Front Matter and Table of Contents

Henry J. Harlow  
*University of Wyoming*

Maryanne Harlow  
*University of Wyoming*

Follow this and additional works at: [http://repository.uwyo.edu/uwnpsrc_reports](http://repository.uwyo.edu/uwnpsrc_reports)

**Recommended Citation**

Available at: [http://repository.uwyo.edu/uwnpsrc_reports/vol22/iss1/1](http://repository.uwyo.edu/uwnpsrc_reports/vol22/iss1/1)

This Front Matter is brought to you for free and open access by Wyoming Scholars Repository. It has been accepted for inclusion in University of Wyoming National Park Service Research Center Annual Report by an authorized editor of Wyoming Scholars Repository. For more information, please contact scholcom@uwyo.edu.
NATIONAL PARK SERVICE RESEARCH CENTER

22nd ANNUAL REPORT 1998

EDITED BY

HENRY J. HARLOW
PROFESSOR
DEPARTMENT OF ZOOLOGY AND PHYSIOLOGY
UNIVERSITY OF WYOMING
DIRECTOR UW-NPS RESEARCH CENTER

MARYANNE HARLOW
REFERENCE LIBRARIAN
UNIVERSITY OF WYOMING LIBRARIES
UNIVERSITY OF WYOMING
22nd ANNUAL REPORT 1998

**WYOMING**
13. Grand Teton National Park
14. Yellowstone National Park
15. John D. Rockefeller, Jr. Memorial Parkway
16. Devils Tower National Monument
17. Fort Laramie National Historic Site
18. Fossil Butte National Monument

**MONTANA**
19. Glacier National Park
20. Bighorn Canyon National Recreation Area
21. Little Bighorn Battlefield National Monument
22. Big Hole National Battlefield
23. Grant-Kohrs Ranch National Historic Site

**NORTH DAKOTA**
24. Fort Union Trading Post National Historic Site
25. Theodore Roosevelt National Park
26. Knife River Indian Villages National Historic Site
27. International Peace Garden

**SOUTH DAKOTA**
28. Badlands National Park
29. Wind Cave National Park
30. Mount Rushmore National Memorial
31. Jewel Cave National Monument

**UTAH**
1. Arches National Park
2. Canyonlands National Park
3. Natural Bridges National Monument
4. Zion National Park
5. Capitol Reef National Park
6. Pipe Spring National Park
7. Dinosaur National Monument
8. Timpanogos Cave National Monument
9. Bryce Canyon National Park
10. Cedar Breaks National Monument
11. Golden Spike National Historic Site
12. Glen Canyon National Recreation Area

**COLORADO**
32. Rocky Mountain National Park
33. Bent's Old Fort National Historic Site
34. Florissant Fossil Beds National Monument
35. Black Canyon of the Gunnison National Monument
36. Curecanti National Recreation Area
37. Great Sand Dunes National Monument
38. Mesa Verde National Park
39. Yucca House National Monument
40. Hovenweep National Monument
41. Colorado National Monument
# TABLE OF CONTENTS

## 22nd ANNUAL REPORT - 1998

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEERING COMMITTEE</td>
<td>ix</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>xi</td>
</tr>
<tr>
<td>FEATURE ARTICLE</td>
<td>1</td>
</tr>
<tr>
<td>&quot;Geographical Analysis of the Distribution and Spread of Exotic Plant Species in Grand Teton National Park, Wyoming&quot;</td>
<td>3</td>
</tr>
<tr>
<td>Deborah Kurtz + Richard Aspinall + Katherine Hansen</td>
<td></td>
</tr>
</tbody>
</table>

## RESEARCH PROJECT REPORTS

<table>
<thead>
<tr>
<th>Research Area</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Teton National Park</td>
<td>S. Anderson et al</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>K. Chamberlain et al</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>H. Harlow et al</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>A. Pinter</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>V. Santucci &amp; W. Wall</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>G. Schrott</td>
<td>38</td>
</tr>
<tr>
<td>Yellowstone National Park</td>
<td>K. Bowman &amp; G. W. Minshall</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>J.W. Laundre</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>M. Turner et al</td>
<td>53</td>
</tr>
<tr>
<td>Greater Yellowstone Ecosystem</td>
<td>D. Debinski et al</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>B. Smith et al</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>N. Stanton et al</td>
<td>71</td>
</tr>
</tbody>
</table>

## 23RD ANNUAL REPORT – 1999

<table>
<thead>
<tr>
<th>Research Area</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Teton National Park</td>
<td>K. Chamberlain et al</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>M. Cody</td>
<td>88</td>
</tr>
<tr>
<td></td>
<td>R. Hall, Jr. &amp; J. Tank</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>H. Harlow et al</td>
<td>98</td>
</tr>
<tr>
<td></td>
<td>R. Kelly</td>
<td>103</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS, CON’T

<table>
<thead>
<tr>
<th>Section</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Teton National Park</td>
<td>R. Marston &amp; R. Gray</td>
<td>119</td>
</tr>
<tr>
<td></td>
<td>B. Miller &amp; H. Harlow</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>A. Pinter</td>
<td>131</td>
</tr>
<tr>
<td></td>
<td>C. Weddle et al.</td>
<td>134</td>
</tr>
<tr>
<td>Yellowstone National Park</td>
<td>A.W. Miller</td>
<td>141</td>
</tr>
<tr>
<td></td>
<td>M. Turner et al.</td>
<td>143</td>
</tr>
<tr>
<td>Greater Yellowstone Ecosystem</td>
<td>J. Ammirati et al.</td>
<td>149</td>
</tr>
<tr>
<td></td>
<td>D. Debinski et al.</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td>B. Smith et al.</td>
<td>159</td>
</tr>
</tbody>
</table>
UW-NPS RESEARCH CENTER PERSONNEL

HENRY J. HARLOW  ♦  DIRECTOR
KAREN K. NOLAND  ♦  OFFICE ASSOCIATE
RICHARD P. VIOLA  ♦  CARETAKER

1998 STEERING COMMITTEE

STEVEN BUSKIRK
DEPARTMENT OF ZOOLOGY AND PHYSIOLOGY ♦ UNIVERSITY OF WYOMING

HENRY HARLOW
DIRECTOR ♦ UW-NPS RESEARCH CENTER

JASON LILLEGRAVEN
GEOLOGY & GEOPHYSICS ♦ UNIVERSITY OF WYOMING

FREDERICK LINDZEY
WYOMING COOPERATIVE RESEARCH UNIT ♦ UNIVERSITY OF WYOMING

RONALD MARRS
GEOLGY AND GEOPHYSICS ♦ UNIVERSITY OF WYOMING

ROBERT SCHILLER
SCIENCE RESOURCE MANAGEMENT ♦ GRAND TETON NATIONAL PARK

JOHN VARLEY
NATURAL RESOURCE COORDINATOR ♦ YELLOWSTONE NATIONAL PARK
INTRODUCTION

1998 ANNUAL REPORT

DIRECTOR'S COLUMN

During the period of this report the University of Wyoming-National Park Service (UW-NPS) Research Center supported and administered research in the biological, physical and social sciences performed in national parks, monuments, and recreation areas in Wyoming and neighboring states. The UW-NPS Research Center solicited research proposals from university faculty or full-time governmental research scientists throughout North America via a request for proposals. Research proposals addressed topics of interest to National Park Service scientists, resource managers, and administrators as well as the academic community. Studies conducted through the Center dealt with questions of direct management importance as well as those of a basic scientific nature.

The Research Center continues to consider unsolicited proposals addressing applied and basic scientific questions related to park management. Research proposals are distributed to nationally-recognized scientists for peer review and are also reviewed and evaluated by the Research Center's steering committee. This committee is composed of University faculty and National Park Service representatives and is chaired by the Director of the UW-NPS Research Center. Research Contracts are usually awarded by the middle to end of March to early April.

The UW-NPS Research Center also operates a NPS-owned field research station in Grand Teton National Park. The research station provides researchers in the biological, physical and social sciences an enhanced opportunity to work in the diverse aquatic and terrestrial environments of Grand Teton National Park and the surrounding Greater Yellowstone Ecosystem. Station facilities include housing for up to 50 researchers, wet and dry laboratories, a library, herbarium, boats, and shop accommodations. The research station is available to researchers working in the Greater Yellowstone Ecosystem regardless of funding source, although priority is given to individuals whose projects are funded by the Research Center.

Special acknowledgement is extended to Ms. Karen Noland, Office Associate, for her skills and dedication to the Research Center which were a vital contribution to this publication.

RESEARCH PROJECT REPORTS

The following project reports have been prepared primarily for administrative use. The information reported is preliminary and may be subject to change as investigations continue. Consequently, information presented may not be used without written permission from the author(s).
FEATURE ARTICLE