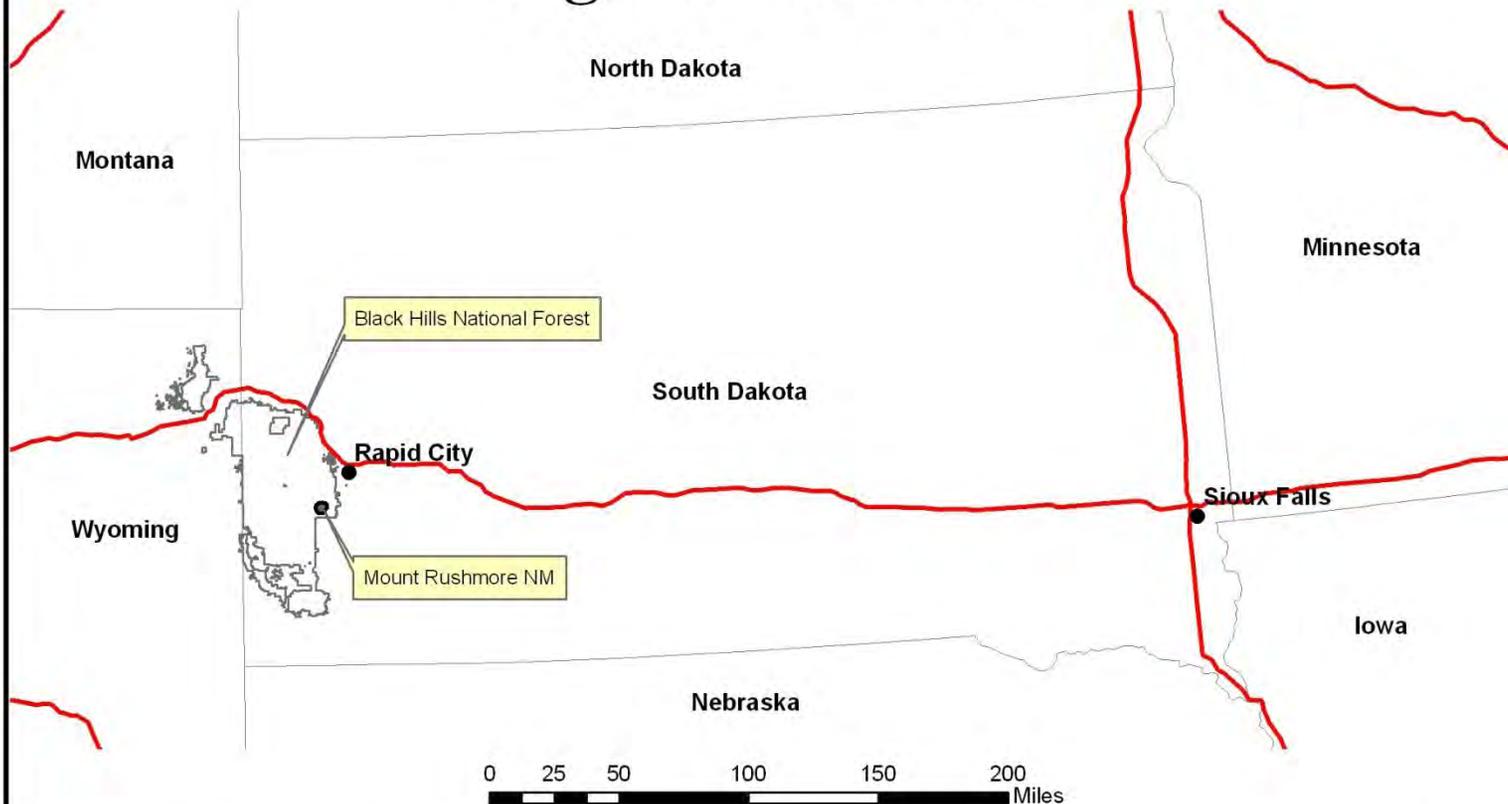
## APPENDIX IV MAPS

1. Regional overview
2. Black Hills area overview showing Mount Rushmore NM relative to 2009 MPB infestation
3. Local area overview showing Mount Rushmore NM relative to 2009 MPB infestation
4. Mount Rushmore NM MPB risk assessment for 2010 and 2011
5. Mount Rushmore NM forest health assessment and tactics
6. Black Hills National Forest adjacent fuel treatments 2000-2010
7. Black Hills National Forest MPB aerial detection results 2006-2009
8. Mount Rushmore NM vegetation classification and land use cover
9. Mount Rushmore NM fire treatment units



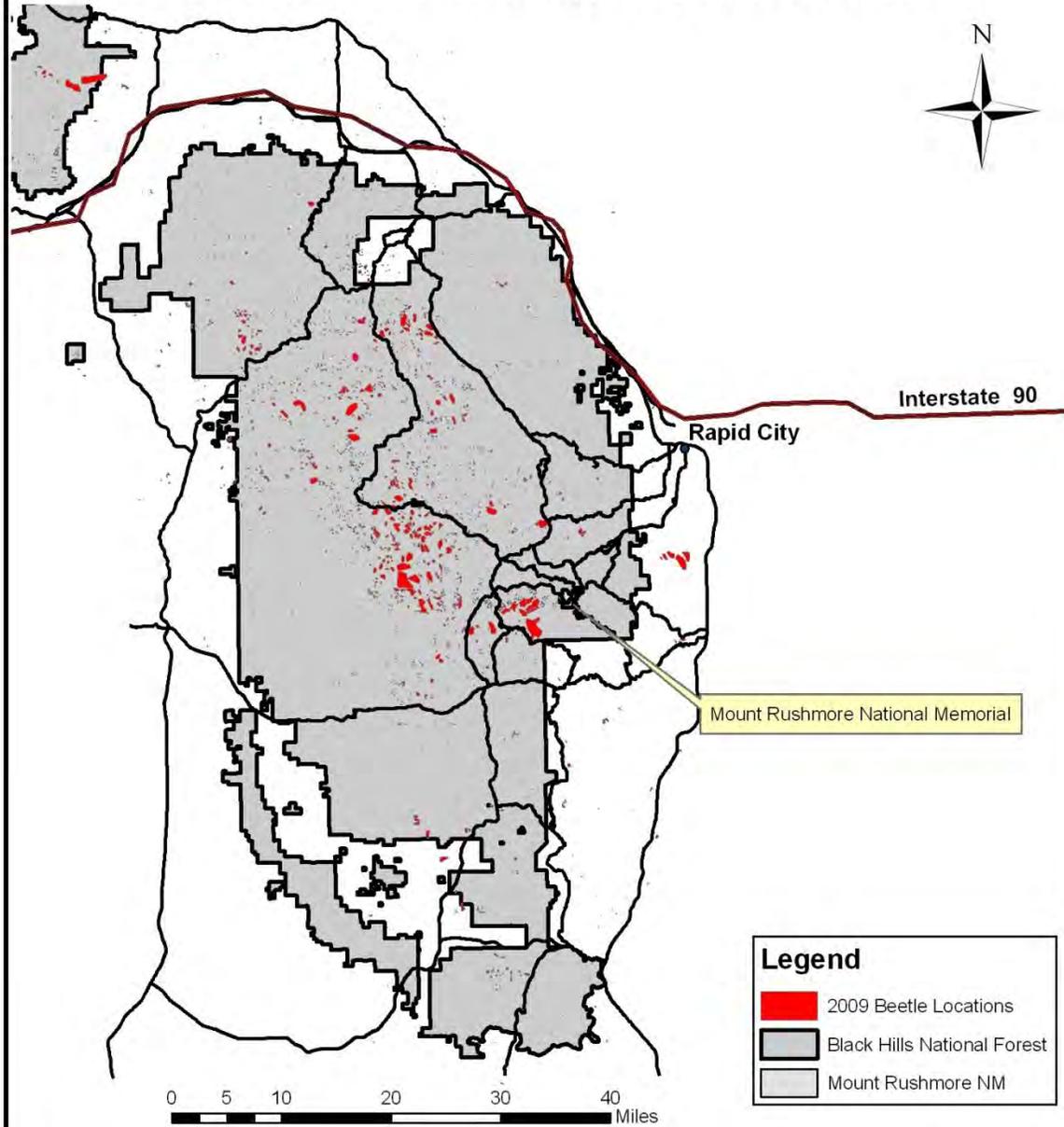


# Mount Rushmore National Memorial Regional Overview



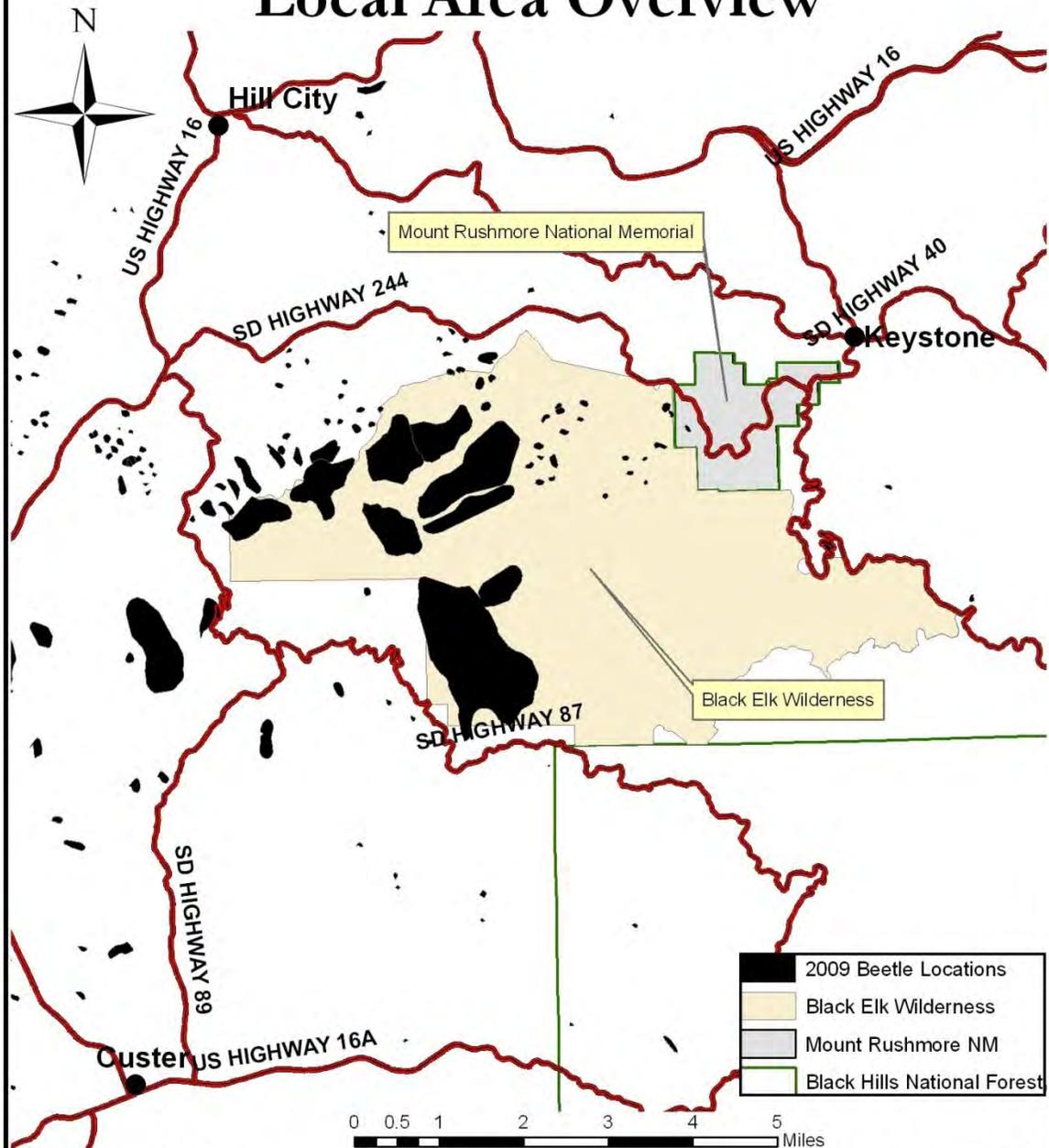


# Mount Rushmore National Memorial Black Hills Area Overview





# Mount Rushmore National Memorial Local Area Overview

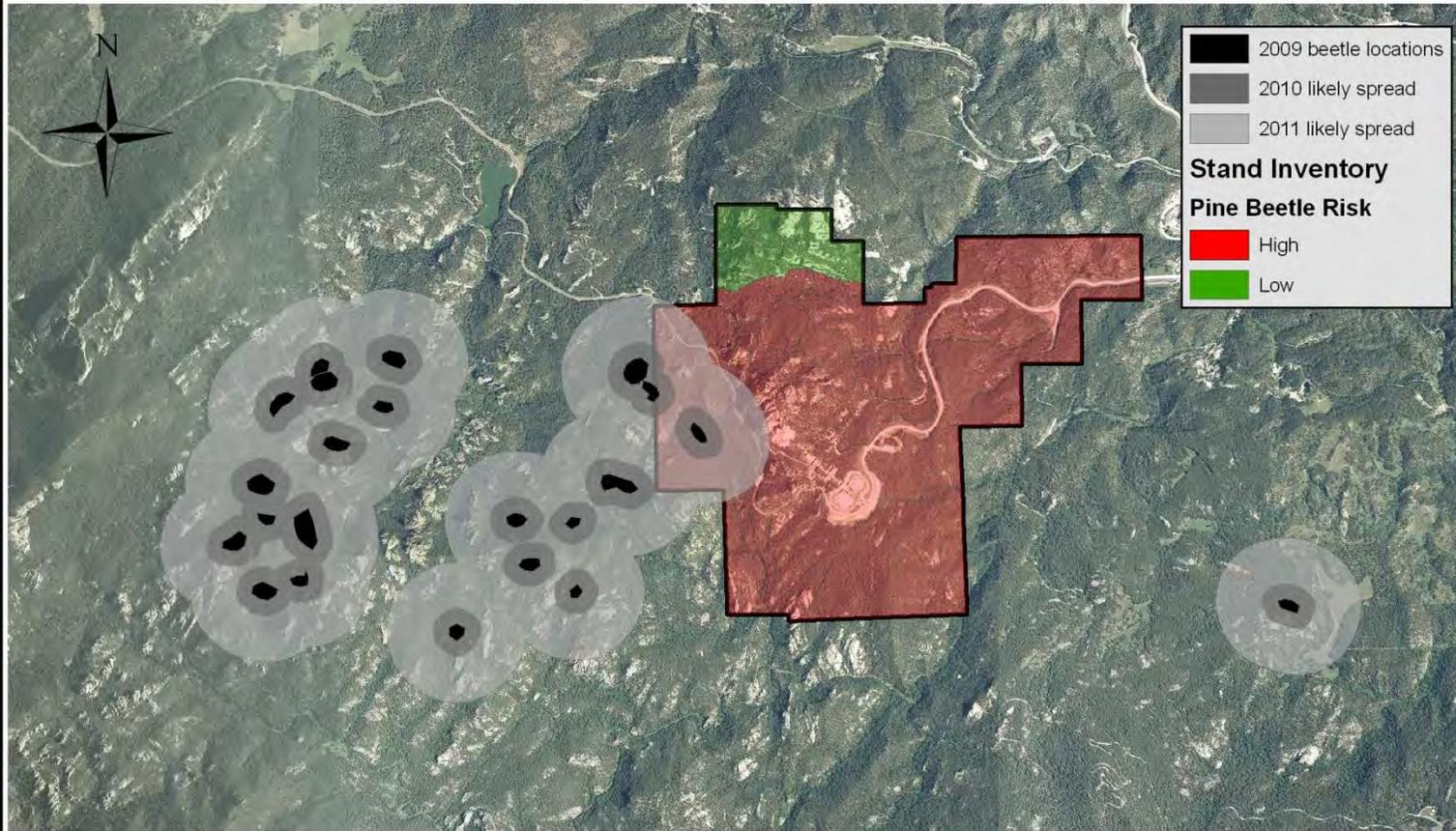


Produced by RRAT GIS specialist

February 2010



# Mount Rushmore National Memorial Mountain Pine Beetle Risk Assessment

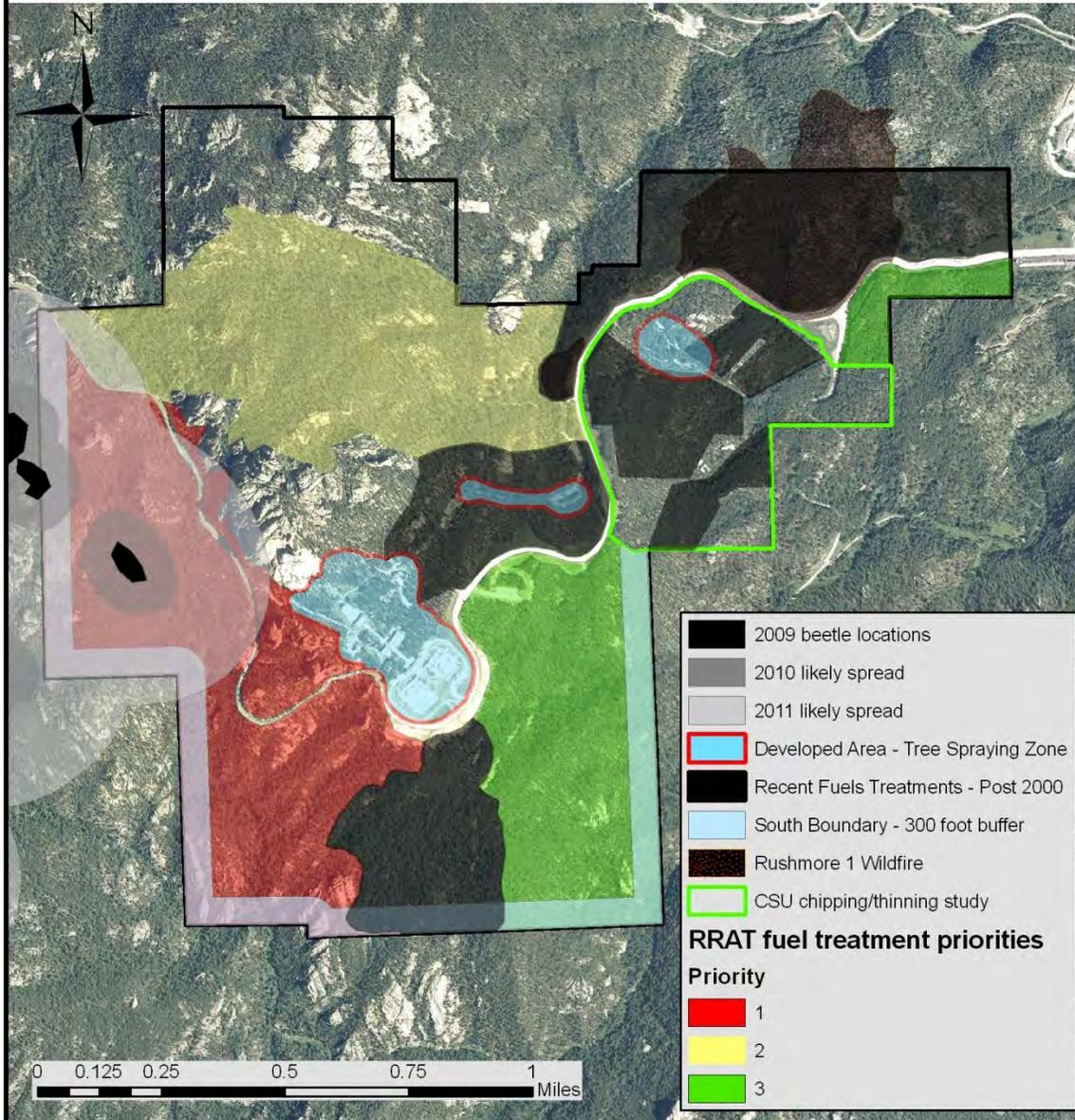


Produced by RRAT GIS Specialist

February 2010

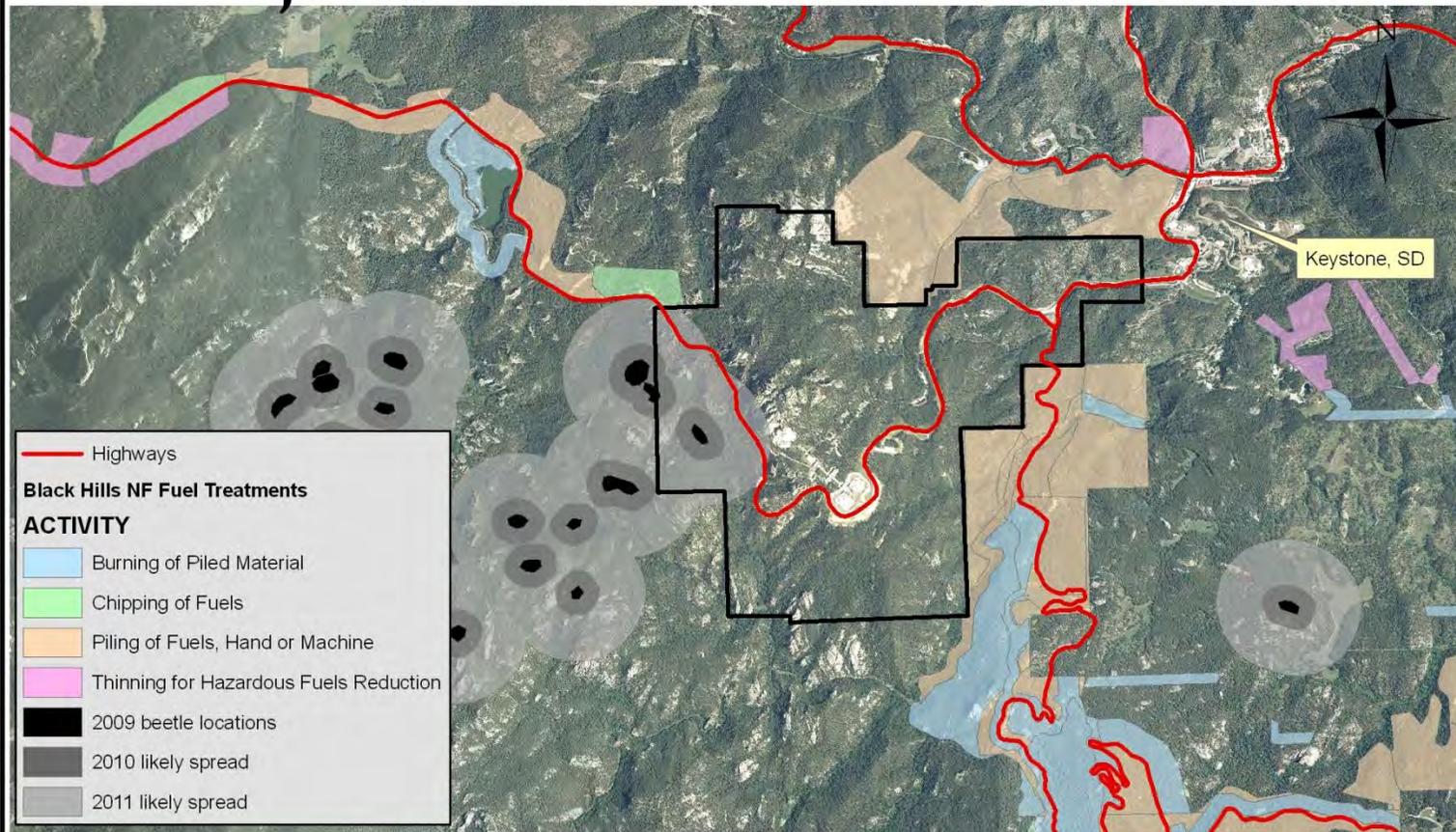


# Mount Rushmore National Memorial Forest Health Assessment





# Black Hills National Forest Adjacent Fuel Treatments 2000-2010

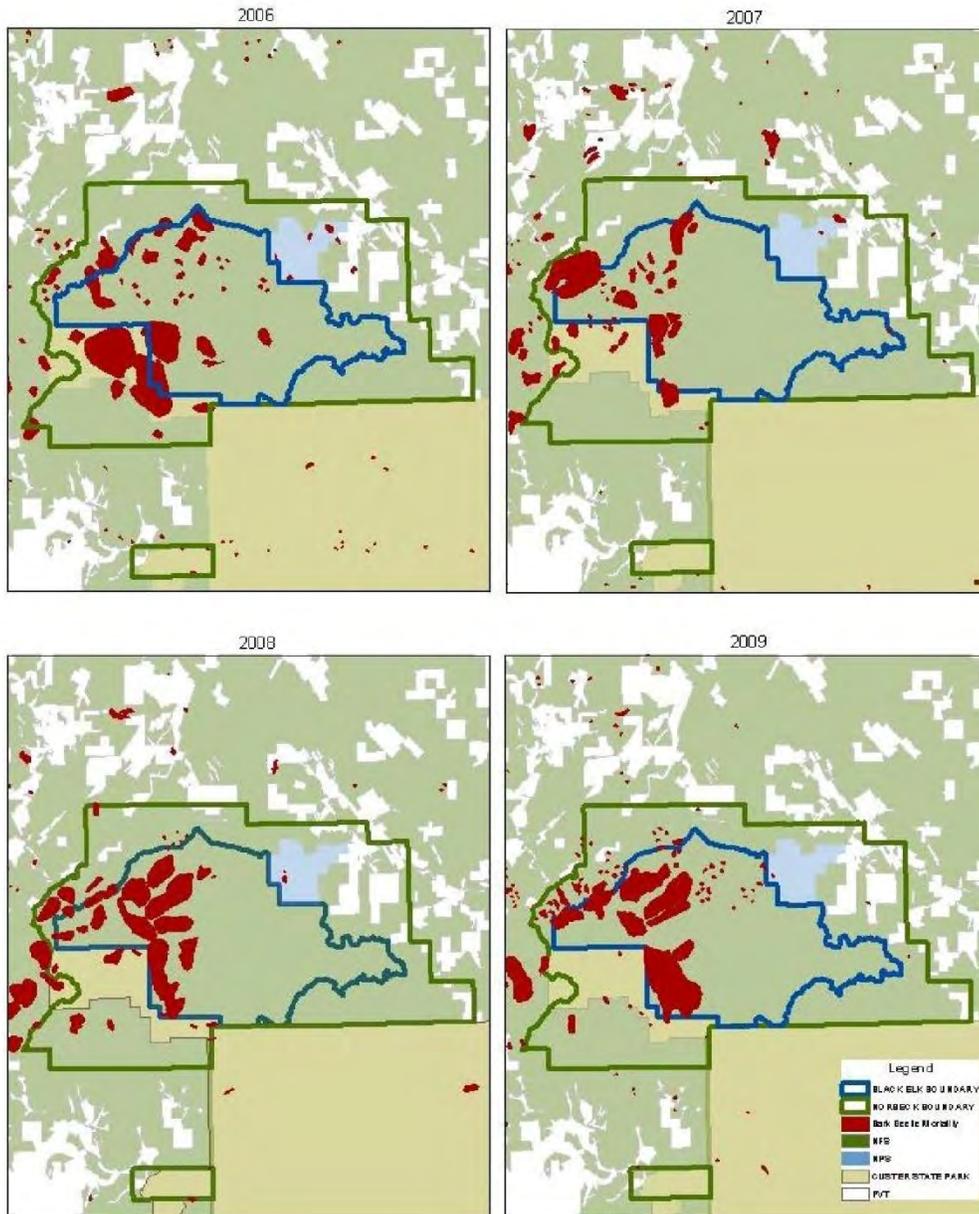


Produced by RRAT GIS Specialist

February 2010

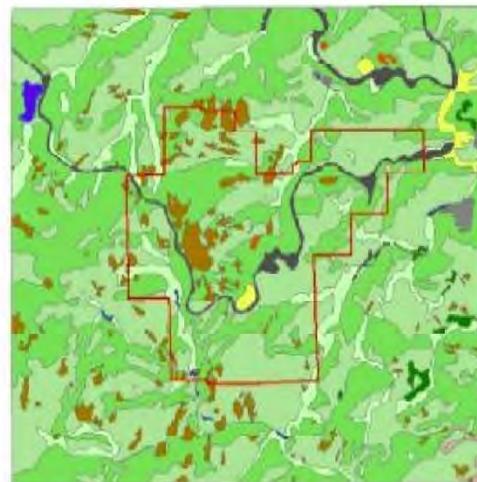


## Progression of Mountain Pine Beetle Infestation US Forest Service Aerial Detection 2006-2009





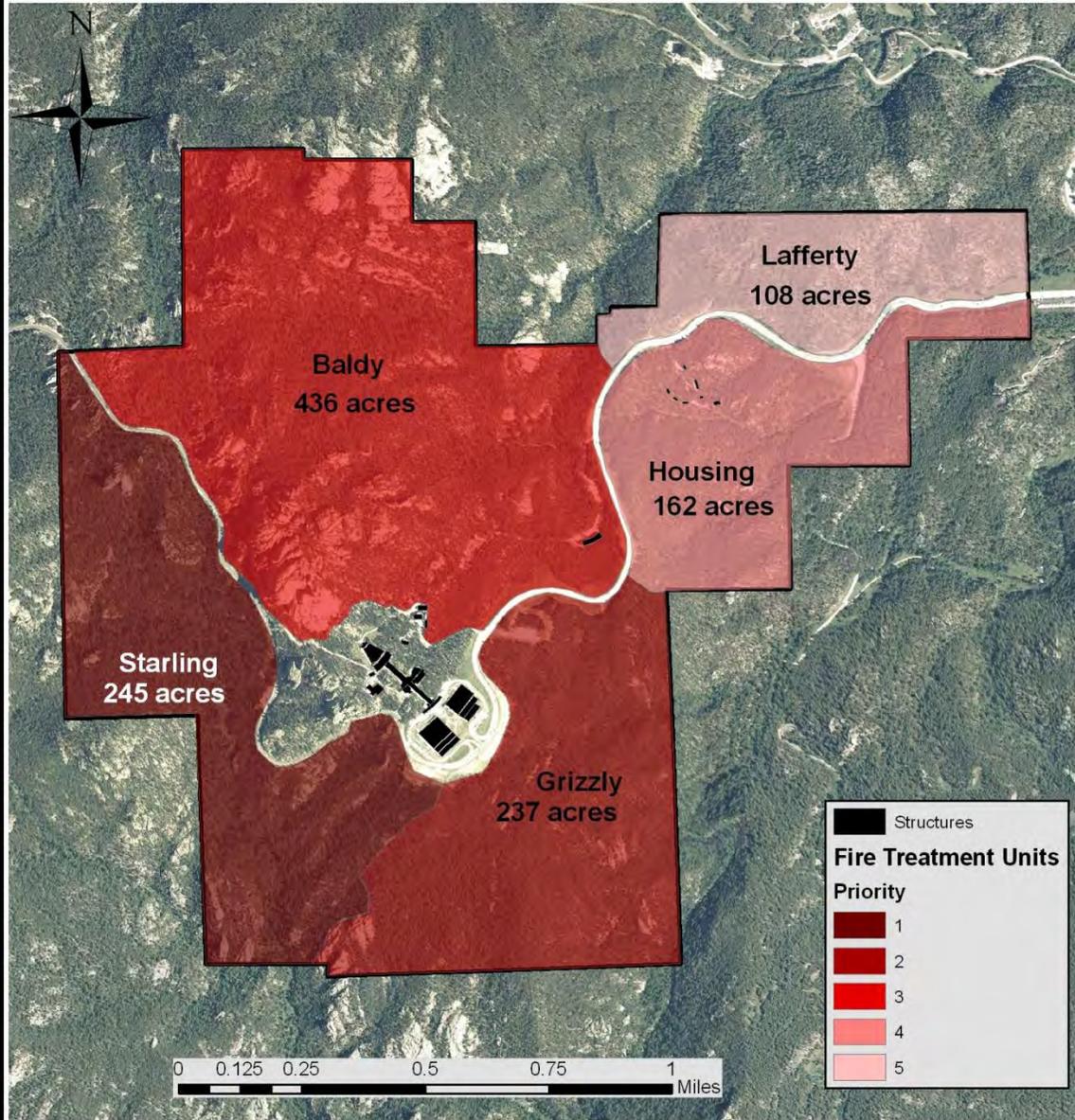
# Mount Rushmore National Memorial Vegetation Classification and Land Use Cover



Map Unit	Map Unit Name	Associations Included
HB	Bur Oak / Ironwood Forest	<ul style="list-style-type: none"> <li>Bur Oak / Ironwood Forest</li> </ul>
PJ	Ponderosa Pine / Common Juniper Woodland	<ul style="list-style-type: none"> <li>Ponderosa Pine / Common Juniper Woodland</li> </ul>
P1	Ponderosa Pine Complex I	<ul style="list-style-type: none"> <li>Ponderosa Pine / Little Bluestem Woodland</li> <li>Ponderosa Pine / Sun Sedge Woodland</li> <li>Ponderosa Pine / Bearberry Woodland</li> <li>Ponderosa Pine / Rough Leafed Rice Grass Woodland</li> </ul>
P2	Ponderosa Pine Complex II	<ul style="list-style-type: none"> <li>Ponderosa Pine / Bur Oak Woodland</li> <li>Paper Birch / Beaked Hazel Forest</li> </ul>



# Mount Rushmore National Memorial Fire Treatment Units



**Mount Rushmore National Memorial  
Mountain Pine Beetle  
Resources Assessment & Action Plan**

**APPENDIX V SUPPORTING DOCUMENTATION**

**FOREST HEALTH EVALUATION**

**RCSC-08-03**

**EVALUATION OF MOUNTAIN PINE BEETLE  
ACTIVITY IN THE NORBECK AREA,  
BLACK HILLS NATIONAL FOREST**

**MAY 2008**

**PREPARED BY:** *Kurt K. Allen*

**KURT K. ALLEN**  
**Service Center Leader**  
**Rapid City Service Center**

**PREPARED BY:** *Daniel F. Long*

**DANIEL F. LONG**  
**Forest Health Technician**  
**Rapid City Service Center**

**APPROVED BY:** *Susan E. Gray*

**SUSAN E. GRAY**  
**Group Leader**  
**R2, Forest Health Management**

Renewable Resources  
USDA Forest Service  
Rocky Mountain Region  
740 Simms Street  
Golden, CO 80401

## INTRODUCTION

Mountain pine beetle (*Dendroctonus ponderosae*) is the number one insect killer of pines throughout the western United States. The beetle is a native species to the West and attacks most pine species including ponderosa pine in the Black Hills.

The mountain pine beetle has one generation per year in the Black Hills. Adult flight typically occurs in July and August, with the peak flight around the first week of August. During this flight, adult beetles leave previously infested trees and attack new host trees. The adults attack green trees, chew through the bark and construct galleries, along which eggs are laid. Larvae hatch from the eggs and begin feeding on the phloem of the tree in late summer to early fall. Larvae, pupae or callow adults overwinter under the bark of the infested tree. In the spring, the beetle finishes its maturation process under the bark of the tree.

Populations of the mountain pine beetle are typically found at an endemic level, killing and reproducing in stressed or weakened trees, including lightning struck and root diseased trees. At times, beetle populations increase dramatically. In the increasing and outbreak stages, any host trees, healthy or stressed, are attacked and killed.

Mountain pine beetle has always been a part of the Black Hills forest ecosystem, with outbreaks occurring periodically. The first recorded outbreak in the Hills occurred from the late 1890's through the early 1900's and killed an estimated 1-2 billion board feet of timber. Outbreaks also have occurred in the 1930's, 1940's, 1960's and 1970's, each lasting 8-13 years with the 1970's outbreak being larger and causing more mortality than any of the others, except for the turn of the century outbreak.

In the mid 1990's, beetle caused mortality was at low, endemic levels across the forest. Starting in the late 1990's large beetle epidemics started and over the past 10 years there have been outbreaks in Beaver Park in the northern Hills and a large outbreak occurring in the central Hills from Deerfield Reservoir down to Bear Mountain and east to the Black Elk Wilderness. The outbreak in the central Hills is one that is causing landscape level changes in the forest. The first significant signs of beetle mortality started occurring in Black Elk Wilderness in about 2003, and have continued to grow since then.

Outbreaks of the beetle can cause considerable changes in forested stands, including a reduction in average stand diameter and stand density (McCambridge et al. 1982). Tree mortality levels of 25% can be expected throughout the landscape surrounding outbreak areas and levels of up to 50% or more can occur in heavily attacked stands (McCambridge et al. 1982). Outbreaks can conflict with land management objectives: they reduce timber stocking levels, affect wildlife habitat, increase short term fire risks, and can negatively affect visual and recreation values (Samman and Logan 2000).

Ponderosa pine stands in the Black Hills differ in their susceptibility to the beetle. Generally stands are considered to be most susceptible when 75% of the stand is in the 7-13 inch diameter range and the stand density is over 120 feet of basal area per acre (Stevens et al. 1980, Schmid and Mata 1992, Schmid et al. 1994). It should be noted that these are general hazard rating guidelines and most stand inventory data are based on stand averages; small pockets that have high stocking levels within a low density

stand can provide a focal point for beetle buildup. Stand hazard ratings give an indication of which stands are most likely to have initial beetle infestations. Once an outbreak has started, any stands containing suitable host material are likely to have damage. These ratings also give no indication of local beetle pressure. However, hazard ratings can help to prioritize what stands can be treated to minimize beetle susceptibility. It also points out that the best approach to reducing losses to the mountain pine beetle for the long-term is forest management to reduce stocking densities. Decreases in stocking densities will lower the probability that beetle outbreaks will be initiated, but it is a continual process to keep stands at lower hazard. Recent work has shown that areas treated to 60 basal area can be expected to reach high hazard (120 basal area) again in about 25-50 years. Stands treated to 80 basal area can reach 120 basal area in 13-36 years, and stands treated to only 100 basal area will be back to 120 basal area in 9-16 years (Obedzinski et al. 1999).

Generally, when beetle populations reach outbreak proportions, natural enemies, such as birds and predaceous or parasitic insects, are not numerous enough to have a noticeable effect on the outbreak. Natural enemies are more important in limiting mountain pine beetle populations that are in the endemic phase (Bellows et al. 1998). Likewise, environmental factors cannot be counted on for lessening the outbreak. For example, temperatures of  $-10^{\circ}$  F can kill beetles in October but temperatures of  $-25^{\circ}$  are needed by February (Schmid et al. 1993). These temperatures need to be reached under the bark, in the phloem, as opposed to air temperatures. Beetles survive low temperatures by removing water from within their cells and replacing it with glycoproteins, which act as a type of anti-freeze (Bentz and Mullins 1999). This is a process known as cold hardening. Beetles have supercooling points, the temperature at which ice crystals start to form in body tissues, as low as  $-32^{\circ}$  F in January (Bentz and Mullins 1999). Phloem temperatures become equal to air temperatures only when they persist for 24 hours or more (Schmid et al. 1993). Generally, phloem temperatures are found to be 5 to  $10^{\circ}$  F warmer than air temperature.

The focus of this evaluation is to examine the beetle situation in the Norbeck area.

## METHODS

Transect lines were run throughout the Norbeck area in October and November 2007. Each transect line was from 1 mile to 3 miles long and 1 chain wide, covering an area of 8-24 acres. Recently killed trees were tallied along each transect line. Attacked trees were broken into three categories: new beetle hits (year 2007 green attacked trees), one-year-old hits (2006), and two-year-old hits (2005).

A total of 4 transect lines were run for a total of 44 acres evaluated. One in the northeast part (near Horsethief Lake), one in the western part (near Lost Cabin), one in the central part (south side of Harney Peak) and one in the southern part (Near Iron Creek). On each line, variable radius prism (BAF 10) plots were measured every 1/4 mile. Diameter at breast height (DBH) was taken for all in trees in each plot. These measurements were used to provide an estimate of basal area (BA), DBH, and trees per acre (TPA) along the transect lines.

In addition, digital color infrared aerial photography was taken of the Norbeck and Black Elk areas in August of 2007. This photography was, then, interpreted and classified for

bark beetle caused mortality. The classification was of acres of mortality and broken into three categories: 1-year (2006), 2-year (2005), 3-year+ (older) and fire mortality. The interpretation was a visual classification using Findit, a GIS tool developed by the Forest Health Technology Enterprise Team.

## RESULTS

Table 1 lists the number of beetle-killed trees found on all transects for the 2007 ground survey in the Norbeck area. Mortality from 2005, 2006, and green infested trees show that there is an average of 83 trees per acre killed throughout this area. Beetle populations have been doubling since 2005; that is, there were approximately 2 green infested trees for every 1-year-old killed tree. The increase will continue from 2006 to 2007. The combination of increasing tree mortality and high number of trees being killed per acre characterize this area as being in an outbreak.

Table 2 lists the number of attacks by transect line in the Norbeck area, and corresponding average basal area and diameter of trees along that line. Based on the ground surveys, the areas having the largest concentrations of beetles are located in the western part of the project area, particularly the Lost Cabin area, the south side of Harney Peak, and the Iron Creek area. Both the Lost Cabin and south Harney Peak areas had much higher rates of green infested to 1-year old infested. Iron Creek had a higher amount of older dead compared to green attacks. The north and east parts of the Project area had the lowest level of beetle activity at this time, however, stand conditions are such that it is very susceptible. The average DBH ranged from 10 inches to 14.9 inches and the average basal area ranged from 65 to 108 square feet per acre. This combination of tree size and stand density provide a large area of suitably sized material for beetle infestation and are characterized as moderate to high beetle hazard. The percent of trees killed per acre ranged from 17% (north east portions) to over 100% (Iron Creek area).

Predicting mountain pine beetle spread and cumulative mortality over the course of an outbreak is difficult. The amount of tree mortality from our transect lines is conservative in that only mortality that has occurred in the last three years was accounted for and the outbreak is by no means over. The outbreak is continuing to increase over the landscape. There was some tree mortality in prior years that was not accounted for, and there will be a continued increase in mortality in the next few years.

Table 3 below shows the results of the aerial photography classification. The results of this analysis show that 93% of the mortality has occurred in the Black Elk Wilderness and 6% in the Norbeck Wildlife Management Area. As of 2006, approximately 28% of the total acreage of the wilderness that has been affected by tree mortality due to bark beetle infestation. In a two-year period (2004 to 2006), there has been a 3-fold increase in acres of tree mortality due to bark beetles. Figure 1 shows the results of the photography analysis and the current location of the largest areas of beetle mortality. Currently, it is not possible to classify current (2007) mortality with aerial photography interpretation, due to the tree crowns remaining green till the following year. However, ground surveys show a substantial increase in tree mortality in 2007.

**Table 1.** Number of mountain pine beetle attacked trees along 5.5 miles of transect lines in the Norbeck Area, and the ratio of attack frequency between years.

<b>Year</b>	<b>Total Trees Attacked (44 acres)</b>	<b>Attacked Trees Per Acre</b>
2005 Dead	544	12.4
2006 Dead	969	22
<u>Green Infested</u>	<u>2128</u>	<u>48.4</u>
All Attacks 2005-2007	4166	82.8

**RATIO OF ATTACK FREQUENCY BETWEEN YEARS**

2005:2006 -- 1:1.8

2006:2007 -- 1:2.2

2005:2007 -- 1:3.9

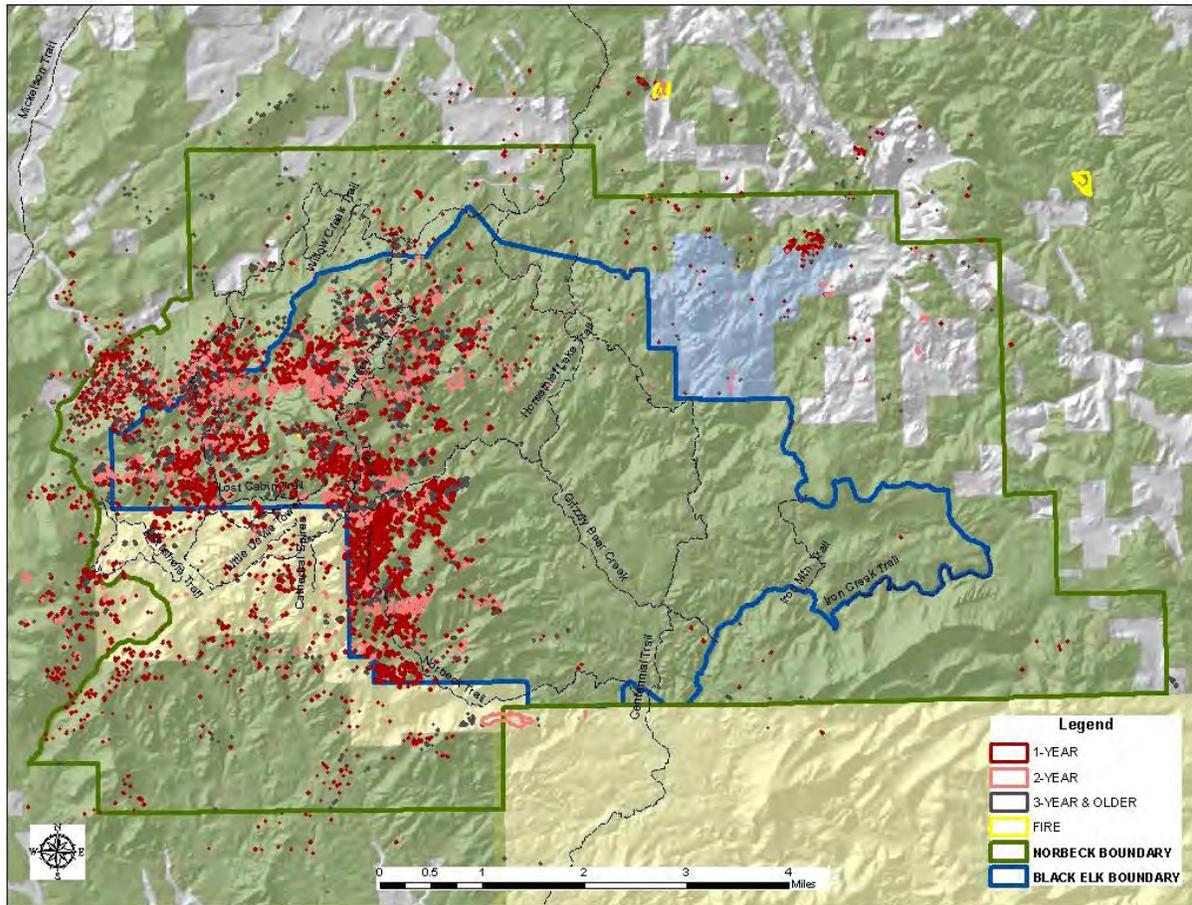
**Table 2.** Transect lines in the Norbeck area and amount of tree mortality associated with each.

Transect	CY	1yr	2yr	Total	BA	DBH	TPA	Trees Killed/Acre	% TPA KILLED
1	16	15	4	35	65	14.6	53	8.8	17%
2	801	341	318	1460	98	12.4	127	60.8	48%
3	266	327	123	716	88	14.9	59	89.5	152%
4	1045	286	99	1430	108	10	213	178.8	84%
<b>Sum</b>	<b>2128</b>	<b>969</b>	<b>544</b>	<b>3641</b>					
<b>Average</b>	<b>532.0</b>	<b>242.3</b>	<b>136.0</b>	<b>910.3</b>	<b>89.8</b>	<b>13.0</b>	<b>113.0</b>	<b>84.5</b>	<b>75.0%</b>

**Table 3.** Acres of bark beetle caused mortality, derived from aerial photography classification.

<b>Mortality Year</b>	<b>Acres of Mortality</b>
2006	2333
2005	1095
2004 and older	611
Total	4101

**Figure 1.** Results of aerial photography interpretation and classification.



## **CONCLUSIONS**

The number of trees killed per acre found in parts of Norbeck/Black Elk Wilderness is extremely high. Certainly, there are large portions of the wilderness that already have 100% mortality of the pine overstory, and this level of mortality is expected to continue in the near future. As the survey data show, 60% of the dead trees encountered this fall are still green, but dead and infested and will produce new beetles in 2008. In parts of the area, this number is much higher, such as the south side of Harney Peak, where there are about 4 green, infested trees for every one year old dead tree. This is a clear indication of increasing tree mortality in years to come. Stand conditions in large parts of the entire area remain susceptible to sustaining high levels of beetle mortality and allowing the outbreak to expand farther. Much of the western part of the project area is heavily infested with beetles right now, the eastern part of the area is less heavily infested, but contains stands that are very similar to those being killed at this time. This creates the opportunity for another 3-5 years of high beetle activity across the landscape.

Mountain pine beetle is at outbreak proportions in the Norbeck area. Significant changes on the landscape have already occurred and these changes will continue to occur into the future. In ponderosa pine in the Black Hills, it was estimated that around 80% of susceptible trees had been killed in portions of the Bear Mountain area in the late 1980's and early 1990's (Pasek and Schaupp 1992) and 100% of susceptible trees had been killed in some stands in the Beaver Park area in the late 1990's through 2000 (Allen and McMillin 2001). McCambridge and others (1983) found that greater than 50% of heavily attacked stands of ponderosa pine were killed in Colorado. The final totals for mortality in Norbeck have already equaled or surpassed the 50% level in moderate or high risk stands, some reaching 100% mortality, and the mortality is still growing and expanding.

The only effective long-range strategy to minimize beetle-caused mortality is controlling stand conditions through silvicultural means over large landscapes and monitoring for areas of beetle buildup. Treating large landscapes does not mean every stand needs to be treated. Denser stands can be left for other objectives and should be afforded some protection from beetles if the surrounding area has been treated to reduce stand density and beetle hazard. Denser stands will require more intense monitoring, as they are still more susceptible to beetles. If beetles are found in these stands, then there should be a contingency plan guiding whether they will be treated or not. Creating diverse stand conditions across the landscape will result in an overall forest that is less susceptible long term to landscape level beetle events.

## **RECOMMENDATION**

The use of silvicultural treatments should be pursued where possible in the project area. These are management actions that increase tree vigor and reduce stand susceptibility to beetle attack through reducing basal area or stand diameter. They are preventative treatments that should be completed prior to stands experiencing beetle outbreaks, when possible. In the Black Hills, stands that are less than 80 square feet of basal area per acre with average stand diameters below 7 inches are at the lowest risk. Treatments should be designed to reduce stand conditions below these thresholds, where desired. Treatments are most effective when carried out on a landscape level, mixing treatments to create a diverse forest. Even though there is an outbreak in progress, treating stands that are as of yet unaffected by the beetle can help in

reducing mortality in those stands treated prior to beetle attack. Considering the current beetle outbreak, any treatments should be implemented as soon as possible.

The use of sanitation harvests, removing currently infested pines prior to the beetle maturation and emergence should be used as appropriate. These green trees are already dead, however, the foliage will not change color until the following summer. Trees removed in a sanitation harvest are treated; either moved to at least one mile from the nearest live host type or processed at the mill, prior to beetle emergence. This can reduce mountain pine beetle populations in localized areas and in individual stands by removing most of the currently infested trees. This can provide some protection to surrounding uninfested trees and stands by removing a large source of attacking beetles. These areas must be marked and cut prior to beetle flight, i.e., before the end of June. Sanitation is not effective on a large scale.

There are parts of the area where no silvicultural treatments are likely to be carried out and beetle populations will continue to grow and tree mortality will increase. The extent of damage that will occur and how long it will continue are difficult to state for sure; however, considering the available food supply for the beetles, high levels of mortality are likely to continue for at least another 2-3 years. Because of the current very high numbers of beetles and overall susceptible stand conditions, Black Elk Wilderness will be very heavily impacted. Parts of the wilderness already have 100% of the overstory killed, and this level of mortality is likely to continue to expand in other susceptible stands in the area.

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## **DRAFT – From personal communication with Kurt Allen, 11/2009 – DRAFT**

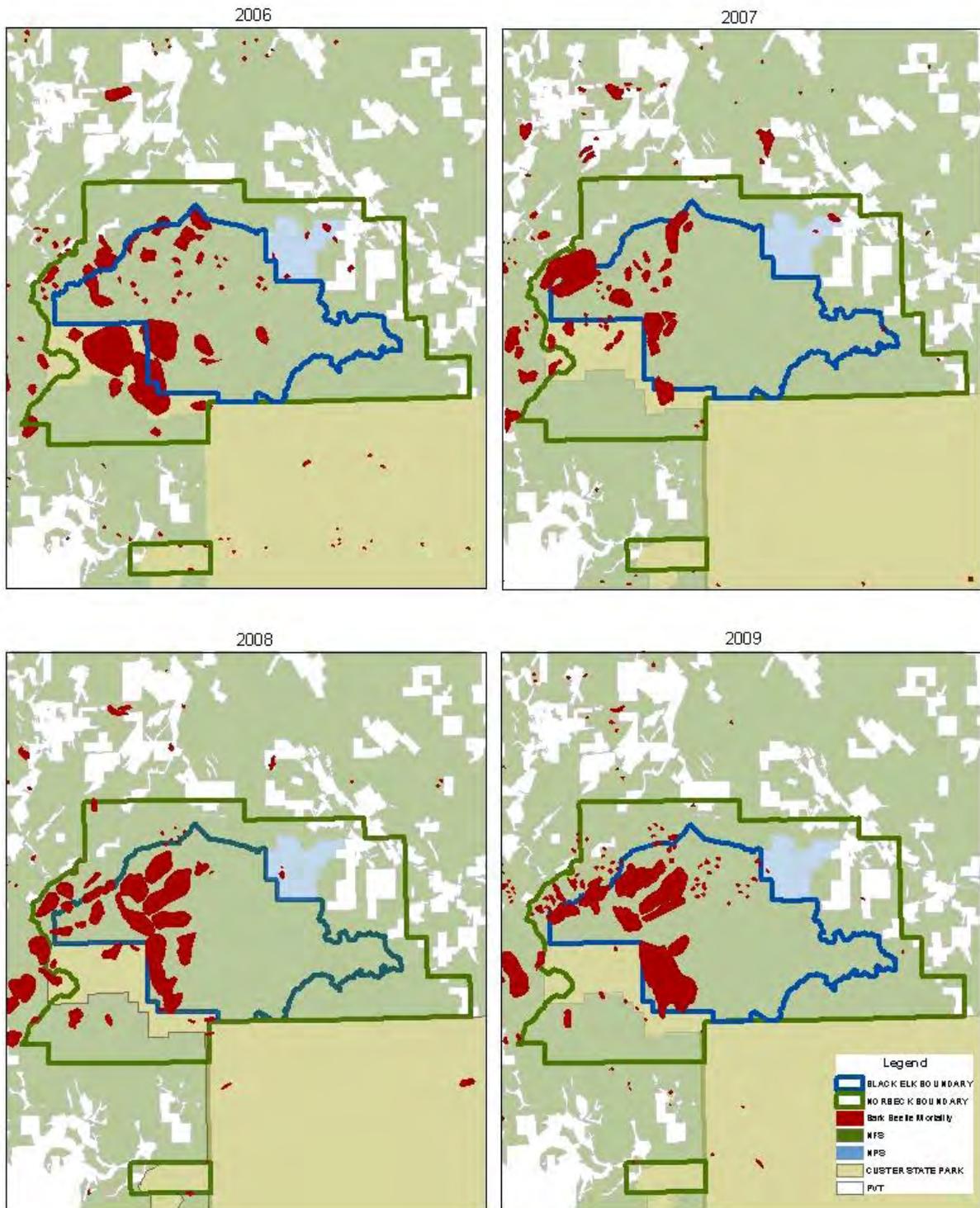
### **Current Conditions**

There is currently a landscape level mountain pine beetle epidemic occurring in the central Black Hills. The most active area of population growth and most concentrated tree mortality the past 3 years has been in and around Black Elk Wilderness. Most of the mortality in the wilderness to date has occurred in the south and west portions of the wilderness. Tree mortality has reached close to 100% in much of this area and the beetles have begun attacking small diameter trees (3-4") and non-hosts such as spruce as the preferred host supply has been depleted. The area north and east of Harney Peak was only lightly infested in 2008, but in the summer of 2009, there was considerable tree mortality beginning to occur in the Elkhorn Ridge, Upper Pine Creek area, and the ridges above Horsethief Lake. Figure 1 shows the progression of beetle activity, based on aerial surveys, over the past 4 years in the Norbeck/Mt. Rushmore area.

Ground surveys in the fall of 2009 in the northeast part of the wilderness (roughly from Willow Creek/Palmer Gulch KOA to Iron Mountain Picnic Ground and points north and east) were done to assess the conditions that were present. In this area there were about 10 trees per acre killed over the past 3 years (trees currently infested in '09, 1 year old dead trees killed in '08 and 2 year old dead trees killed in '07). Of these, 83% were currently infested, 13% were 1 year old dead trees, and 4% were 2 year old dead trees. Already roughly 10% of the trees per acre have been killed over the past 3 years. This affirms the picture that this area at lower elevations on the northeast side of Harney Peak has not had much activity until the past year or 2 and that the beetles are rapidly moving into the area. The increase in currently infested trees compared to those killed in '08 indicates a 4 times increase in newly attacked trees to those attacked the previous years in this part of the wilderness. There are typical spots of 20-50 green attacked trees showing up in this area, with very few previously killed red trees, again indicating that the beetle are rapidly moving into this area from up above.

The stand conditions throughout the entire wilderness and most of the natural forest of Mt. Rushmore are highly susceptible to continued beetle mortality and expansion. This is the case in the northeast part where average stand diameters are about 14.5 inches DBH and stand densities average around 130 ft<sup>2</sup> per acre of basal area. With stands that are high hazard such as this and the large resident beetle population this creates an area of high risk.

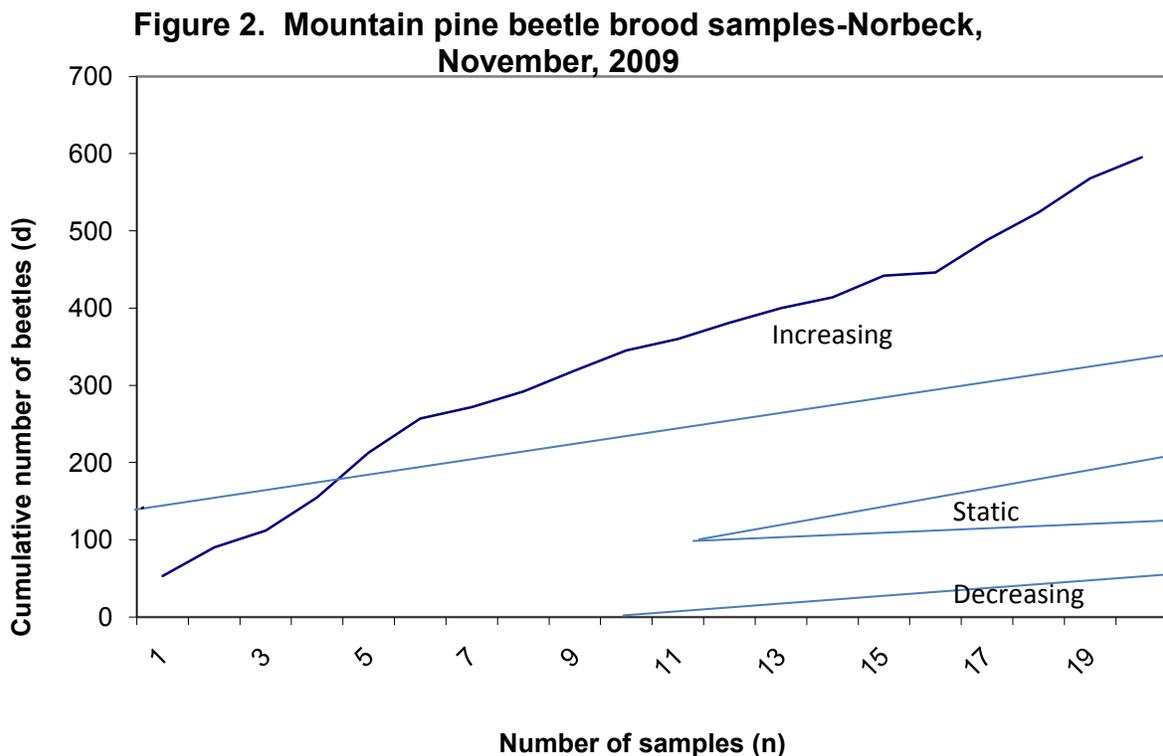
Figure 1: Progression of bark beetle infestation 2006 to 2009 based on Aerial Detection Surveys



Brood sampling was carried out in November 2006 according to methods described by Knight (1960). A 6 x 6-inch piece of bark was removed from the north and south sides of currently infested trees. All live and dead mountain pine beetle brood in the pieces were counted. Ten trees were sampled near Willow Creek Campground. The numbers of brood found were totaled. The cumulative number of brood is used in regression equations to classify whether beetle populations are decreasing, increasing or static.

The brood data classify mountain pine beetle populations as increasing. 20 samples were taken and a total of 302 live brood or greater would indicate an increasing beetle population. In the 20 samples taken, there was a total of 595 live brood. This is well above the level needed to show an increasing trend (Figure 2). The trend numbers, 302 for 20 samples, is based on a 90% confidence level (Knight 1960).

Decreases in this year's brood are expected before beetle flight occurs in the summer of 2010. Natural enemies and competition with woodborer larvae feeding on the same food resource can cause brood mortality. The amount of mortality caused by weather factors, for example cold temperatures, is hard to estimate. These samples were taken in November, after below freezing temperatures had been seen in these areas. By this time of year, beetles have started to undergo cold hardening in preparation for the winter and so large reductions in brood caused from cold are unexpected.



## Beetle Management Strategies

There are a number of actions that can be used to reduce the impacts of mountain pine beetle. These actions fall into two categories: direct action against the beetles themselves or indirect actions that address general stand conditions. Direct action deals with the symptoms, too many beetles, and is aimed at directly reducing the number of beetles present. Indirect action focuses on the cause of the problem, which relates to optimal stand conditions for beetle buildup and epidemic.

**Strategy 1: Silvicultural Treatments.** These are forest management actions that increase tree vigor and reduce stand susceptibility to beetle attack through reducing stand basal area or average stand diameter. They are preventative treatments that should be completed prior to stands experiencing beetle outbreaks. Typically in the Black Hills, stands that are less than 80 square feet of basal area per acre with average stand diameters below 7 inches are at the lowest risk. When beetle pressure is high, as is the case here, stand basal area should be reduced even further, to the 40-60 basal area range. The larger an area of contiguous susceptible stands, the more likely is an intense, area-wide mountain pine beetle epidemic, which is what is occurring. To truly reduce beetle susceptibility, stand density needs to be reduced on a landscape level, treating individual stands while the remaining areas are not treated will not provide full protection for those treated stands.

**Strategy 2: Sanitation/Salvage Harvest.** Sanitation harvesting involves the removal of green trees that have live beetle brood in them. These green trees are already dead, however, the foliage will not change color until the following summer. Salvage harvest involves the removal of beetle-killed trees that no longer have live beetles in them. These trees have already changed color; their needles are either red or gone. Salvage does nothing to reduce the beetle population in the area, but can help recoup some timber value and remove standing dead trees from the landscape.

Another type of sanitation treatment involves treating infested trees without removal. Trees can be cut and individually treated trees prior to beetle emergence. The action should kill most or all of the beetles within the cut trees. Examples of treatments include: cut and chunk into small pieces, cut and burn on site, cut and chip, cut and debark. This type of sanitation is very time and labor intensive.

**Strategy 3: Protection of High Value Trees.** Prior to beetle emergence in the summer, the stems of high value uninfested trees are treated with a registered insecticide. This relatively expensive treatment only works as a preventative; there is no chemical treatment available for trees that are already infested. This treatment is highly effective at preventing beetle attacks on uninfested trees.

**Strategy 4: Use of Bark Beetle Pheromones.** There are a number of different synthetically produced pheromones for mountain pine beetle. They consist of lures, tree baits, and anti-aggregation pheromones.

Lures are used in conjunction with funnel traps. Beetles are attracted by the pheromone to the trap. The beetles that go into the traps then die. There has been considerable work done on the effectiveness of mass trapping, and to this point is not considered effective with mountain

pine beetle. Presently, the synthetic lures cannot compete with the natural pheromones being produced, especially in high population situations such as we have now.

The second types of pheromones are tree baits. Tree baits are aggregation pheromones that are used to draw beetles to selected trees. The trees must be live hosts and as the beetles aggregate, the trees are infested and killed. The infested trees must be removed as the bait concentrates the beetles and can cause an outbreak to proceed even faster. At this time, with the already high beetle populations present, and the dangers of increasing the outbreak, tree baits are not recommended in this area.

The third alternative for use in protecting high value trees is the use of anti-aggregation pheromones. In the case of mountain pine beetle, Verbenone (4,6,6-trimethylbicyclo [3.1.1]-hept-3-en-2-one), has been identified as a chemical with anti-aggregation or repellent properties that reduces mountain pine beetle attacks on a tree. Past trials of verbenone in the Black Hills have shown little effectiveness in reducing beetle attacks.

### **Conclusions and Recommendations**

There is a growing mountain pine beetle outbreak occurring in areas surrounding Mt. Rushmore National Monument. At the present time, tree mortality on the monument has been relatively light, however, rapidly increasing populations are now very close. It appears that increased mortality in the monument is imminent and that starting in the summer of 2010 tree mortality could start rising dramatically on the monument. The beetle outbreak is no longer over the ridge or up the hill, but is on the doorstep.

As noted above, there are a variety of treatments and the monument will have to prioritize and decide which ones to implement. Use of preventative sprays to protect trees in the developed areas around the buildings should be considered as a high priority. Many of the trees in the developed areas are large diameter and will be very attractive to beetles. Mortality of these trees in the developed areas would cause a significant change in the feel visitors have when at the monument. As this is the beginning stages of the outbreak reaching Mt. Rushmore, it is likely that any trees to be protected with sprays, would have to be sprayed every year for the next 4-5 years until the beetle outbreak has passed by. We are available to provide further guidance on the type of chemicals and application methods should you choose to use preventative spray. If preventative sprays are seen as a high priority, they should be started prior to beetle flight in 2010.

In addition to protecting high value areas, the monument should continue its ongoing sanitation efforts. Infested trees have been felled and bucked the past few years as they have been located. This has certainly helped reduce the number of beetles coming out of trees within the monument itself. This task is going to get much larger and harder to accomplish as beetle mortality increases in the coming years. Sanitation by itself will not change the forest conditions and create stands that are less susceptible to beetle attack.

The use of sanitation alone is not going to be effective in preventing beetles from infesting stands of pine. Silvicultural treatments of natural forest are a highly recommended alternative for managing mountain pine beetle. Forest management, changing the condition of the forest, is the only way to minimize extensive losses to the beetle over long periods of time. These include maintaining a diversity of age classes, diversity of species where possible and reducing basal area. Thinning of stands should proceed prior to beetle infestations, where possible. As

pointed out above, the stand density may need to be reduced significantly to minimize beetle mortality considering the high level of beetle activity.

The use of pheromones is somewhat problematic. With the large beetle population nearby, I would not recommend the use of tree baiting. Beetles are already moving into the monument and baiting will increase that. Also, with a relatively small amount of area to work with, finding areas that would be used as sacrifice areas where the trees are intentionally killed would be difficult. The use of lures and traps has not been shown to be an effective technique for significantly reducing beetle caused mortality. Traps that are hung on or near host trees will cause a spillover attack and those nearby hosts will become infested by beetles drawn to the traps, creating a similar situation as with the tree baits. Again, I would not recommend mass trapping as an option. The use of verbenone is not generally recommended. Our past trials of verbenone with mountain pine beetle/ponderosa pine here in the Black Hills have shown that it is ineffective in reducing beetle attacks. Since those trials there have been improvements in the way verbenone is packaged and it is now used at a higher dose. Whether these differences would cause it to be more effective is questionable. Generally, I would not recommend the use of verbenone as a protective measure, however, if there are remote areas where you would like to consider its use, we could discuss and consider the pro's and con's of such a situation and perhaps consider it.

**TESTIMONY OF HERBERT C. FROST, ASSOCIATE DIRECTOR, NATURAL RESOURCE STEWARDSHIP AND SCIENCE, NATIONAL PARK SERVICE, DEPARTMENT OF THE INTERIOR, BEFORE THE HOUSE NATURAL RESOURCES COMMITTEE, SUBCOMMITTEE ON WATER AND POWER AND SUBCOMMITTEE ON NATIONAL PARKS, FORESTS, AND PUBLIC LANDS REGARDING MOUNTAIN PINE BEETLES: STRATEGIES FOR PROTECTING THE WEST.**

**JUNE 16, 2009**

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Chairwoman Napolitano, Chairman Grijalva, and members of the subcommittees, thank you for the opportunity to appear before you today to discuss mountain pine beetles and the devastating impacts to our western pine forests.

I am Dr. Herbert C. Frost, Associate Director for Science and Stewardship in the National Park Service. I am joined today by representatives of other bureaus within the Department of the Interior who share in the management of public lands affected by the mountain pine beetle, including the Bureau of Land Management, the Bureau of Indian Affairs, and the U.S. Fish and Wildlife Service.

The Department is extremely concerned about escalating mountain pine beetle populations and the associated disastrous impacts to public and private lands including the increased risk of wildfires from dead or dying trees, loss of wildlife habitat, impacts to natural and cultural resources, and threats to surrounding communities. This spread, and the related impacts that are currently being experienced, are at epidemic proportions throughout the west, and appear to be the result of a number of factors including natural beetle population cycles, continuous mild winters, and an abundance of uniformly mature pine forest stands.

This testimony highlights the collaborative efforts of bureaus within the Department to combat the immediate threat of the mountain pine beetle while also promoting the long-term

stewardship and sustainability of healthy, resilient forests that will be better able to endure cyclic mountain pine beetle epidemics and their potential impacts.

## **Background**

The mountain pine beetle (*Dendroctonus ponderosae*) ranks first in destructiveness among the tree-killing bark beetles that are native to the west, although there are many native beetle species affecting a host of other pine tree species nationally. The mountain pine beetle affects numerous species of western pine, including ponderosa, lodgepole, and the five-needle white pine species. In recent years, outbreaks have increased mortality rates well above ambient levels within forestlands in the Northern and Central Rockies, in Eastern Oregon and Washington, and as far north as Canada. A current and very visible outbreak is affecting virtually all mature lodgepole pine in Colorado, along with large areas of lodgepole and limber pine in Wyoming. Affected lodgepole pine trees are as young as sixty years old and as small as six inches in diameter at breast height. Tree mortality from this outbreak is estimated to have now occurred on nearly 8 million acres nationwide.<sup>1</sup>

Bark beetles infest pine trees by laying eggs under the bark. When the eggs hatch, the larvae mine the area beneath the bark and eventually cut off the tree's supply of nutrients. The beetles also carry a fungus that causes dehydration and inhibits a tree's natural defenses against beetle attacks.

Under typical conditions, bark beetles play an important role in forest ecosystems, providing for periodic forest renewal. Periodic outbreaks help shape our forested landscapes,

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<sup>1</sup> USDA-APHIS. 2008; Western Forestry Leadership Coalition, 2009.

resulting in forest succession. The dead trees also provide critical habitat for birds, bats, and other cavity-dependent species.<sup>2</sup>

Although mountain pine beetle outbreaks and associated pine tree die-offs are a natural cyclic phenomenon, the current outbreak is epidemic due to several variables.<sup>3</sup> One variable is that the northern part of the beetle's geographic range has expanded to include high-elevation areas that historically were too cold for the beetle to survive during the winter months. These high elevation pine stands, such as the five-needle pines, do not have an historic evolutionary relationship with the beetles and hence, the beetles act in similar ways to an invasive species. This range expansion may be the result of reoccurring drought and climate change, which contribute to warming trends in mountain ecosystems.<sup>4</sup> Another variable is that certain species throughout our western forests have been impacted by years of fire suppression efforts, aimed at protecting critical infrastructure and developed areas.<sup>5</sup>

When trees are killed by the beetle, the resulting impacts are significant. Dead trees produce additional fuel for wildfires that can lead to the destruction of large numbers of natural and cultural resources including tribal values on Indian reservations, archeological sites in park units, and economically valuable timber. Large-scale fires can also destroy high-value resources

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<sup>2</sup> Shrimpton, D.M. 1994. A report for Forest Health. DC Ministry of Forests, December 1994; Davis and Johnson. 1987. Forest Management 3<sup>rd</sup> Edition, McGraw Hill; Bentz, et.al. (2005) Bark Beetle Outbreaks in Western North America: Causes and Consequences, Bark Beetle Symposium, Snowbird, Utah.

<sup>3</sup> USDA-APHIS. 2008; Western Forestry Leadership Coalition, 2009.

<sup>4</sup> Logan J.A.; Powell J.A. 2001. Ghost Forests, Global Warming, and the Mountain Pine Beetle (Coleoptera: Scolytidae). American Entomologist. 160-172; Kurz, W.A. et al. Mountain Pine Beetle and Forest Carbon Feedback to Climate Change; Campbell, Elizabeth M. 2007. Climate change, mountain pine beetle, and the decline of whitebark pine, a keystone species of high-elevation ecosystems in British Columbia, Canada. Ecological Society of America meeting, August 2007, San Jose, CA.

<sup>5</sup> Davis and Johnson. 1987. Forest Management 3<sup>rd</sup> Edition, McGraw Hill.

such as campgrounds and visitor facilities, and can quickly spread from our public lands to surrounding communities, causing death and destruction of property. High severity fires can also result in ground surface heating and consequential increased erosion in some watersheds.

Mortality of these tree stands also negatively impacts wildlife. Pine forests offer critical habitat for many wildlife species, providing vital sources for food, protection, and breeding sites. For example, white bark pine produce seeds that are a major source of food for federally listed grizzly bears in the late summer and early fall.<sup>6</sup>

No effective treatment for suppression of large-scale pine beetle outbreaks currently exists, but many bureaus within the Department are approaching this problem in a variety of ways based upon their individual missions, policies, laws, and management mandates under which they operate.

### **National Park Service**

Although there are no current estimates of the potential acres involved, approximately 40% of National Park Service (NPS) lands in the west are forested and a significant percentage of those lands are occupied by vulnerable species. The NPS is approaching this problem by mapping the outbreaks of mountain pine beetles within its park units, which at this time is now occurring in all western states except North Dakota; areas of California, the front range of Colorado, the Black Hills of South Dakota, and the North Cascades are particularly hard hit.

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<sup>6</sup> Felicetti, L.A., C.C. Schwartz, R.O. Rye, M.A. Haroldson, K.A. Gunther, D.L. Phillips, and C.T. Robbins. 2003. Use of sulfur and nitrogen stable isotopes to determine the importance of whitebark pine nuts to Yellowstone grizzly bears. *Canadian Journal of Zoology* 81:763–770; Lanner, R.M., and B.K. Gilbert. 1994. Nutritive value of whitebark pine seeds, and the questions of their variable dormancy. U.S. Forest Service General Technical Report INT-GTR-309. pp. 206–211; Mattson, D.J., B.M. Blanchard, and R.R. Knight. 1992. Yellowstone grizzly bear mortality, human habituation and whitebark pine seed crops. *Journal of Wildlife Management* 56:432–442; Robbins, Charles T.; Schwartz, Charles C.; Gunther, Kerry A.; Servheen, Chris. 2006. Grizzly Bear Nutrition and Ecology: Studies in Yellowstone National Park. *Yellowstone Science*, Volume 14, Number 3, pg. 19-26.

Within these states, 57 national park units have reported elevated populations of beetle infestations. An additional 21 units are within the affected area but have not yet reported increased beetle activity.

Outbreaks in the 1970's – 1980's contributed to the historic Yellowstone fires of 1988, the largest wildfire in the history of the park, which destroyed over 793,000 acres. At that time, dense, 90+ year old stands of lodgepole pine were further stressed by several years of drought, adding to the vulnerability of these trees and leading to thousands of acres of beetle-killed lodgepole in the park. These beetles are now again playing a role in changing ecosystems within the greater Yellowstone area, including Grand Teton and Yellowstone National Parks.

NPS is also responding to escalating mountain pine beetles epidemic by providing for visitor safety, minimizing fire danger to visitors and neighboring communities, protecting dependent wildlife species and habitats, and providing for long-term sustained healthy forest ecosystems. In campgrounds, visitor centers, and other high-use areas, a combination of actions are being employed to ensure these goals and objectives are met with highly susceptible trees and problem trees being removed. These actions are helping to manage existing infestations and protect vulnerable areas. In some parks, targeted insecticides are being used to save high-value trees.

Specifically with respect to Rocky Mountain National Park in Colorado, mountain pine beetles are rapidly expanding with mortality in lodgepole pine approaching nearly 100%. Beetle outbreaks in the park represent only a small portion of the Colorado forests that are a part of this current outbreak. Response to the potential fire and watershed consequences of this outbreak are being coordinated through an interagency task group that includes federal, state, and 22 counties. The goals of the plan at Rocky Mountain National Park are consistent with the task force

recommendations: to remove or protect high-value resources in or near park facilities, such as campgrounds, housing areas, and visitor centers. The plan identified more than 350 locations in the park where life and property are at risk. Current projections indicate that the park will need to remove more than one million hazard trees, costing more than \$7 million dollars during the upcoming years. In areas where heavy tree mortality is occurring adjacent to towns and communities, fire reduction treatments are planned.

Even with the aggressive plan at Rocky Mountain National Park, approximately 95% of the park lands will not be treated. Unlike other agencies, commercial timber sales are not authorized on NPS lands. Consequently, much of beetle-killed trees will remain standing. In accordance with our the Organic Act and our *National Park Service Management Policies*, NPS allows natural recovery of areas following disturbances, such as fires, unless additional action is needed to protect cultural and historic resources, protect park developments, or to ensure human safety.

### **Bureau of Land Management**

The Bureau of Land Management (BLM) estimates that up to 800,000 acres of BLM-managed forestland in Colorado, Wyoming, Montana, and Idaho are infested by the mountain pine beetle. Warm winters, drought stress, and a prevalence of over-mature, over-stocked, even-aged, single species forests present ideal conditions for such a severe outbreak. The unhealthy condition of the forest makes it susceptible to fatal insect attack.

Harmful impacts to BLM lands are numerous. Increased tree mortality leads to increased fire hazards, degraded conditions for wildlife, negative effects on wood products industries, and

declining tourism. In some areas of high tree mortality, fire suppression will be difficult and dangerous.

BLM is approaching this epidemic by treating, in fiscal year 2009, 9,500 acres to mitigate impacts of the mountain pine beetle outbreak. The treatments are focused on protecting high-value recreation sites through placement of pheromone traps to prevent tree mortality, and reducing the risk of catastrophic wildfire events by reducing fuels through salvage of dead and dying trees. Some challenges to conducting treatments of additional acreage include poor markets for treatment by-products, limited inventory data, limited numbers of contractors to perform the work, steep and/or inaccessible site conditions, and time required to complete the necessary National Environmental Policy Act (NEPA) processes.

While this hearing is focused on the mountain pine beetle outbreak, there are other insects that could create similar impacts in crowded, drought-stressed forests. Creating resilient landscapes is one possible long term solution to addressing outbreaks of insect infestation. Approximately 50% of the 32 million acres of public domain forestland that BLM manages in the lower 48 States are vulnerable due to overstocking and are therefore at great risk of increased insect and disease attacks and catastrophic wildfires. To restore forest health, projects are planned to achieve the correct density, species composition, and stand structure for a given site, so that insect and disease agents will remain at endemic levels as opposed to epidemic levels now seen in pine beetles.

In fiscal year 2009, BLM is also thinning 25,000 acres to improve forest health via commercial timber sales, service contracts, and stewardship contracts.

**Bureau of Indian Affairs**

Some of the most devastated areas of pine stands in the west occur on reservation lands under the management of the Bureau of Indian Affairs (BIA). In the Central and Northern Cascades (Northwest Region), the Warm Springs Reservation in Oregon has experienced mortality in some of their lodgepole pine stands due to mountain pine beetles -- 69,000 acres are infested, of which 40,000 acres are completely dead. Similarly, the lodgepole pine stands have been nearly wiped out on the Yakama Reservation in Washington. In many of these areas, the beetle has run its course, with few healthy lodgepole pines left.

Tribal, agency and regional staff at these locations are concerned that the high beetle populations may significantly alter the ecosystem by effectively removing mature lodgepole pine as a component. They are also concerned that the resulting extremely high fuel hazards will create a catastrophic wildland fire risk that could not only endanger the lodgepole pine areas, but the surrounding forest and its multitude of tribal values as well.

In response to the devastation on Indian lands, BIA has assisted reservations in taking steps to protect the remaining pine stands. At the Colville Indian Reservation in Washington, 8,000 acres of lodgepole pine stands are at high-risk for mountain pine beetle infestation. The main treatment is a regeneration harvest and conversion to a different species, mostly western larch. About 10,000 acres have been converted since the 1970's.

At the Rocky Boys Indian Reservation, the reservation has been successful in timber harvest salvaging of the mortality, but is still facing ongoing infestation. Non-commercial stands have been affected as well. On other reservations, the incompatibility between salvage operations and reservation uses, and proximity to markets are restricting large-scale salvage operations.

**U.S. Fish and Wildlife Service**

Mountain pine beetles are not a significant issue on lands managed by the U.S. Fish and Wildlife Service (USFWS), specifically National Wildlife Refuge System and National Fish Hatchery System lands. Very few USFWS lands have significant forested habitat and thus the Service only administers small amounts of acreage of western pine forest, most of which consists of ponderosa pine, not the mature (and over-mature) lodgepole pine that has, to date, suffered from the most intensive beetle infestation.

Leadville National Fish Hatchery (NFH) in Leadville, Colorado, is an exception. NFH lands total over 3,000 acres of timber, including 2,500 acres of mature lodgepole pine. The hatchery is near the epicenter of the severe beetle infestation in the Colorado High Country and beetle infestation is an active management issue at the hatchery. The majority of this timber is in the Mt. Massive Wilderness Area; approximately 500 acres of the hatchery's timbered areas lie outside the wilderness.

The hatchery manager first observed beetle kill on hatchery forests in 2006 and has tasked staff and volunteers to remove dead/infected individual trees on an annual basis. Pheromone packets are applied each year to protect individual pine trees in the hatchery headquarters area, and in 2008, the Service participated in an interagency effort with the Bureau of Land Management to thin lodgepole and to encourage aspen, spruce, and fir regeneration on hatchery lands. Additional pine thinning partnership projects are planned for 2009 and beyond.

While the USFWS does not anticipate these efforts will completely prevent beetle-kill of the hatchery's lodgepole forest, the Service is hopeful the efforts will help reduce fuel loads and stimulate regeneration of other species. It remains unclear if thinning in uninfested forest stands will have any mitigating impact on mortality of mature lodgepole on USFWS or any other infested lands in Colorado.

## **Department Efforts**

In addition to all the actions being taken by specific bureaus, the Department is coordinating several efforts including integrated pest management (IPM), creation of an incident commander for beetle control efforts in Colorado, multi-agency discussions, and blended fuels treatment plans and zones. The Department is also collaborating with the Department of Agriculture (through the U.S. Forest Service) who provides forest health information and support annually to the bureaus.

In the face of rising mountain pine beetle infestations across the west, the Department will need increasing attention and dedicated resources to face this challenge. The greatest need will be for continued mapping and monitoring, fuel treatment around high-value areas, and for careful assessment of stressors such as sustained drought, climate change, beetle spread and impacts to the other integral flora and fauna components that make up a healthy, intact forest.

## **Conclusion**

Mountain pine beetles will continue to be a part of the western landscape. It is an episodic pest reoccurring periodically throughout our western forests. It is currently rapidly expanding to epidemic levels in parts of the west. Some of this expansion is beyond the historic parameter for this species, in part assisted by reoccurring drought, climate change, overly dense mature forests, and changes in the biology of mountain pine beetle.

The Department is committed to continued monitoring of the mountain pine beetle as it spreads to new areas and expands its range. We will continue to coordinate and support our federal, state and local partners to address this issue. The Department is dedicated to the

interagency fuels and fire suppression efforts to respond to the inevitable fires and loss of habitat that will occur as a result of this outbreak. Although stopping the mountain pine beetle is not a viable option, management strategies to control its damage in priority areas, and protect resources and communities from catastrophic wildfires are critical. The continued collaboration and support between the Departments of the Interior and Agriculture will help us to face this unprecedented forest health challenge.

This concludes my prepared testimony. I, along with our technical witnesses from the other bureaus, would be happy to answer any questions you or the other members of the subcommittees have on this topic.

HOUSE CONCURRENT RESOLUTION NO. 1006

A CONCURRENT RESOLUTION, Urging the United States Forest Service, the National Park Service, the Bureau of Land Management, and other federal agencies to actively manage mountain pine beetle infestations on lands under their control in South Dakota.

WHEREAS, the current mountain pine beetle epidemic in the Black Hills that began in 1997 has been exacerbated by the lack of management on lands managed by the federal government; and

WHEREAS, the spread of mountain pine beetles to private and state lands, including Custer State Park, due to the limited or nonexistent treatment of mountain pine beetle infested trees on adjacent United States Forest Service lands has forced private landowners as well as the South Dakota Departments of Agriculture and Game, Fish and Parks to incur unnecessary costs to control this pest; and

WHEREAS, the mountain pine beetle epidemic in the Black Elk Wilderness Area and other federal lands has become so widespread that the National Park Service recently announced it will cancel the annual Independence Day fireworks show at Mount Rushmore in 2010 due to the threat of catastrophic wildfire from the hundreds of thousands of standing dead trees recently killed by mountain pine beetle:

NOW, THEREFORE, BE IT RESOLVED, by the House of Representatives of the Eighty-fifth Legislature of the State of South Dakota, the Senate concurring therein, that the South Dakota Legislature urges the United States Forest Service, the National Park Service, the Bureau of Land Management, and other federal agencies to structure their policies so the mountain pine beetle epidemic is actively managed through proven management practices and active treatment of infested trees in South Dakota.

**MOUNT RUSHMORE NATIONAL MEMORIAL  
RAPID RESOURCE ASSESSMENT TEAM  
MOUNTAIN PINE BEETLE INFESTATION**

**ISSUES IDENTIFIED BY IN-BRIEF AUDIENCE**

Resource preservation and protection

- significant trees in the developed area
- trees with cultural significance
- park infrastructure
- legacy old growth forest
- cultural resources and sacred sites
- ecological integrity
- overall aesthetics
- prioritizing treatment areas and creating a timeline based on “highest value”
- creating an effective monitoring protocol
- assessing water quality issues associated with insecticide (Carbaryl) spraying
- assessing non-native invasive plant infestations associated with project
- assessing impacts on wildlife and species of concern

Communication and public relations

- safety with respect to hazard trees
- safety with respect to tree insecticide spraying
- education and incorporation with interpretation division
- outreach to public and local communities
- creating an effective communication plan
- promoting aggressive beetle mitigation by neighboring private landowners
- learn lessons from parks that have experienced similar problems
- dealing with commercial traffic on highway 244

Process and decision making

- reconciling management of a “cultural” forest versus a “backcountry” or natural forest
- creating thinning prescription and methods based on targeted conditions and forest structure
- calculating timelines for contractors to insure work gets done in time
- how to get the project funded
- coordinating the park’s efforts with US Forest Service and other “neighbors”
- Managing emerging wildfire issues (pre-suppression, suppression, and tactics)



National Park Service  
U.S. Department of the Interior

Mount Rushmore  
National Memorial

13000 Highway 244,  
Building 31, Suite 1  
Keystone, SD 57751

**FOR IMMEDIATE RELEASE**  
January 19, 2010

Navnit Singh  
605-574-3115

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## Mount Rushmore National Memorial News Release

### Mount Rushmore to Develop Action Plan to Manage Pine Beetle Infestation

(Keystone, SD) The National Park Service has assembled a team of managers and specialists to develop an action plan for summer 2010, relating to the treatment of the mountain pine beetle (*Dendroctonus ponderosae*) at Mount Rushmore National Memorial. The team is comprised of National Park Service employees from Mount Rushmore National Memorial, the Northern Great Plains Fire Management Program, and the Midwest Regional Office which provides oversight and technical guidance to the Memorial.

For decades, the Black Hills have been experiencing outbreaks of the mountain pine beetle which currently are killing large swaths of forests on private and public lands. The National Park Service has been working with Black Hills partners and developing strategies on how to slow the spread of the infestation by working with the USDA Forest Service, the South Dakota Department of Agriculture, and various local government agencies.

The team will convene today at Mount Rushmore to strategize on the development of an action plan. The plan will most likely include a three prong approach and will focus on prevention, elimination of existing infestations, and a post-treatment clean-up component.

The Black Hills area has experienced severe drought conditions for several years now, allowing the mountain pine beetle to proliferate, infecting more and more trees. Mount Rushmore National Memorial is surrounded by the Black Hills National Forest and abuts the Black Elk Wilderness area. As of 2009, 100% of the total acreage of the Black Elk Wilderness has been affected by tree mortality due to bark beetle infestation. The nearby Norbeck Wildlife Preserve is also adversely impacted, with an anticipated mortality rate of 80% for its mature timber stands.

Populations of the mountain pine beetle are typically found at an endemic level, killing and reproducing in stressed or weakened trees. At times, beetle populations increase dramatically. In the increasing and outbreak stages, any host trees, healthy or stressed, are attacked and killed.

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Mountain pine beetle has always been a part of the Black Hills forest ecosystem, with outbreaks occurring periodically. The first recorded outbreak in the Hills occurred from the late 1890's through the early 1900's and killed an estimated 1-2 billion board feet of timber. Outbreaks also have occurred in the 1930's, 1940's, 1960's and 1970's, each lasting 8-13 years with the 1970's outbreak being larger and causing more mortality than any of the others, except for the turn of the century outbreak.

The standing dead timber with many trees still retaining their dried out needles, combined with the drought conditions, significantly increases the potential for a catastrophic wildfire to rapidly spread throughout the area. Just like the mountain pine beetle, wildfire does not recognize political boundaries and can affect public and private lands without discrimination.

Mount Rushmore National Memorial has successfully completed several fuel-reduction projects in the past several years in an attempt to provide a means to stop or slow the growth of any unwanted wildfire. These projects have included thinning, through prescribed fire or mechanical removal, overcrowded stands of timber near critical structures and areas within the memorial.

The goal of this planning team is to develop a plan for action to slow the spread of mountain pine beetle and protect the Mount Rushmore area from large wildfires.

**-NPS-**  
[www.nps.gov/moru](http://www.nps.gov/moru)



National Park Service  
U.S. Department of the Interior

Mount Rushmore  
National Memorial

13000 Highway 244,  
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Keystone, SD 57751

**FOR IMMEDIATE RELEASE**  
February 26, 2010

Navnit Singh  
605-574-3115

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## Mount Rushmore National Memorial News Release

### Mount Rushmore Develops Action Plan to Address Mountain Pine Beetle Infestation

(Keystone, S.D.) Mount Rushmore National Memorial has assembled a National Park Service Rapid Resource Assessment Team (RRAT) to create an action plan to address the Mountain Pine Beetle (MPB) epidemic that is causing ponderosa pine mortality throughout the Black Hills. Working with area agencies, the memorial is developing an aggressive plan to slow and hopefully mitigate the movement of the pine beetle into the memorial.

On February 23, the action team and memorial staff met with local and regional specialists from Custer State Park, South Dakota Department of Agriculture - Wildland Fire Suppression Division, South Dakota State University, United States Geological Survey, United States Forest Service, and entomology and forest health professionals to begin drafting the action plan. The group discussed the current condition of MPB in the central Black Hills, identified issues and concerns surrounding the beetle problem, and explored treatment options and resources available to address the outbreak. To date, the park has identified pockets of trees affected by the mountain pine beetle, and have taken action to remove some of them from the park for decontamination.

Because the mountain pine beetle epidemic has the potential to affect some of the memorial's fundamental resources, including the forested setting of the sculpture, old growth ponderosa pine, and scenic vistas, the park's management team is considering options to mitigate effects while returning the forest to a more natural, historic and sustainable landscape.

Integrating scientific research information, current condition reports, and experience from area specialists, the memorial's Rapid Resource Assessment Team has compiled an action plan that combats the mountain pine beetle on several fronts. Included for consideration in the DRAFT plan are steps to prevent infestation of high value trees within visitor use areas that help maintain



the visual landscape around the sculpture, measures to seek out and attack mountain pine beetles that have already entered the park, and proactive thinning and buffering of the memorial's forest against the encroaching mountain pine beetle population. These actions are in concert with projects being carried out by Custer State Park and the Black Hills National Forest to mitigate the mountain pine beetle infestation. Superintendent Gerard Baker states, "This level of cooperation among partner land management agencies and experts is critical to helping the National Park Service explore and develop effective methods to keep this infestation from getting out of control within memorial grounds. This landscape has been and continues to be treasured by many cultures over the ages and we have a responsibility to preserve the unique natural resources in the park and the Black Hills."

While mountain pine beetles are native to the Black Hills ecosystem, forests stressed by drought, warm winters, and other environmental factors have contributed to a higher than normal beetle population leading to the local epidemic. This is causing an imbalance in the forest ecosystem and a dangerous fire risk for the Black Hills.

"The issue of Mountain Pine Beetle in the Black Hills is severe, and the landscapes are breathtaking. This week we have brought a team of resource and policy professionals to the memorial, to work with local area experts to develop a plan that addresses the presence of Mountain Pine Beetle. The plan must be professionally credible, actionable, and fundable in order to succeed. And the outcomes must be positive. We hope we are able to make a difference for this outstanding area, and for the people who love and respect it. Here at the memorial, the landscape, and the sculpture are of local, regional and national significance, and the memorial is small enough in size, that aggressive action on the ground is possible. Indeed some of the actions recommended in the plan could be completed in the first 100 days. The plan will be open to public review and we are very interested in what the public has to say regarding our recommended approach," says Chris Holbeck, RRAT team leader.

The public is invited to review the DRAFT plan online and submit comments through the National Park Service's Park Planning website. The plan, still in development, should be posted by March 1<sup>st</sup>. The website, <http://parkplanning.nps.gov>, will contain information on the action plan and provide an avenue for public comment on the project. To make a comment online, please go to the planning website, search by park name "Mount Rushmore NMem" and click on

the project title “Mountain Pine Beetle Action Plan.” Comments can be made by clicking on “Open for Public Comment” and then following the prompts. The website is available for public comment until March 15, 2010. Copies of the plan will also be available for viewing at the Mount Rushmore Information Center, located at the memorial, until March 15.

The memorial is working within the scope of National Park Service Management Policies and regulations to develop the plan, and will continue planning, consultation with public, partners, and neighbor agencies throughout the project to maintain a cooperative, interagency, multi-partner effort to address the current mountain pine beetle epidemic.

Comments on the action plan may be mailed to:

Pine Beetle Management Plan  
Mount Rushmore National Memorial  
13000 Highway 244  
Building 31, Suite 1  
Keystone, SD 57751



- NPS -  
[www.nps.gov/moru](http://www.nps.gov/moru)



# TREES & SHRUBS

## Mountain Pine Beetle

no. 5.528

by D.A. Leatherman, I. Aguayo, and T.M. Mehall<sup>1</sup>

### Quick Facts...

Mountain pine beetles (MPB) are the most important insect pest of Colorado's pine forests. MPB often kill large numbers of trees annually during outbreaks.

Trees that are not growing vigorously due to old age, crowding, poor growing conditions, drought, fire or mechanical damage, root disease and other causes are most likely to be attacked.

For a long-term remedy, thin susceptible stands. Leave well-spaced, healthy trees.

For short-term controls, spray, cover, burn or peel attacked trees to kill the beetles. Preventive sprays can protect green, unattacked trees.

Mountain pine beetle (MPB), *Dendroctonus ponderosae*, is native to the forests of western North America. Periodic outbreaks of the insect, previously called the Black Hills beetle or Rocky Mountain pine beetle, can result in losses of millions of trees. Outbreaks develop irrespective of property lines, being equally evident in wilderness areas, mountain subdivisions and back yards. Even windbreak or landscape pines many miles from the mountains can succumb to beetles imported in infested firewood.

Mountain pine beetles develop in pines, particularly ponderosa, lodgepole, Scotch and limber pine. Bristlecone and pinyon pine are less commonly attacked. During early stages of an outbreak, attacks are limited largely to trees under stress from injury, poor site conditions, fire damage, overcrowding, root disease or old age. However, as beetle populations increase, MPB attacks may involve most large trees in the outbreak area.

A related insect, the Douglas-fir beetle (*D. pseudotsugae*), occasionally damages Douglas-fir. Most often, outbreaks are associated with previous injury by fire or western spruce budworm. (See fact sheet 5.543, *Western Spruce Budworms*). Spruce beetle (*D. rufipennis*) is a pest of Engelmann and Colorado blue spruce in Colorado. Injured pines also can be attacked by the red turpentine beetle (*D. valens*).

Mountain pine beetles and related bark beetles in the genus *Dendroctonus* can be distinguished from other large bark beetles in pines by the shape of the hind wing cover (Figure 1, top). In side view, it is gradually curved. The wing cover of *Ips* or engraver beetles, another common group of bark beetles attacking conifers, is sharply spined (Figure 1, bottom).

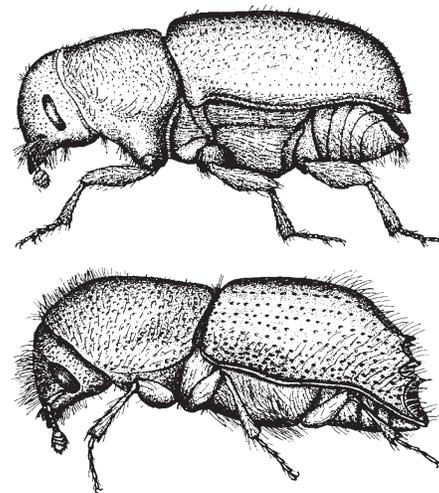


Figure 1: Adult *Dendroctonus* (top) versus *Ips* (bottom). Note gradually curved wing of *Dendroctonus*. Actual size of *Dendroctonus* from 1/8 to 1/3 inch, *Ips* 1/3 to 1/4 inch.

### Signs and Symptoms of MPB Attack

- Popcorn-shaped masses of resin, called "pitch tubes," on the trunk where beetle tunneling begins. Pitch tubes may be brown, pink or white (Figures 2 and 6).
- Boring dust in bark crevices and on the ground immediately adjacent to the tree base.

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Figure 2: "Pitch tubes" indicating trunk attacks by MPB. Success of the attacks is confirmed by looking under the bark with a hatchet for beetles, their tunnels and/or bluestaining.

- Evidence of woodpecker feeding on trunk. Patches of bark are removed and bark flakes lie on the ground or snow below tree.
- Foliage turning yellowish to reddish throughout the entire tree crown. This usually occurs eight to 10 months after a successful MPB attack.
- Presence of live MPB (eggs, larvae, pupae and/or adults) as well as galleries under bark. This is the most certain indicator of infestation. A hatchet for removal of bark is needed to check trees correctly (Figures 3, 5 and 8).
- Bluestained sapwood (Figure 9). Check at more than one point around the tree's circumference.

## Life History and Habits

Mountain pine beetle has a one-year life cycle in Colorado. In late summer, adults leave the dead, yellow- to red-needled trees in which they developed. In general, females seek out large diameter, living, green trees that they attack by tunneling under the bark. However, under epidemic or outbreak conditions, small diameter trees may also be infested. Coordinated mass attacks by many beetles are common. If successful, each beetle pair mates, forms a vertical tunnel (egg gallery) under the bark and produces about 75 eggs. Following egg hatch, larvae (grubs) tunnel away from the egg gallery, producing a characteristic feeding pattern.



Figure 3: Top view of adult MPB (actual size, 1/8 to 1/3 inch).

Figure 4: Mountain area infested by MPB, showing three years of mortality. Old, dead trees are gray; newly killed trees are straw yellow or orange. Some trees may also be infested but do not turn color until nine months or so under attack.



MPB larvae spend the winter under the bark. Larvae are able to survive the winter by metabolizing an alcohol called glycerol that acts as an antifreeze. They continue to feed in the spring and transform into pupae in June and July. Emergence of new adults can begin in mid-June and continue through September. However, the great majority of beetles exit trees

during late July (lodgepole pine) and mid-August (ponderosa pine).

A key part of this cycle is the ability of MPB (and other bark beetles) to transmit bluestain fungi. Spores of these fungi contaminate the bodies of adult beetles and are introduced into the tree during attack. Fungi grow within the tree and assist the beetle in killing the tree. The fungi give a blue-gray appearance to the sapwood.

## Infested Trees

- Once MPB infests a tree, nothing practical can be done to save that tree.
- Under epidemic or outbreak conditions, enough beetles can emerge from an infested tree to kill at least two, and possibly more, trees the following year.
- *Ips* and related beetles that emerge early in summer often are mistaken for mountain



Figure 6: Not all pitch tubes indicate successful attacks. Note the beetle trapped in this large pitch tube. If the majority of tubes look like this, the tree may have survived the current year's attack.



Figure 5: Larva of MPB (actual size, 1/8 to 1/4 inch). They are found under the bark in tunnels.



Figure 7: Checking beneath the bark for MPB. This attack was successful (note tunnels and stain).



Figure 9: Cut tree killed by MPB, showing the characteristic blue-staining pattern.



Figure 11: The appearance of a forest thinned to help prevent MPB. This can also improve mountain views and reduce fire hazard.

pine beetle, leading to early reports that “MPB is flying.” Be sure to properly identify the beetles you find associated with your trees.

- Trees from which MPB have already emerged (look for numerous round, pitch-free exit holes in bark) do not need to be treated.
- The direction and spread rate of a beetle infestation is impossible to predict. However, attacked trees usually are adjacent to or near previously killed trees.

## Control

Natural controls of mountain pine beetle include woodpeckers and insects such as clerid beetles that feed on adults and larvae under the bark. However, during outbreaks these natural controls often fail to prevent additional attacks.

Extreme cold temperatures also can reduce MPB populations. For winter mortality to be a significant factor, a severe freeze is necessary while the insect is in its most vulnerable stage; i.e., in the fall before the larvae have metabolized glycerols, or in late spring when the insect is molting into the pupal stage. For freezing temperatures to affect a large number of larvae during the middle of winter, temperatures of at least 30 degrees below zero (Fahrenheit) must be sustained for at least five days.

Logs infested with MPB can be treated in various ways to kill developing beetles before they emerge as adults in summer.

One very effective way to kill larvae developing under the bark (though very labor intensive) is by peeling away the bark, either by hand or mechanically; this exposes the larvae to unfavorable conditions—the larvae will dehydrate, starve and eventually die. Logs may also be burned or scorched in a pile—preferably when there is snow on the ground (contact your local forester for assistance). They can also be buried under at least eight inches of soil, or chipped. Following beetle emergence, wood can be used without threat to other trees.

Chemical control options for MPB larvae have been greatly limited in recent years. At present, there are no labeled pesticides for use on MPB.

Solar treatments may be appropriate in some areas of Colorado to reduce beetle populations in infested trees. For the treatment to be effective, the temperature under the bark must reach 110 degrees Fahrenheit or more. Such treatments can be performed with or without plastic. This method is also labor intensive; contact your local forester for more details on solar treatments.

## Prevention

An important method of prevention involves forest management. In general, MPB prefers forests that are old and dense. Managing the forest by



Figure 8: Characteristic tunnels (galleries) of mountain pine beetle made by the adults and larvae. The underbark area looks like this in late spring. Blue-stained wood is caused by fungi the beetles introduce.



Figure 10: Large, uninfested pine being preventively sprayed. This protects high-value trees and should be done annually between April 1 and July 1.

creating diversity in age and structure with result in a healthy forest that will be more resilient and, thus, less vulnerable to MPB. Most mature Colorado forests have about twice as many trees per acre as those forests which are more resistant to MPB. Contact your local forester for more information on forest management practices.

Certain formulations of carbaryl (Sevin and others) permethrin (Astro, Dragnet and others), and bifenthrin (Onyx) are registered for use to prevent attacks on individual trees. These sprays are applied to living green trees in early summer to kill or deter attacking beetles. This preventive spray is generally quite effective through one MPB flight (one year). During epidemic conditions, the pressure from beetle populations may result in less satisfactory results due to several factors:

*Always carefully read and follow all label precautions before applying insecticides for MPB prevention.*

- Misidentification of healthy trees: Under dry conditions, trees may not produce pitch tubes when infested, therefore healthy trees are not as obvious. Time may need to be spent looking for sawdust around a tree's circumference and at the base of the tree.
- Timing of application: Trees sprayed after June may already have been attacked.
- Improper coverage: Spray may not have been applied high enough (up to where the trunk tapers to less than six inches), or spray coverage of the tree did not begin at ground level, or was not applied to the entire circumference of the tree (thus creating "windows" for beetle attack).
- Improper dosage/mixing of chemical: Low dosage—effective dosages for bark beetles are higher than the percent used for other insects. Mixture—the carbaryl and water were not fully mixed.
- Environmental conditions: Significant rain or moisture within two hours of application may wash off the insecticide. Very high temperatures may break down the chemical (this can occur when treated trees are near forest fires).
- Chemical shelf life/storage: Manufacturers guarantee stable chemical properties for at least two years after manufacturing date, if stored properly. Chemical properties of carbaryl may be altered if stored at very high or very low temperatures.
- Improper volume/formulation: Not enough spray is used to cover the bark area susceptible to beetle attack; lodgepole pine has "flaky" bark which may require more spray. The label on the chemical does not indicate bark beetle prevention (if using Sevin, SL or XLR is recommended).

Always carefully read and follow all label precautions before applying insecticides for MPB prevention.

## Related Fact Sheets

5.543, *Western Spruce Budworms*

5.558, *Ips Beetles*

Contact the Colorado State Forest Service for additional information related to mountain pine beetles.



This fact sheet was produced in cooperation with the Colorado State Forest Service.

<sup>1</sup>D.A. Leatherman, Colorado State Forest Service entomologist (retired); I. Aguayo, Colorado State Forest Service entomologist; and T.M. Mehall, Colorado State Forest Service forester.

Colorado State University, U.S. Department of Agriculture and Colorado counties cooperating. CSU Extension programs are available to all without discrimination. No endorsement of products mentioned is intended nor is criticism implied of products not mentioned.

Summary of stand exam data from Symstad and Bynum (2005)

Basal area (ft<sup>2</sup>/acre) by prioritized thinning areas. Columns represent size classes of ponderosa pine in inches. Percentage row is the percentage of total basal area in each size class. The third row is cumulative percentage.

DBH (inch)	1- 3.9	4-7.9	8- 11.9	12- 15.9	16- 19.9	20- 23.9	24- 27.9	28- 31.9	32+	Total
<b>Priority 1</b>	7	12	33	24	28	13	2	1	1	121
%	5.6%	10.3%	27.3%	19.7%	23.3%	10.7%	1.6%	1.0%	0.6%	
<b>Cumm.</b>	5.6%	15.9%	43.2%	62.8%	86.2%	96.9%	98.4%	99.4%	100.0%	
<b>Priority 2</b>	6	21	30	21	20	9	3	1	0	111
%	5.4%	19.3%	26.6%	18.9%	18.3%	7.8%	2.7%	0.9%	0.0%	
<b>Cumm.</b>	5.4%	24.7%	51.4%	70.3%	88.6%	96.4%	99.1%	100.0%	100.0%	
<b>Priority 3</b>	3	14	22	36	22	7	2	2	0	108
%	2.6%	13.1%	20.7%	33.3%	20.6%	6.1%	1.8%	1.7%	0.0%	
<b>Cumm.</b>	2.6%	15.8%	36.5%	69.8%	90.4%	96.5%	98.3%	100.0%	100.0%	

Current basal area by stand in prioritized thinning areas. Last three columns include estimated basal area resulting from proposed thinning specifications.

	Current Basal Area	8" Thin	10" Thin Est.	12" Thin
<b>Stand 7</b>	98	92	69	47
<b>Stand 8</b>	125	95	77	58
<b>Stand 11</b>	89	89	79	68
<b>Stand 12</b>	157	126	116	106
<b>Stand 13</b>	156	110	91	73
<b>Stand 14</b>	107	101	78	55
<b>Stand 15</b>	114	97	86	75
<b>Stand 2</b>	119	80	58	36
<b>Stand 3</b>	128	95	85	75
<b>Stand 4</b>	57	31	29	28
<b>Stand 5</b>	111	81	71	62
<b>Stand 6</b>	145	85	67	48
<b>Stand 10</b>	112	91	74	58
<b>Stand 20</b>	113	105	74	42
<b>Stand 21</b>	99	73	62	50
<b>Stand 22</b>	117	113	100	88
<b>Stand 17</b>	96	90	77	64
<b>Stand 18</b>	101	96	87	77
<b>Stand 19</b>	125	86	75	64

Summary of stand exam data from Symstad and Bynum (2005)

Density (stems/acre) by prioritized thinning areas. Columns represent size classes of ponderosa pine in inches. Percentage row is the percentage of total density in each size class. The third row is cumulative percentage.

<b>DBH (inch)</b>	<b>1-3.9</b>	<b>4-7.9</b>	<b>8- 11.9</b>	<b>12- 15.9</b>	<b>16- 19.9</b>	<b>20- 23.9</b>	<b>24- 27.9</b>	<b>28- 31.9</b>	<b>32+</b>	<b>Total</b>
<b>Priority 1</b>	198	64	60	22	16	5	1	0	0	366
<b>%</b>	54.2%	17.3%	16.5%	6.1%	4.4%	1.3%	0.1%	0.1%	0.0%	
<b>Cumm.</b>	54.2%	71.5%	88.0%	94.1%	98.4%	99.8%	99.9%	100.0%	100.0%	
<b>Priority 2</b>	177	109	54	23	12	3	1	0	0	380
<b>%</b>	46.5%	28.8%	14.3%	6.2%	3.0%	0.9%	0.2%	0.1%	0.0%	
<b>Cumm.</b>	46.5%	75.4%	89.7%	95.8%	98.9%	99.7%	99.9%	100.0%	100.0%	
<b>Priority 3</b>	83	72	41	34	13	3	1	0	0	245
<b>%</b>	34.0%	29.3%	16.6%	13.6%	5.1%	1.0%	0.2%	0.1%	0.0%	
<b>Cumm.</b>	34.0%	63.2%	79.9%	93.5%	98.6%	99.6%	99.9%	100.0%	100.0%	

Current density by stand in prioritized thinning areas. Last three columns include estimated density resulting from proposed thinning specifications.

	<b>Density &gt;=1" dbh (/ac) Total</b>	<b>8" Thin</b>	<b>10" Thin Est.</b>	<b>12" Thin</b>
Stand 7	135	103	62	21
Stand 8	410	110	77	43
Stand 11	80	80	60	41
Stand 12	612	107	88	69
Stand 13	892	112	78	44
Stand 14	150	122	79	36
Stand 15	285	96	75	54
Stand 2	580	134	93	53
Stand 3	254	84	66	48
Stand 4	275	18	15	12
Stand 5	337	81	64	47
Stand 6	900	101	67	33
Stand 10	405	97	67	37
Stand 20	188	149	91	33
Stand 21	361	81	60	39
Stand 22	118	98	75	52
Stand 17	135	101	77	54
Stand 18	110	85	66	48
Stand 19	492	85	66	46

Summary of stand exam data from Symstad and Bynum (2005)

Map showing distribution of basal areas with thinning treatment removing trees less than 10 inch in diameter.

