

United States  
Department of  
Agriculture

Forest Service

**Technology &  
Development  
Program**

5100 Fire  
2400 Timber  
April 2000  
0051-2826-MTDC



# Understory Biomass Reduction Methods and Equipment Catalog



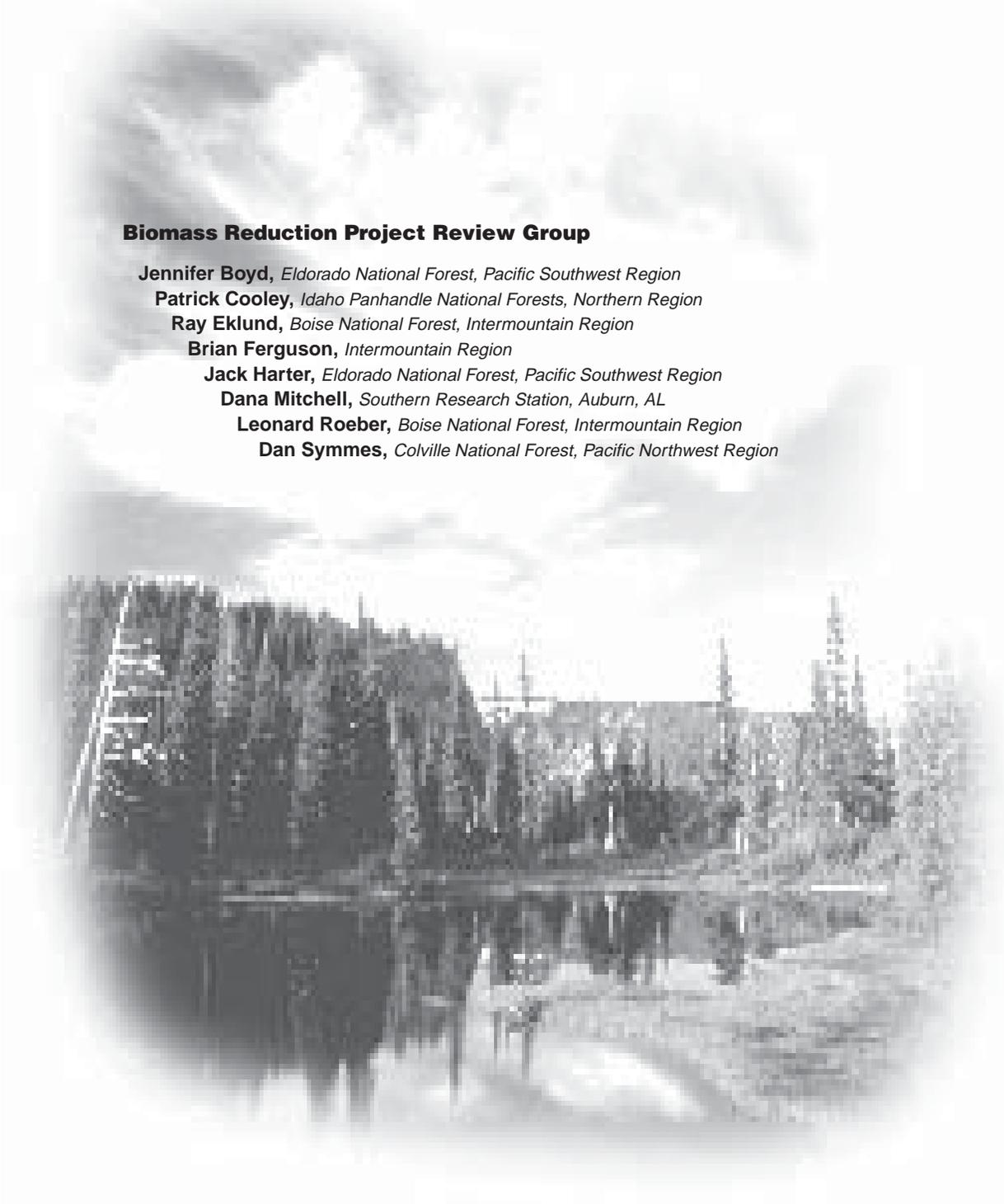


# Acknowledgments

---

**T**his publication was requested by a specially formed biomass reduction project review group. The group offered useful and informative input that has been incorporated into this report. In addition, the group reviewed

several intermediate drafts. MTDC appreciates their contributions. The authors would also like to thank Sara Lustgraaf for her dedicated efforts in the extremely tedious task of laying out this report for publication.



## **Biomass Reduction Project Review Group**

**Jennifer Boyd**, *Eldorado National Forest, Pacific Southwest Region*

**Patrick Cooley**, *Idaho Panhandle National Forests, Northern Region*

**Ray Eklund**, *Boise National Forest, Intermountain Region*

**Brian Ferguson**, *Intermountain Region*

**Jack Harter**, *Eldorado National Forest, Pacific Southwest Region*

**Dana Mitchell**, *Southern Research Station, Auburn, AL*

**Leonard Roeber**, *Boise National Forest, Intermountain Region*

**Dan Symmes**, *Colville National Forest, Pacific Northwest Region*



Acknowledgments _____	ii
About the Authors _____	iv
Introduction _____	1
Historical Perspective _____	2
Extent of the Problem _____	3
Project Constraints _____	4
Revenue Considerations .....	4
Other Considerations .....	5
Treatment Concepts _____	6
Special Prescribed-Fire Techniques _____	7
Series of Short-Interval Prescribed Fires .....	7
Slashing Douglas-fir and Allowing It to Dry .....	7
Burning Duff .....	8
Burning During Snow Season .....	8
Aerial Options .....	8
Fireproofed Perimeter With Hot Center Burn .....	8
Residential/Forest Interface .....	9
Mechanical Treatment _____	10
Tracks Versus Wheels .....	10
Methods to Modify Fuels Profile .....	10
Lop and Scatter .....	10
Cut with Chain Saw, Hand Pile, and Burn .....	10
Cut, Machine Pile, and Burn .....	11
Cut and Trample .....	11
Crush and Chop .....	12
Brush Cutting, Thinning, and Shredding Machines .....	12
Vertical- Versus Horizontal-Shaft Machines .....	13
Chip .....	14
Remove Biomass .....	15
Whole-Tree Skidding .....	15
Cut-to-Length Systems .....	15
Girdle .....	16
Some Equipment Options to Minimize Soil Disturbance on Steeper Slopes .....	16
Cut With Chain Saw and Hand Pile .....	16
Multipurpose, Low-Ground-Pressure, Rubber-Tracked Vehicles .....	16
Feller-Bunchers With Self-Leveling Cabs .....	16
Cable Yarders .....	17
Cable Chippers .....	17
Extreme Machines .....	18
Fuel Reduction During Harvest _____	19

Catalog of Machines and Specialized Attachments .....	20
Equipment Suitable for Reducing Excess Biomass .....	21
Brush-Cutting, Thinning, and Shredding Machines .....	21
Self-Propelled Whole-Tree Chippers .....	42
Multipurpose, Low-Ground-Pressure, Rubber-Tracked Vehicles .....	45
Other Machines and Miscellaneous Attachments .....	48
Brush-Cutting, Thinning, Shredding, and Crushing Attachments .....	56
Small Tree-Cutting/Processing Heads .....	87
Slash-Piling Attachments .....	96
Skid-Steer Attachments .....	107
Equipment Suitable for Steeper Slopes .....	116
Self-Leveling-Cab Feller-Bunchers .....	116
Extreme Machines .....	120
Extreme Machine Attachments .....	125
Small Cable Yarders .....	129
 Appendix A—Equipment and Techniques	
Survey Response Summary .....	137
 Appendix B—Cited References and Resources .....	140
 Appendix C—Manufacturer or Source Addresses .....	143
 Index—Equipment List by Category .....	149

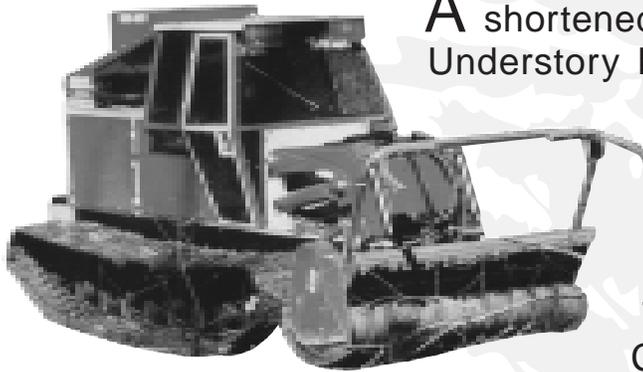
## About the Authors



**Keith Windell** is a Project Leader for reforestation, fire, and residues projects. He has a bachelor's of science degree in mechanical engineering from Montana State University, and has an extensive field background in fire suppression. He has worked for the California Department of Forestry and the Bureau of Land Management.

**Sunni Bradshaw** is a former news reporter now working as a freelance journalist, photographer, and technical writer in Arlee, MT. She has contributed articles or research to numerous national publications and organizations, including National Geographic, National Geographic Traveler, Smithsonian Magazine, USDA Forest Service, USDI Bureau of Land Management, and many others. Sunni was also a rural firefighter and emergency medical technician. She received her bachelor's degree in forest recreation management from the University of Montana in 1985.





A shortened version of this report titled Understory Biomass Reduction Methods and Equipment (0051-2828-MTDC) does not include the 137-page Catalog of Machines and Specialized Equipment. It is available from the Missoula Technology and Development Center.

