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Report PSW-GTR-152



# Ecology and Conservation of the Marbled Murrelet

*State of the Science*



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## Abstract:

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Ralph, C. John; Hunt, George L., Jr.; Raphael, Martin G.; Piatt, John F., Technical Editors. 1995. Ecology and conservation of the Marbled Murrelet. Gen. Tech. Rep. PSW-GTR-152. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 420 p.

This report on the Marbled Murrelet (*Brachyramphus marmoratus*) was compiled and edited by the interagency Marbled Murrelet Conservation Assessment Core Team. The 37 chapters cover both original studies and literature reviews of many aspects of the species' biology, ecology, and conservation needs. It includes new information on the forest habitat used for nesting, marine distribution, and demographic analyses; and describes past and potential effects of humans on the species' habitats. Future research needs and possible management strategies for both marine and forest habitats are suggested.

*Retrieval Terms:* *Brachyramphus marmoratus*, Marbled Murrelet, old-growth forests, habitat use, marine distribution, seabird.

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*Cover:* Late-winter-plumaged Marbled Murrelet, Auke Bay, Alaska —Photograph by Gus van Vliet

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**C. John Ralph**

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## Preface

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The Marbled Murrelet (*Brachyramphus marmoratus*) has long been regarded as a bird of mystery in the Pacific Northwest because its nesting habits have remained largely unknown to ornithologists, and its nearshore feeding habits made it difficult to survey. This small, dove-sized seabird inhabits coastal areas of North America from Alaska to central California. Throughout most of its range it nests in forests within about 25 to 50 miles of the coast, and feeds in nearshore marine waters on small fish and invertebrates. In contrast to most alcids, which nest colonially on rocky cliffs or relatively barren islands, the Marbled Murrelet nests inland throughout most of its range in solitary pairs (or perhaps loose associations), on the wide, upper branches of old, coniferous trees. This retiring habit delayed the discovery of its nest in North America until 1974, when one was found in central California (Binford and others 1975). Since then, despite many thousands of person-days of effort over the past decade, fewer than 60 nests have been located through the 1993 breeding season (Nelson and Hamer, this volume a).

In the 1980s, field biologists discovered evidence suggesting that many, if not most, individuals nest in unharvested coniferous old-growth forests. Further research, much of it presented for the first time in this volume, has provided additional information on habitat use, on their relatively low reproductive rates, and on the high predation they experience at the nest.

In at least some areas, evidence also began to accumulate that the Marbled Murrelet population has declined in recent years. This decline has been attributed to reduction and fragmentation of old-growth forests, increased predation, pollution (especially oil spills), and mortality from fishing nets. This potential decline heightened management sensitivity to assure the maintenance of healthy interacting populations throughout its range. At present, the murrelet is classified as threatened or endangered by the U.S. Fish and Wildlife Service in Washington, Oregon, and California, as well as by the State of California and the Province of British Columbia. For most land management agencies, these listings require inventories and analyses of potential impacts of proposed projects on the species. If adverse impact on murrelet habitat is found, it may result in mitigation measures, project modification, delays, and possible cancellation.

## Issues

Several issues faced land management agencies in the United States and Canada in 1992 when the effort on this volume began.

**Timber harvest**—The legal status of the species was beginning to prevent or delay timber harvest activities throughout most of its range on the Pacific Coast of North America. No forest management standards and guidelines to maintain murrelet habitats existed, because documentation of the full range of the species' habitat was unknown.

**Survey and monitoring efforts**—Surveys to determine the species' presence or absence in forest stands throughout its range required substantial financial and personnel resources. Due to a lack of knowledge of its distribution and abundance, costly efforts often included surveys in areas that were unsuitable or of marginal value to the species.

**Other resources**—It seemed probable that the species occupied habitats containing large amounts of economically valuable timber.

These stands also functioned as reservoirs of biological diversity, and had great values as watersheds and as sources of a variety of wildlife and fishery resources. While at sea, the bird coexisted with large numbers of commercially important fish, especially salmon, the harvesting of which may result in significant murrelet mortality.

**Consolidation of information**—It was apparent that a need existed to consolidate available information, and to synthesize knowledge of population trends, distribution, habitat associations, and potential management alternatives. The U.S. Fish and Wildlife Service appointed a Marbled Murrelet Recovery Team early in 1993 to determine the status and mode of recovery of the species. They needed a rapid production of scientific background material for their deliberations.

## Goals of the Assessment

To meet these issues, the USDA Forest Service began a "Marbled Murrelet Conservation Assessment" in late 1992 with the following mandate. The Assessment would consolidate the available information concerning Marbled Murrelet ecology and evaluate current habitat conditions to determine the likelihood of long-term persistence of healthy populations throughout its current range. The Assessment would include monitoring and research recommendations, be a primary source of information for the Recovery Team, and provide information that would enable agencies to make management plans.

This work would be accomplished by the following methods:

1. Identify patterns of habitat use in the forests and marine environments occupied by the murrelet, and develop an understanding of the spatial and temporal dynamics of these habitats and murrelet populations, by using a compilation of existing survey data.

2. Summarize and synthesize existing information from throughout the range about the life history, status, and trends of the murrelet and its utilized habitats, and provide the information gathered to all interested parties.

3. Identify additional inventory needs and methodology to facilitate statistically meaningful long term monitoring of both the species and its habitats, thus providing the information needed to develop sound strategies to provide for their maintenance and management.

4. Identify additional research needs to fill information gaps preventing a full understanding of Marbled Murrelet ecology.

5. Provide suggestions to improve the compatibility of data bases maintained by various entities.

## Organization

The Assessment effort was organized into a set of working groups as follows:

- Interagency Conservation Assessment Coordinating Group—The intent of this group was to coordinate and provide support to Conservation Assessment activities among the state, provincial, and federal agencies with Marbled Murrelet management responsibilities. These agencies and organizations were invited to participate by the two Group Leaders: Garland N. Mason, Pacific Southwest Research Station, Albany, California; and Hugh Black, Pacific Northwest Region, Portland, Oregon—both with the USDA Forest Service.

- Conservation Assessment Core Team—The Core Team was headed by a Team Leader (C.J. Ralph), provided by the Pacific Southwest Station, and three senior scientists with established expertise in various aspects of ecology who, drawing on the knowledge provided by the Technical Working Group, provided the scientific expertise to formulate the Conservation Assessment. The Team Leader provided the overall technical and administrative leadership for assessment development and ensured good communication between the Coordinating Group, the Core Team, and the Technical Working Group. The scientists in the Core Team became the technical editors of the final volume.

- Conservation Assessment Technical Working Group—This group was open to all persons with knowledge or abilities that could contribute to the formulation of the Conservation Assessment (see *Appendix A* in this volume), and provided the following functions:

- Collected and provided technical information required by the Working Group.
- Wrote chapters of the Assessment, as appropriate.
- Provided assistance, advice, and input to other members of the Working Group as requested.
- Informed respective agencies, organizations, or regions as to progress and findings of the Conservation Assessment.
- Provided expertise to formulate inter-regional assessments.
- Identified and overcame obstacles to gathering information for the Assessment.

Members of the Working Group included:

- Marbled Murrelet specialists from universities, agencies, private industry, and conservation organizations.
- Regional representatives from USDA Forest Service Regions in Alaska, Washington, Oregon, and California.
- Agency Representatives from three U.S. Department of the Interior agencies— Fish and Wildlife Service, National Biological Service, National Park Service— and Canadian Wildlife Service, among others.
- Representatives from state and provincial fish and wildlife agencies not represented above.
- Specialists from various disciplines useful to the process of the Assessment.
- Line officers.

Financial assistance was provided by various agencies and organizations, acknowledged in each chapter, and also by the Assessment itself that provided certain members of the Technical Working Group with funds to enable them to analyze their data in a more timely manner than would have been possible in the normal course of events.

## Working Environment

Working sessions of the Core Team and the Working Group were open to all persons interested in the proceedings, with the Team Leader acting as chair.

Working Group members participated fully with the Core Team and participated in all decisions. The Core Team provided direction and strived for consensus among the Team and Group members. Minority reports were possible and encouraged. Wildlife Society standards for authorship were used. In the final stages of compilation of the volume, the technical editors met and reviewed chapters which were then sent to authors for final approval of all contents.

## Products

The primary product of the Assessment is this volume. Each chapter in the volume was reviewed by numerous researchers and biologists in appropriate fields, as well as by the Core Team. In addition, the entire document was reviewed by four persons appointed by the Presidents of learned societies: The Wildlife Society (David Marshall), American Ornithologists Union (Peter Connors), Ecological Society of America (Frank A. Pitelka), and the Cooper Ornithological Society (Douglas Bell).

The report is organized into chapters addressing the various aspects of Marbled Murrelet biology and provide data and analyses. Some general management considerations are offered in the overview chapter, and are intended to

supplement those offered by the Recovery Team, appointed by the USDI Fish and Wildlife Service.

## Acknowledgments

We express our appreciation to all the reviewers, members of the Technical Working Group, and the authors, who worked so smoothly together to assemble this compendium of knowledge of the murrelet. Behind the scenes, employees of the Pacific Southwest Station's Redwood Sciences Laboratory did the lion's share of the work in first assembling the data, and preparing the manuscripts. Sherri Miller, Deborah Kristen, Ann Buell, Tina Menges, Jennifer Weeks, Brian Cannon, Robin Wachs, Kim Hollinger, Jim Dahl, Brian O'Donnell, and Michelle Kamprath worked tirelessly in the "Murrelet House" in downtown Arcata during 1993 to enable the authors to publish their data. John Young and Beth Galleher, Pacific Northwest Station, USDA Forest Service, Olympia, contributed to GIS data assembly and analysis. Garland

Mason, Mike Lennartz, and Barry Noon were very supportive of the entire effort, and we are grateful to them.

The final manuscripts were edited by technical publications editors B Shimon Schwarzschild, Sandra L. Young, and Laurie J. Dunn; and the layouts were designed and produced by visual information specialists Kathryn Stewart and Esther Kerkmann—all of the Pacific Southwest Research Station.

Finally, we acknowledge the herculean effort that Linda Long provided at all stages of the manuscript preparation, as she directed all of us towards producing an excellent product.

We hope that this effort will serve well the bird and the people charged with its management. Most importantly we dedicate this volume to the biologists who have spent so many cold, lonely, but exhilarating hours in pursuit of this sprightly, energetic bird, both on the ocean and in the forest, where it turns into a hurtling, small, dark shadow, as it enters the primeval forest in pursuit of its largely still mysterious habits.

*Technical Editors:*

**C. John Ralph    George L. Hunt, Jr.    Martin G. Raphael    John F. Piatt**