

**RIC Report 009
Discussion Document**

**A SELECTED BIBLIOGRAPHY ON
BIODIVERSITY**

Prepared for:

**THE BIODIVERSITY INVENTORY TASK FORCE
OF THE RESOURCES INVENTORY COMMITTEE**

Prepared by:

**IRENE RONALDS
Victoria, B.C.**

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Preamble

The Resources Inventory Committee consists of representatives from various ministries and agencies of the Canadian and the British Columbia governments. First Nations peoples are represented in the Committee. RIC objectives are to develop a common set of standards and procedures for the provincial resources inventories, as recommended by the Forest Resources Commission in its report *The Future of Our Forests*.

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Contents of this report are presented for discussion purposes only. A formal technical review of this document has not yet been undertaken. Funding from the partnership agreement does not imply acceptance or approval of any statements or information contained herein by either government. This document is not official policy of Forestry Canada nor of any British Columbia Government Ministry or Agency.

For additional copies, and/or further information about the Resources Inventory Committee and its various Task Forces, please contact:

The Executive Secretariat
Resources Inventory Committee
840 Cormorant Street
Victoria, BC V8W 1R1

FAX: (604) 384-1841

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General References

1. American Association for the Advancement of Science. 1991. Perspectives on biodiversity. *Science* 253:712-782.

This issue of *Science* is devoted to papers offering different perspectives on biodiversity. Relevant articles include: Extinction: are ecologists crying wolf? by M.E. Soule; Conservation: tactics for a constant crisis, by M.E. Soule; An evolutionary basis for conservation strategies, by T.L. Erwin; and Biodiversity studies: science and policy, by P.R. Ehrlich and E.O. Wilson.

2. Bunnell, F.L., and L.L. Kremsater. 1990. Sustaining wildlife in managed forests. *N.W. Environ. J.* 6(2):243-270.

For decades, foresters in North America have been grappling with the issue of maintaining wildlife while practising forestry. This paper examines broad principles and patterns relevant to sustaining wildlife in the forests of the Pacific Northwest. In this review the authors distinguish between silvicultural practices applied to single stands and management regimes of 100 000 hectares or more. They note the special features of the Pacific Northwest, then present a simplified approach for defining the problems. Finally they address sustainability of forest-dwelling wildlife at the level of stands and larger management areas, concentrating on species associated with old growth because their habitat is most difficult to re-create.

The authors suggest the practical approach of selecting reserves, then managing a long-rotation buffer zone around them. Maintaining corridors of habitat, particularly around riparian areas, also will increase effective patch sizes and allow for movement of animals and some genetic mixing. For preservation of many species, firm control of access around reserves will be necessary. The major task is to learn how to distribute management practices through space and time.

3. Burton, P. J., A. C. Balinsky, L. P. Coward, S. G. Cumming, and D. D. Kneeshaw. April 1992. The value of managing for biodiversity *For. Chron.* 68(2)

The concept of biological diversity is reviewed, with special attention to its measurement and natural trends. While the authors acknowledge that generalizations regarding the necessity of biodiversity need to be interpreted with caution, they provide a broad range of rationales to support the argument that biodiversity should be protected in more ecosystem and landscape reserves, and that biodiversity is a reasonable management objective on timber-lands as well.

4. Coastal Oregon Productivity Enhancement. (Sponsor). Wildlife diversity and landscape patterns in northwest coastal forests. Sept. 14-15, 1989, Newport, Oregon. C.O.P.E., Unpublished Papers., 85 p.

Conference proceedings contain abstracts from papers presented at the workshop. Sessions included: a general introduction; landscape and wildlife patterns in Pacific

Northwest Coastal Forests; case studies: integrating timber and wildlife management in the real world; strategies for maintaining wildlife diversity in managed forests; and a panel discussion: trade-offs of alternative management strategies.

5. Hansen, A.J., T.A. Spies, F.J. Swanson, and J.L. Ohmann. 1991. Conserving biodiversity in managed forests, lessons from natural forests. *BioScience* 41(6):382-392.

In this article patterns of disturbance and succession in natural forest in the Coastal Northwest are reviewed and structure and composition across an age gradient of unmanaged stands are compared. Stand and landscape patterns in managed forests are then examined and compared with those in natural forests. The authors draw on the results to offer guidance on the management of Coastal Northwest forests that are dedicated to both wood production and conservation of biodiversity. Finally, they suggest that the lessons learned from natural forests here may be useful in other biomes, where unmanaged forests are rare and standards for designing seminatural forests are not available.

6. Harris, L.D. 1984. *The Fragmented Forest: Island biogeography theory and the preservation of biotic diversity*. Univ. Chicago Press, Chicago, Illinois., 211 p.

A book showing how the principles of conservation biology can be used to provide guidelines for planning parks and nature reserves. Patches of old growth forest are treated as islands in a sea of forest plantations or human-dominated landscape. A scheme is described for surrounding each patch with a low-intensity forest management buffer zone (long-rotation management), and the functioning of these long-rotation islands as an archipelago system is considered. Movement of wildlife between patches is to be planned for and the whole system is to be fitted into the landscape. The fieldwork and data for the study are from the Pacific Northwest region of the USA.

The book is organized in four sections: 1) problem setting; 2) current state of nature, including description of the forest community, its role as animal habitat, and its use as a resource; 3) analysis of alternatives, applicability of insular biogeography, genetic resources and biodiversity and evaluation of alternative approaches; and 4) a strategy for management planning which incorporates a system of long-rotation islands, fitting the system to the landscape. It ends with characteristics of the island archipelago approach. There are five appendices providing data from the study area, as well as author, species and subject indices.**

7. Hopwood, D. 1991. *Principles and practices of new forestry: a guide for British Columbia*. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Rep. No. 71. 95p.

This report briefly covers the scientific and social background of New Forestry. The more significant management practices in place or planned in Washington and Oregon are described, and evaluated according to their applicability to British Columbia. Recommendations are made for incorporating New Forestry into management practices in British Columbia.

8. Hudson, W.E. 1991. Landscape linkages and biodiversity. Island Press, Washington D.C. and Covelo, California., 196 p.

Landscape linkages – land corridors between undeveloped or protected habitat areas – are the focus of growing attention in the conservation of biological diversity. Since habitat loss and fragmentation are primary causes of species extinction, these linkages are fast replacing single-species protection as the strategy favoured by professionals. This book presents the most recent thinking and controversies surrounding this newest approach to conservation. Leading experts, including Larry Harris, Reed Noss, Michael Soule, and J. Michael Scott, address the necessity for large-scale, methodical land-corridor management.

9. Hunter Jr., M.L. 1990. Wildlife, forests, and forestry: principles of managing forests for biological diversity. Prentice-Hall, Englewood Cliffs, New Jersey., 370 p.

This book provides a conceptual overview of two aspects of forest management – wood products and wildlife. In Part I, wildlife and diversity are defined and a brief justification for making maintenance of wildlife diversity an important goal of forestry is provided. This section also includes a brief introduction to forest ecology today. In Part II forest management is discussed at the macro level in which the entire forest landscape is considered. Topics include stand tree species composition, age, and area; horizontal structure; forest fragmentation; and riparian zones management.

Part III takes a look at the micro level of managing individual forest stands. In this section the role of dying, dead, and down trees is discussed and management procedures that maintain these features are outlined. Next, vertical stand structure and the development of vegetation strata and their associated biota are described. This is followed by a chapter on intensive silviculture techniques. The final chapter of this section moves from the broad goal of maintaining biological diversity, to the narrow one of maintaining individual species because of their special values, by examining the interface of these two goals. Part IV, covers synthesis and implementation. Principles of forest management planning are examined and ecosystem classifications and forest models are discussed. Finally the cost and benefits of managing forests for biological diversity are considered and the question of who should 'pay the costs is explored.

10. Institute of Environmental Studies – University of Washington. 1990. The northwest Environmental Journal. 6(2):1-474.

This entire edition of Northwest Environmental Journal is devoted to research on the conservation and management of old growth forests of Northwestern North America.

11. Keystone Center. 1991. Biological diversity on federal lands. Keystone Center, Keystone, Colorado., 96p.

This report presents the consensus recommendations of the Dialogue Group, a diverse cross section of groups and organizations concerned about the conservation of biological diversity on U.S. federal lands. Their efforts focused on the biological diversity programs

of the major federal U.S. land management agencies. The report includes a concise overview of the issue as well as specific recommendations for improving federal land management programs.

12. Lea, E.C. 1991. Special issue: biological diversity in the South Okanagan Valley (Association of Professional Biologists of British Columbia). *BioLine* 10(2)

Following the special issues of *BioLine* devoted to the issue of biodiversity in 1990, this issue begins a series which will focus on special areas of biological importance in British Columbia. Articles include: 1) A race to conserve: South Okanagan endangered spaces program; 2) South Okanagan Conservation Strategy; 3) Nature Conservation Areas: a planner's perspective; 4) soils and wildlife in the South Okanagan; and 5) habitat inventory in the South Okanagan.

----- 1990. Special issues: biological diversity and endangered biota: Part I and Part II (Association of Professional Biologists of British Columbia). *BioLine* 9 (2-3)

These two issues of *BioLine* address biological diversity and endangered species in British Columbia. The order of articles chosen is biased towards those species that are often most forgotten, that is the non-vascular plants and what we call "lower" animals. The articles point out the lack of knowledge for many species groups, as well as the need for legislation to protect all species groups, not just higher plants and animals. Several articles indicate that preservation of ecosystems is the key to preserving many-endangered species.

Articles in Part I include: Biological diversity: what's it all about; Endangered species and biological diversity; Committee on the status of endangered wildlife in Canada; Rare and endangered lichens in B.C.; Endangered invertebrates in B.C. ; Benthic marine algal flora (seaweeds) of B.C.: diversity and conservation status; Amphibians in B.C.: forestalling endangerment; Threatened fish diversity in the province's fish waters.

Articles in Part II include: The importance of preserving systems; The role of the Washington Natural Heritage Program in the protection of biodiversity in Washington State; Protecting rare and endangered plants in Ecological Reserves; Criteria for designation of endangered and threatened species under the B.C. Wildlife Act; Rare and endangered bryophytes in British Columbia; Endangered mammals in B.C.; Rare and endangered vascular plants in B.C. – an update; Threatened and endangered birds in B.C.

13. Lord, J.M., and D.A. Norton. 1990. Scale and the spatial concept of fragmentation. *Conserv. Biol.* 4(2):197-202.

The paper addresses the issue of habitat fragmentation beyond just the landscape level. The authors stress that fragmentation is not limited to any particular scale. They discuss the effect of scale as applied to fragmentation in the spatial domain. In particular, they explore the conservation implications of scale in spatial fragmentation, since fragmentation is a major conservation, issue.

14. Maser, C., R.F. Tarrant, J.M. Trappe, and J.F. Franklin. 1988. From the forest to the sea: a story of fallen trees. U.S. Dept. of Agric., For. Serv., Pac. Northwest Research Stn., Portland, Oregon., Gen. Tech. Rep. PNW-GTR-229. 153p.

Large, fallen trees in various stages of decay contribute much-needed diversity of ecological processes to terrestrial, aquatic, estuarine, coastal beach, and open ocean habitats in the Pacific Northwest. Intensive utilization and management can deprive these habitats of large, fallen trees. This publication presents sound information for managers' making resource management decisions on the impact of this loss on habitat diversity and on ecological processes that have an impact on long-term ecosystem productivity.

15. Norse, E.A., K.L. Rosenbaum, D.S. Wilcove, B.A. Wilcox, W.H. Romme, D.W. Johnston, and M.L. Stout. 1989. Conserving biological diversity in our National Forests. The Wilderness Society, Washington, D.C., 116 p.

This book addresses the consequences of forest management practices for biodiversity. The authors assert that fundamental changes in the management of national forest, wildlife refuges, and parks are required for the conservation of biodiversity. Different aspects of the issue are revealed in nine chapters: 1) the importance of biodiversity; 2) some important concepts of conservation biology; 3) wildlands and ecosystem management; 4) consequences of habitat fragmentation; 5) forest management and biodiversity; 6) national forest planning; 7) what to look for in a forest plan; 8) conserving rare species in national forests; 9) maintaining biological diversity in large wildlands: the greater Yellowstone experience.

16. Noss, R. F. 1987. Protecting natural areas in fragmented landscapes. Nat. Area J. 7(1):2-13.

Natural areas are usually selected for protection according to the elements contained within them. A focus on content alone, however, is incomplete because the structure and use of the surrounding landscape will determine whether a "protected area" will be able to maintain the most threatened elements and allow for their continued evolution. In fragmented landscapes, few if any natural areas comprise intact ecosystems. A complementary focus on landscape context includes not only consideration of external threats (reviewed here), but also how each individual natural area combines with other landscape elements to determine regional, and ultimately, global diversity.

17. Pearson, A.F., and D.A. Challenger. 1990. Forests – wild and managed: differences and consequences. Symposium

Proceedings. Jan. 19-20, 1990, Univ. B.C. Univ. B.C., Faculty of Forestry, Students for Forestry Awareness, Vancouver, B.C., 196 p.

This symposium brought together scientists and foresters to share their research on the ecology of wild forests and plantations. Proceedings include papers by the presenters and summaries of questions from the floor. The keynote address, by Jerry Franklin, was on "Old growth forests and the new forestry". Presenters spoke on the topic of managing for

biodiversity at a variety of management levels, from a broad theoretical perspective, to the landscape and stand levels, to the micro-level of the living soil.

18. Rankin, C., and M. M'Gonigle. 1991. Legislation for biodiversity: a review and proposal for British Columbia. *University of British Columbia Law Review* 25(2):277-333.

In this article the fundamental premises and principles of conservation biology are summarized and legislative provisions from other jurisdictions for the conservation of biological diversity are distilled. The authors then review British Columbia legislation in light of our present understanding of conservation biology and recommend legal reforms by which British Columbia can better address the maintenance of biological diversity.

19. Ruggiero, L.F., K.B. Aubry, A.B. Carey, and M.H. Huff. 1991. Wildlife and vegetation of unmanaged Douglas-fir forests. *USDA For. Serv. Pac. Northwest Res. Stn., Portland, Oregon., Gen. Tech. Rep. PNW-285.* 533p.

This book presents the major findings of the USDA Forests Service's Old Growth Forest Wildlife Habitat Research and Development Program. Although the findings presented here are most pertinent to Douglas-fir forests of the Pacific Northwest, many of the ecological insights contained in these papers have more general applicability. Sections of the work include: Introduction; The Environmental Setting; Douglas-Fir Forests of Oregon and Washington; Diurnal Forest Birds of Oregon and Washington; Small Mammals of Oregon and Washington; Amphibians of Oregon and Washington; Old Growth Community Studies in Northern California and Southern Oregon; and, Wildlife and Forest Management in the Pacific Northwest.

20. Saunders, D.A., R.J. Hobbs, and C.R. Margules. 1991. Biological consequences of ecosystem fragmentation: a review. *Cons. Biol.* 5(1):18-32.

Research on fragmented ecosystems has focused mostly on the biogeographic consequences of the creation of habitat "islands" of different sizes, and has provided little of practical value to managers. However, ecosystem fragmentation causes large changes in the physical environment as well as biogeographic changes. Fragmentation generally results in a landscape that consists of remnant areas of native vegetation surrounded by a matrix of agricultural or other developed land. As a result, fluxes of radiation, momentum, water, and nutrients across the landscape are altered significantly. These in turn have important influences on the biota within remnant areas, especially at or near the edge between the remnant and the surrounding matrix. The isolation of remnant areas by clearing also has important consequences for the biota. The influences of physical and biogeographic changes are modified by size, shape, and position in the landscape of individual remnants, with larger remnants being less adversely affected by the fragmentation process. The dynamics of remnant areas are predominantly driven by factors arising in the surrounding landscape. Management of, and research on, fragmented ecosystems should be directed at understanding and controlling these external influences as much as the biota of the remnants themselves. There is a strong need to develop an integrated approach to landscape management that places conservation reserves in the context of the overall landscape.

21. Schlosser, I.J. 1991. Stream fish ecology: a landscape perspective. *BioScience* 41(10):704-712.

Land use, which influences the terrestrial-aquatic interface, can affect fish populations and their community dynamics. In this paper, the basic life cycle of stream fish and the role physical and biological processes are likely to play in regulating the population and community dynamics are reviewed. The relationship between the structural and functional characteristics of the landscape and stream-fish dynamics are then examined. Lastly, the influence of landscape change on these relationships and, consequently, on the population and community dynamics of stream fish are assessed.

22. Soule, M. E. 1986. *Conservation biology: the science of scarcity and diversity*. Sinauer Assoc. Inc., Sunderland, Massachusetts. 584 p.

According to the author, this book has several objectives: to provide an up-to-date synthesis of conservation biology; to encourage communication among sections of the conservation community; and to engender a sense of purpose and excitement in students and professionals. Each of the book's six section is preceded by an introduction which describes the commonalities and differences in the papers that make up the section. These introductions were also designed to facilitate understanding and applications of the principles presented. The 25 papers which make up this volume are organized under the following sections: fitness and viability of populations, patterns of diversity and rarity (their implications for conservation), effects of fragmentation, community processes, sensitive habitats (threats and management), and interactions with the real world.**

23. Stace-Smith, R. (Editor). 1980. *Threatened and endangered species and habitats in British Columbia and the Yukon – proceedings of the symposium*. B.C. Min. Environment, Fish and Wildl. Br., Victoria! B.C., 302 p.

This book contains the proceedings from the symposium on Endangered Wildlife and Habitat in British Columbia and the Yukon. The keynote address, entitled, "The Basis of Endangerment" was given by Dr. Ian McTaggart Cowan. Papers were presented for the following sessions: habitat concerns; endangered species in British Columbia; other rare and endangered species; Yukon rarities; and other considerations.

24. Urban, D.L., R.V. O'Neill, and H.H. Shugart Jr. 1987. Landscape ecology: a hierarchical perspective can help scientists understand spatial patterns. *Bioscience* 37 (2) :119-127.

Landscape ecology is motivated by the need to understand the development and dynamics of pattern in ecological phenomena, the role of disturbance in ecosystems, and characteristic spatial and temporal scales of ecological events. This paper outlines an approach to landscape study that employs a hierarchical paradigm of pattern and behavior. Although the emphasis is on forested landscapes, a theory of landscape ecology can be generalized.

25. Wilcove, D.S. 1987. From fragmentation to extinction. *Nat. Areas J.* 7(1):23-29.

Restricted in size and surrounded by a modified, even alien environment, fragmented ecosystems can suffer a loss of biological diversity, most noticeable through the extinction of species. The extinction process that occurs as a result of fragmentation can be divided into four categories: (1) the loss of species that were initially excluded from the protected fragments; (2) the loss of species that no longer find certain fragments to be acceptable habitat; (3) the loss of species that can reproduce, successfully within the fragments, but that occur as small populations; and (4) the loss of species due to ecological imbalances within the fragments. These categories are discussed in the context of, designing and managing nature reserves.

Managing for Biodiversity (British Columbia Examples)

26. B.C. Ministry of Forests. February, 1992. Okanagan Timber Supply Area integrated resource management timber harvesting guidelines. B.C. Min. For., Victoria, B.C., 74 p.

The guidelines in this report provide an overall framework for integrated resource management decision making with respect to timber harvesting in the Okanagan TSA. The focus is on timber management, as this activity has a major impact on fish, wildlife, soils, water, range, and recreation. The guidelines contain recommended management practices which recognize the significance of these other values and which include measures for their conservation.

27. B.C. Ministry of Forests. Dec. 1991. Guidelines to maintain biological diversity in TFL #44 and TFL #46. B.C. Min. of For., Integrated Resource Br., Victoria, B.C., 9 p.

These guidelines are a first approximation at addressing biodiversity concerns within TFLs 44 and 46 at the landscape level. They are designed to ensure that all life processes and native organisms within the management units are recognized and maintained. They are intended to be used by forest management planners, and to be implemented in conjunction with existing and proposed management strategies and guidelines. This paper provides an example of a method of addressing biodiversity concerns at the landscape level.

28. Hamilton, A.N. 1992. Interim guidelines for integrating coastal grizzly bear habitat and silviculture in the Vancouver Forest Region. B.C. Min..Envir., Lands and Parks, Wildl. Br., Victoria, B.C. 9 p.

These interim guideline propose to manage specific site associations in the Coastal Western Hemlock (CWH) Biogeoclimatic zone on an adaptive management basis in an attempt toward a more integrated solution to maintaining grizzly bear habitat in managed forests in the Vancouver Forest Region. These guidelines are intended to assist Ministry of Forests, Silviculture Resource Officers and District Planners, Ministry of Environment, Lands and Parks Habitat Protection Technicians and Biologists, industry silviculturalists and other managers who prepare harvest plans and silvicultural prescriptions.

29. Radcliffe, G., G. Porter, B. Bancroft, and C. Cadrin. 1991 (Draft). Biodiversity of the Prince Rupert Forest Region. for B.C. Min. For. and Min. Envir., Smithers, B.C., 58 p.

This report identifies and documents the major known components of biological diversity in the Prince Rupert Forest Region, and identifies major information gaps. The emphasis in the study is on ecosystem and species diversity in forested areas. No attempt is made to address other specific components of biodiversity, such as genetic, structural, or landscape diversity. To some extent these will be reflected in species and ecosystem diversity. A synopsis of all known seral and climax terrestrial ecosystems comprised a significant component of the study.

30. Steventon, J.D. 1992 (Draft). Managing for biodiversity in the Prince Rupert Forest Region. B.C. Min. For., Prince Rupert Forest Region, Forest science, Smithers, B.C.

This report provides recommendations on managing for biological diversity in the Prince Rupert Forest Region. The report encourages an adaptive management approach. Landscape level and stand level concepts and management are discussed. It is listed here to provide an example of a method of addressing biodiversity concerns by adopting an adaptive management approach.

Mammals

31. Banfield, A.W. F. 1981. The mammals of Canada. University of Toronto Press, Toronto and Buffalo. 438 p.

This book provides a popular account of the mammals of Canada for students, lay readers, and professional biologists. Concise life history descriptions of each species include information concerning habits, habitat, distribution, and reproduction. However, the distribution maps are quite general and, therefore, are not all that helpful for determining the distribution and extent of species in British Columbia. The identification keys and references are considered incomplete. Given these notes of caution, this book is still considered to be the best general reference on mammal life-histories, relevant to British Columbia.

32. Cannings, R.A., and A.P. Harcombe. 1990. The vertebrates of British Columbia: scientific and English names. Royal B.C. Museum, and B.C. Min. Env, Wildl. Br., Victoria, B.C., Heritage Rec. No. 20. 110 p.

This publication includes the names of all vertebrate species known to occur, or to have occurred, in the province of British Columbia and the adjacent Pacific Ocean to the 200 mile limit during historical times. scientific names, English names, and species codes are listed.

33. Chapman, J.A., and G.A. Feldhamer. (Editors). 1982. Wild mammals of North America: biology, management, and economics. John Hopkins University Press, Baltimore and London., 1147 p.

This text provides a comprehensive reference manual on the life history, ecology' and management of most of the economically important mammals of North America. A total of 57 species are covered in 57 chapters. The general format for each chapter contains distribution, description, physiology, reproduction, ecology, food habits, habitat, behavior, mortality, age determination, management, economic status, current research and management needs, and an extensive citation of the literature.

34. Cowan, I.M., and C. Guiget. 1965. The mammals of British Columbia. Royal B.C. Museum, Victoria, B.C., Handb. No. 11. 414 p.

This handbook provides a reference to the identification, distribution, and life histories of the mammal species and subspecies of British Columbia, based on the data that was available at the time of publication in 1965. Since the date of publication, changes in taxonomy and nomenclature have occurred. Seven new species have been added to the mammals list. Many species have been divided into subspecies which often co-exist, making precise identification problematic. The range maps were very general, and specific data gaps were not clearly presented.

The Royal British Columbia Museum will be revising this publication in a series of 6 handbooks. The first handbook in the new series will cover bats (see Nagorsen, 1992) and

is in press. The second volume will cover insectivores. The entire series may not be published for another 8-10 years. However, much of the new data which will be synthesized in these new volumes is available through the RBCM database.

35. DeBlase, A.F., and M.E. Robert. 1974. A manual of mammalogy. WM. C. Brown Company Publishers, Dubuque, Iowa., 329 p.

This manual includes general information on anatomy and natural history of mammals, systematics and classification of the orders of mammals, and a techniques section. The identification keys are unique in their coverage of the cranial characters of all the world's living families of mammals.

36. Maser, C., B.R. Mate, J.F. Franklin, and C.T. Dryness. 1981. Natural history of Oregon coast mammals. USDA For. Serv., Pac. Northwest For. and Range Exp. Stn., Portland, Oregon., Gen. Tech. Rep. PNW-133. 496p.

The book presents detailed information on biology, habitats, and life histories of the 96 species of mammals of the Oregon Coast. Soils, geology, and vegetation are described and related to wildlife habitats for the 65 terrestrial and 31 marine species. The book is not simply an identification guide to the Oregon coastal mammals but is a dynamic portrayal of their habits and habitats. Life histories are based on fieldwork and available literature. An extensive bibliography is included. Personal anecdotes of the authors provide entertaining reading. The book should be of use to students, educators, land-use planners, resource managers, wildlife biologists, and naturalists.

37. Nagorsen, D. 1990. The mammals of British Columbia: a taxonomic catalogue. R.B.C. Mus., Victoria, B.C., Memoir No. 4. 140p.

This publication is a technical reference which synthesizes recent research on the taxonomy and nomenclature of British Columbia mammals. The publication provides a basic reference to the currently accepted common and scientific names of these mammals. For those looking for more detail however, the publication documents the number of species of each mammal, their geographic range, the most recent taxonomic revision of each species, the number of subspecies currently recognized for each species, where they occur, and who described them. Current names for obsolete species names are also provided. This publication is intended for a wide variety of users. In addition to museum biologists and other mammalian systematists, the information summarized herein will be useful to biologists, resource managers, students, ecologists, and serious naturalists.

38. Nagorsen, D.W., and M.R. Brigham. 1992. The mammals of British Columbia: 1. Bats. Royal B.C. Museum, Victoria, B.C., Handb. No. -. (In press) 180 p.

This is the first of 6 handbooks being prepared by the Royal British Columbia Museum to replace the Museum's Handbook 11, The Mammals of British Columbia by Ian McTaggart-Cowan and Charles J. Guiget, which is out of date. The choice of bats (Chiroptera) as the subject of the first new handbook is a reflection of public interest, the

significance of Chiroptera to biodiversity in this province, and the need to stimulate more research on Chiroptera. This handbook provides up to date information on identification, natural history, distribution, and conservation of the bats which are known to occur in British Columbia. Taxonomic information is limited to a listing of subspecies. Although these new handbooks will be useful to mammalogists and other biologists, they are directed towards a more general audience.

39. Rand, A.L. 1945. Mammals of Yukon. Nat. Mus. Canada, Ottawa, Ontario., Biological Series No. 29, Bull. No. 100. 93p.

This is a preliminary report intended to give a complete list of the present day (up to 1945) mammals known to occur in Yukon and adjacent areas. It includes a summary of their distribution and status, enough data to enable identifications to be made in the field, and an indication of life history and importance of the species in the area.

40. Ritcey, R., D. Low, A. Harestad, W. Campbell, and A. Harcombe. 1988. Species – habitat relationship models for mammals. Volume 5 in Wildlife habitat handbooks for the Southern Interior Ecoprovince. A. P. Harcombe (tech. ed.). B.C. Min. Envir. and Min. For., Victoria, B.C., Wildl. Rep. No. R-19, or Wildl. Habitat Res. WHR-32. 252 p.

The following report assimilates knowledge on the relationships between mammals and their habitats, based on a blend of literature and professional expertise. Several assumptions are made. The first is that habitat requirements of wildlife can be related to successional stages for most habitats, and the second is that the resulting values are a good approximation of those habitat requirements. The third is that of the possible life requisites, the three most important are feeding, reproduction, and special needs. The fourth is that habitats of comparable value to a species seasonal needs can be substituted for each other.

For each species a standardized set of information is provided in two types of tables. The first table consists of a listing of all habitats or habitat complexes used by that species; the season it uses each habitat; and the expected relative abundance of the species in that habitat. The second set of tables displays the species-habitat relationship values for: 1) all habitats in which the abundance was rated as common or abundant for a particular season of use; or 2) all habitats in which the highest abundance category was only scarce.

A knowledge of wildlife-habitat relationships will aid in the development of coordinated guidelines to integrate these requirements with other land use activities.

41. Stevens, V., and S. Lofts. 1988. Species notes for mammals. Volume 1 in Wildlife habitat handbooks for the Southern Interior Ecoprovince. A. P. Harcombe (tech. ed.). B.C. Min. Envir. and Min. For., Victoria, B.C., Wildl. Rep. No. R-15, or Wildl. Habitat Res. WHR-28. 180 p.

This publication is part of the series "Wildlife Handbooks of the Southern Interior Ecoprovince". The purpose of this series is to provide forest, wildlife, and range managers with the knowledge and tools to assess impacts of various land management

practices on wildlife and its habitat. The species notes provide the literature data-base for developing the species-habitat relationship models that will indicate suitability values for wildlife species for each major wildlife habitat. Although the information in this series applies specifically to the Southern Interior Ecoprovince and similar ecosystems in the area, the principles and processes described apply generally to all managed forests and rangelands, when the welfare of wildlife is affected by land management decisions.

This report is the "mammal" component of the information base which the authors call species notes. It provides a summary of literature describing the distribution, habitat requirements, and selected life history characteristics for the 70 mammal species occurring in the Southern Interior Ecoprovince. References are cited. Appendices include: a phylogenetic listing of the mammals for which species notes are provided; a bibliography of general mammal texts; and a glossary,

42. van Zyll de Jong, C.G. 1983. Handbook of Canadian mammals. 1. Marsupials and insectivores. National Museums of Canada, Nat. Mus. Natur. Sci., Ottawa, Ontario., 210 p.

The aim of this handbook series is to provide an up-to-date summary of the systematics, distribution and life-history all free-living species of mammals that occur in Canada, or that occurred in this country in the historic past. This volume provides a critical compilation and synthesis of the literature on marsupials and insectivores. The basic format followed in this book is taxonomic, with sections on orders, families, genera, and species in hierarchical sequence forming the bulk of the text. The species accounts contain detailed information on morphology, including measurements and weight; distribution; and systematics and biology. Bibliographic references follow each species account.

43. van Zyll de Jong, C.G. 1985. Handbook of Canadian mammals. 2. Bats. National Museums of Canada, Nat. Mus. Natur. Sci., Ottawa, Ontario., 212 p.

The aim of this handbook series is to provide an up-to-date summary of the systematics, distribution and life-history all free-living species of mammals that occur in Canada, or that occurred in this country in the historic past. This volume provides a critical compilation and synthesis of the literature on bats. The volume differs from the preceding volume chiefly in the more extensive treatment of some aspects of the general biology of the Chiroptera. The systematic, ecological and behavioral aspects of the biology of bats are emphasized. Bibliographic references are included.

44. Youngman, P.M. 1975. Mammals of the Yukon Territory. Nat. Museums of Canada, Mus. of Natur. Sciences, Ottawa, Ontario. 192 p.

This primarily taxonomic study of the 64 species of Recent mammals recorded from the Yukon Territory of Canada attempts to discover the proximate origins of terrestrial species in the north-western Arctic and Subarctic. Ecological data are included for some species, and distributional maps are provided for all native terrestrial species.

Birds

45. Beebe, F.L. 1974. Field studies of the Falconiformes (vultures, eagles, hawks, and falcons). B.C. Dept. Rec. and Cons., Victoria, B.C. 163p.

The first section of this books provides information on the origins and relationships of North American falconiformes. The species accounts that follow include species description, subspecies, field recognition, range, migration, habitat (including habits and food), reproduction, voice and calls, historical use, and comments.

46. Campbell, W.R., H.R. Carter, C.D. Shepard, and C.J. Guiget. 1979. A bibliography of British Columbia ornithology. Volume 1. B.C. Prov. Museum, Victoria, B.C., Heritage Rec. No. 7. 185p.

This bibliography provides a comprehensive listing of published ornithological material relevant to British Columbia, cross-referenced by species, geographic area, and author. This is the first of the two-volume ornithological series.

47. Campbell, W.R., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, Kaiser, Gary W., and M.C. E. McNall. 1990. The birds of British Columbia, Volume 1: Nonpasserines, introduction and loons through waterfowl; and Volume 2: Nonpasserines, diurnal birds of prey through woodpeckers. Royal B.C. Mus. in assoc. with Environ. Can., Can. Wildl. Serv., Vancouver, B.C., 514 p. and 636 p.

These two volumes are the first two of a three volume set, describing the natural history, migration patterns, habitat requirements, reproductive biology, and distribution of the provinces avifauna. Volume I contains an extensive introduction and species accounts for nonpasserines: loons through waterfowl. The Introduction is made up of five sections: 1) a general introduction describing the geology of British Columbia, the bird resource and the history of the project; 2) the ornithological history of British Columbia; 3) an extensive treatment of the Ecoregion classification system for the province; and 4) and 5) lay the foundations for the taxonomy and the treatment of data in the species accounts of loons through waterfowl that follow.

Volume 2 completes the species accounts for nonpasserine birds begun in the first volume' and covers diurnal birds of prey through woodpeckers. Volume 3 will cover the passerines, but it is yet to be published.

According to the authors, this book is written for professionals as well as for serious amateur students of ornithology. It is a descriptive and complete inventory of the avifauna of the province to the end of 1987. Range maps show breeding as well as nonbreeding distributions throughout all four seasons of the year.

48. Campbell, W.R., K.H. Morgan, and C. Pamateer. 1988. Species notes for selected birds. Volume 2 in Wildlife habitat handbooks for the Southern Interior Ecoprovince. A. P. Harcombe (tech. ed.). B.C. Min. Envir. and Min. For., Victoria, B.C., Wildl. Rep. No. R-16, or Wildl. Habitat Res. WHR-29. 135p.

This publication is part of the series "Wildlife Handbooks of the Southern Interior Ecoprovince". The purpose of this series is to provide forest, wildlife, and range managers with the knowledge and tools to assess impacts of various land management practices on wildlife and its habitat. Although the information in this series applies specifically to the Southern Interior Ecoprovince and similar ecosystems in the area, the principles and processes described apply generally to all managed forests and rangelands, when the welfare of wildlife is affected by land management decisions.

This report is the "bird" component of the information base which the authors call species notes. It provides a summary of literature describing the distribution, habitat requirements, and selected life history characteristics for the selected bird species occurring in the Southern Interior Ecoprovince. Regional wildlife biologists based this selection on their need for more information on certain species or for species of management importance. References are cited. Appendices include: a phylogenetic listing of birds for which species notes are provided; a bibliography of general bird texts; and a glossary.

49. Cannings, R.A., R.J. Cannings, and S.G. Cannings. 1987. Birds of the Okanagan Valley, British Columbia. Royal B.C. Museum, Victoria, B.C. 420 p.

This book is not a field guide. Rather it is a biology of the 303 species known to have occurred in the Okanagan Valley to September 1986. Records as well as specimen data were used in this work. The species accounts deal with seasonal status, habitat preferences, migration patterns, breeding biology, feeding habits, and behaviour. The historical flavour of many species accounts is an important aspect of this book. The data encompass the major land-use changes in the valley, the analysis of which may provide insights into the effect of a changing environment on particular species as well as emphasizing the dynamic nature of bird populations.

50. Hatler, D.F., W.R. Campbell, and A. Dorst. 1978. Birds of Pacific Rim National Park. B.C.. Min. Prov. Secretary and Travel Ind., Victoria, B.C., Occas. Papers No. 20. 194 p.

This report identifies and describes the avifauna, and their pertinent habitats, in and around Pacific Rim National Park.

51. Hooper, T.D., and N.K. Dawe. 1988. A bibliography of British Columbia ornithology. Volume 2. Royal B.C. Museum, Victoria, B.C., Heritage Rec. no. 19. 591 p.

This book completes the two-volume series of bibliographies on ornithology in British Columbia. With this volume, 4,635 references have been assembled for the 438 species of birds known to occur in the province. The book is organized in three major categories: a master list of citations by senior author; a species/subject index; and a geographic index.

52. Johnstone, W.B. 1949. An annotated list of the birds of the East Kootenay, British Columbia. B.C. Prov. Museum, Victoria, B.C., Occas. Papers No. 7. 87 p.

This report provides a record of the bird fauna observed in the East Kootenay region in the 1940's. Notes on spring and autumn migration, and nesting are included for most species.

53. Peterson, R.T. 1990. A field guide to western birds. Houghton Mifflin Company, Boston, Massachusetts., 432 p.

This edition is a completely new and revised guide to field marks of all species found in North America west of the 100th meridian and north of Mexico. Painted illustrations, with arrows indicating key field marks, and direct comparisons between similar species, are the core of the Peterson system. Range maps are quite general, but do indicate isolated colonies of breeding or wintering populations.

54. Ritcey, R., D. Low, R.R. Howie, and A. Harcombe. 1988. Species – habitat relationship models for birds. Volume 6 in Wildlife habitat handbooks for the Southern Interior Ecoprovince. A. P. Harcombe (tech. ed.). B.C. Min. Envir. and Min. For., Victoria, B.C., Wildl. Rep. No. R-20, or Wildl. Habitat Res. WHR-33. 194 p.

The following report assimilates knowledge on the relationships between birds and their habitats, based on a blend of literature and professional expertise. Several assumptions are made. The first is that habitat requirements of wildlife can be related to successional stages for most habitats, and the second is that the resulting values are a good approximation of those habitat requirements. The third is that of the possible life requisites, the three most important are feeding, reproduction, and special needs. The fourth is that habitats of comparable value to a species seasonal needs can be substituted for each other.

For each species a standardized set of information is provided in two types of tables. The first table consists of a listing of all habitats or habitat complexes used by that species; the season it uses each habitat; and the expected relative abundance of the species in that habitat. The second set of tables displays the species-habitat relationship values for: 1) all habitats in which the abundance was rated as common or abundant for a particular season of use; or 2) all habitats in which the highest abundance category was only scarce.

A knowledge of wildlife-habitat relationships will aid in the development of coordinated guidelines to integrate these requirements with other land use activities.

Reptiles and Amphibians

55. Campbell, W.R., M.G. Shepard, B.M. Van Der Raay, and P.T. Gregory. 1982. A bibliography of Pacific Northwest herpetology. B.C. Prov. Museum, Victoria, B.C., Heritage Rec. 14. 151 p.

This handbook provides a bibliography of research pertaining to reptiles and amphibians of British Columbia, including the Pacific Northwest. The objective was to locate sources, and extract relevant information, for people interested in Pacific Northwest herpetology, whether professionals or amateurs. Source that would be useful to conservationists, habitat protection biologists, land planners and wildlife managers were considered. Each entry is cross-referenced by species, geographic area, and author.

56. Cook, F. R. 1991. Introduction to Canadian amphibians and reptiles. National Museums of Canada, Ottawa, Canada., National Museum of Natural Sciences. 200 p.

This publication is a comprehensive handbook of Canadian herpetology. It is a readable and authoritative guide, providing identification and distribution maps as well as some general information on natural history. It falls between the necessarily more condensed information on Canadian amphibians and reptiles distributed by the Interpretation and Extension Division of the national Museum of Natural Sciences, and the comprehensive, more technical monograph now in preparation, which will emphasize and summarize original research on Canadian amphibians and reptiles. It is not intended as a replacement for guides of individual provinces.

57. Green, D.M. 1992. The amphibians of British Columbia. B.C. Prov. Museum, Victoria, B.C., Handb. No. 45. 100 p.

This present handbook is an entirely rewritten and newly illustrated successor to G. Clifford Carl's 1943 handbook. The book includes a comprehensive introductory section describing the life history of amphibians. Separate keys for the identification of salamanders and frogs are provided. For each species of salamander, frog, and toad, life history information is detailed, including distinguishing features, description, habits, breeding, and range. Illustrations and range maps are provided.

58. Gregory, P.T., Campbell, Wayne, R. 1984. The reptiles of British Columbia. B.C. Prov. Museum, Victoria, B.C., Handb. No. 44. 102 p.

This handbook provides a synthesis of recent herpetological research on the reptiles which occur in British Columbia. The first section deals with the general biology of reptiles and includes information on their classification and the use of keys for their identification. Turtles, lizards and snakes are treated separately in three consecutive sections of the handbook. Information is provided on their identification, description (including illustrations), habits and habitat, subspecies, and range and distribution. This handbook incorporates much of the earlier work of G. Clifford Carl's earlier work "The

Reptiles of British Columbia, BCPM H311, and brings up to date the results of herpetological research from the past 30 years.

59. Nussbaum, R.A., J.E. D. Brodie, and R.M. Storm. 1989. Amphibians and reptiles of the Pacific Northwest. University of Idaho Press, Moscow, Idaho. 498p.

It is our aim in this book to provide interested amateurs and serious students with a concise guide to the identification of the species of amphibians and reptiles that occur in the Pacific Northwest. We also present a summary of the classification, geographic distribution, and natural history of each species. To the extent that some of the data on distribution and life history are new, we hope that this book will also be of use to the professional herpetologist. The Pacific Northwest is defined here as the states of Idaho, Oregon, and Washington and the province of British Columbia. The detailed range maps in this guide are constructed from museum records and field notes.

60. Orchard, S. 1984. Amphibians and reptiles of British Columbia: an ecological overview. B.C. Min. For., Res. Br., Victoria, B.C., Wildl. Hab. Res. No. 15.

This report is a synthesis of literature, life history and distribution of amphibians and reptiles in British Columbia. It is designed to complement, rather than overlap, existing publications on the B.C. herpetofauna. It bridges the gap between the field guides, which provide detailed morphological descriptions but sparse life history information, and the not so "user friendly" Bibliography of Pacific Northwest Herpetology (Campbell et al. 1982).

61. Orchard, S. 1988. Species notes for reptiles. Volume 3 in Wildlife habitat handbooks for the Southern Interior Ecoprovince. A. P. Harcombe (tech. ed.). B.C. Min. Envir. and Min. For., Victoria, B.C., Wildl. Rep. No. R-17, or Wildl. Habitat Res. WHR-30. 47 p.

This publication is part of the series "Wildlife Handbooks of the Southern Interior Ecoprovince". The purpose of this series is to provide forest, wildlife, and range managers with the knowledge and tools to assess impacts of various land management practices on wildlife and its habitat. Although the information in this series applies specifically to the Southern Interior Ecoprovince and similar ecosystems in the area, the principles and processes described apply generally to all managed forests and rangelands, when the welfare of wildlife is affected by land management decisions.

This report is the "reptile" component of the information base which the authors call species notes. It provides a summary of literature describing the distribution, habitat requirements, and selected life history characteristics for the 11 reptile species occurring in the Southern Interior Ecoprovince. References are cited. Appendices include: a taxonomic listing of reptiles; a bibliography of general reptile texts; and a glossary.

62. Orchard, S. 1988. Species notes for amphibians. Volume 4 in Wildlife habitat handbooks for the Southern Interior Ecoprovince. A. P. Harcombe (tech. ed.). B.C. Min. Envir. and Min. For., Victoria, B.C., Wildl. Rep. No. R-18, or Wildl. Habitat Res. WHR-31. 41 p.

This publication is part of the series "Wildlife Handbooks of the Southern Interior Ecoprovince". The purpose of this series is to provide forest, wildlife, and range managers with the knowledge and tools to assess impacts of various land management practices on wildlife and its habitat. Although the information in this series applies specifically to the Southern Interior Ecoprovince and similar ecosystems in the area, the principles and processes described apply generally to all managed forests and rangelands, when the welfare of wildlife is affected by land management decisions.

This report is the "amphibian" component of the information base which the authors call species notes. It provides a summary of literature describing the distribution, habitat requirements, and selected life history characteristics for the 8 amphibian species occurring in the Southern Interior Ecoprovince. References are cited. Appendices include: a taxonomic listing of amphibians; a bibliography of general amphibian texts; and a glossary.

63. Orchard, S., and A. Harcombe. 1988. Species – habitat relationship models for reptiles. Volume 7 in Wildlife habitat handbooks for the Southern Interior Ecoprovince. A. P. Harcombe (tech. ed.). B.C. Min. Envir. and Min. For., Victoria, B.C., Wildl. Rep. No. R-21, or Wildl. Habitat Res. WHR-34. 47 p.

The following report assimilates knowledge on the relationships between reptiles and their habitats, based on a blend of literature and professional expertise.

For each species a standardized set of information is provided in two types of tables. The first table consists of a listing of all habitats or habitat complexes used by that species; the season it uses each habitat; and the expected relative abundance of the species in that habitat. The second set of tables displays the species-habitat relationship values for: 1) all habitats in which the abundance was rated as common or abundant for a particular season of use; or 2) all habitats in which the highest abundance category was only scarce.

A knowledge of wildlife-habitat relationships will aid in the development of coordinated guidelines to integrate these requirements with other land use activities.

64. Orchard, S., and A. Harcombe. 1988. Species – habitat relationship models for amphibians. Volume 8 in Wildlife habitat handbooks for the Southern Interior Ecoprovince. A. P. Harcombe (tech. ed.). B.C. Min. Envir. and Min. For., Victoria, B.C., Wildl. Rep. No. R-22, or Wildl. Habitat Res. WHR-35. 45p.

The following report assimilates knowledge on the relationships between amphibians and their habitats, based on a blend of literature and professional expertise.

For each species a standardized set of information is provided in two types of tables. The first table consists of a listing of all habitats or habitat complexes used by that species; the season it uses each habitat; and the expected relative abundance of the species in that habitat. The second set of tables displays the species-habitat relationship values for: 1) all habitats in which the abundance was rated as common or abundant for a particular season of use; or 2) all habitats in which the highest abundance category was only scarce.

A knowledge of wildlife-habitat relationships will aid in the development of coordinated guidelines to integrate these requirements with other land use activities.

65. Stebbins, R.C. 1966. A field guide to western reptiles and amphibians. Houghton Mifflin Company, Boston. 279 p.

The primary function of this field guide is to aid in the identification of salamanders, frogs, toads, turtles, lizards, and snakes of Western North America. Information on capture methods and care of live specimens is included. Species accounts include detailed species descriptions, including similar species, range, and subspecies. Keys to species and colour plates are included.

Vascular Plants

66. Calder, J.A., and R.L. Taylor. 1968. Flora of the Queen Charlotte Islands, Part 1 and Part 2. Canada Dept. Agri., Res. Br., Ottawa, Ontario., 659 and 148 p.

Part I of the two volume series provides a systematic treatment and distribution maps of the 594 taxa found on the Queen Charlotte Islands. A botanical history of the islands, and a discussion of their physiography, geology, climate, economic botany, plant communities, and phytogeography are included. Part II covers the cytological aspects of the vascular plants of the Islands. The chromosome numbers given are correlated with the systematic discussion in Part I. A third publication was intended to cover the systematics and phytogeography of the nonvascular plants, but was never completed.

67. Cody, W.J., and D.M. Britton. 1989. Ferns and fern allies of Canada. Min. Supply and Services Canada, Ottawa, Ontario., 430 p.

This book provides keys, descriptions, illustrations, and distributions for all species of ferns and fern allies (pteridophytes) of Canada. This book also includes a reference list to the literature on ferns for those looking for more information on certain taxa.

68. Douglas, G.W., A. Ceska, and G.G. Ruyle. March, 1983. A floristic bibliography for British Columbia. B.C. Min. For., Research Br., Victoria, B.C., Land Manage. rep. No. 15. 143p.

This bibliographic publication is directed towards assisting resource managers with various floristic problems. The report is divided into 7 major sections: general floras; general texts; taxonomic vascular plant papers; floristic vascular plant papers; bryophyte papers; lichen papers; and general vegetation papers. Other government researchers, university scientists and graduate students and interested "lay persons" will also find the references helpful.

69. Douglas, G.W., G.B. Straley, and D. Meidinger. 1989-91. The vascular plants of British Columbia. Part 1 – Gymnosperms and Dicotyledons (Aceraceae through Cucurbitaceae). Part 2 – Dicotyledons (Diaspensiaceae through Portulaceae). Part 3 – Dicotyledons (Primulaceae through Zygophyllaceae) and Pteridophytes. B.C. Min. For., Res. Br., Victoria, B.C., Spec. Rep. Ser. No. 1-3. 3 vol.

This series provides a descriptive checklist of the flowering plants and vascular cryptogams, both native and naturalized, occurring within the borders of British Columbia. Keys are included for all genera, species, subspecies, and varieties. The study is based on examination of specimens in all major Canadian herbaria and some U.S. herbaria as well as a complete review of the pertinent literature. Illustrations are not included.

70. Hitchcock, C.L., and A. Cronquist. Flora of the Pacific Northwest: an illustrated manual. Univ. Wash. Press, Seattle and London., 730 p.

This manual contains a taxonomic treatment of all the species of flowering plants, conifers, ferns, and fern-related plants native to or established in the Pacific Northwest, which includes southern British Columbia. This is essentially a condensation of the five-volume work, *Vascular Plants of the Pacific Northwest* (Hitchcock et al. 1955-1969). This text is outstanding for its descriptions, the clarity of its drawings, the listing of synonyms, and the taxonomic notes. The 5 volume series provides more detailed descriptions and illustrations.

71. Hubbard, W.A. 1969. *The grasses of British Columbia*. B.C. Prov. Museum, Victoria, B.C., Handb. No. 9. 205 p.

This booklet provides a basic reference to the identification and description of grasses of British Columbia that were documented at the time the book was published in 1969. One of its main purposes was to stimulate further research. However, the book is now quite out of date. A new Royal B.C. Museum Handbook on grasses should be available in 1994. For more information on grasses, refer to Hitchcock and Cronquist's *Flora of the Pacific Northwest*.

72. Hulten, E. 1968. *Flora of Alaska and neighbouring territories*. Stanford University Press, Stanford, California., 1008 p.

This book describes and illustrates all flowering plants known to occur in Alaska, the Yukon, the Mackenzie District, and the eastern extremity of Siberia. Keys to genus, families, and species are provided. For most of the species included, detailed descriptions, nomenclature, plant drawings, and range maps (for the Alaska region as well as circumpolar projection) are provided.

73. Kartesz, J.T., and R. Kartesz. 1980. *A synonymized checklist of the vascular flora of the United States, Canada, and Greenland, Volume II, The biota of North America*. University of North Carolina Press, U.S.A., 498 p.

This checklist provides an comprehensive enumeration of the names of all known native and naturalized vascular plant taxa in the regions covered. The checklist is divided into three sections: Pteridophyta, Gymnospermae, and Angiospermae.

74. Klinka, K., V.J. Krajina, A. Ceska, and A.M. Scagel. 1989. *Indicator plants of Coastal British Columbia*. Gov. Can., Prov. B.C., Canada., 288 p.

This guide is designed to be a concise and coherent tool for understanding the use of indicator plants for site diagnosis for Coastal British Columbia. Coastal British Columbia includes the hypermaritime, maritime, and subarctic belts of the coastal region as well as the subcontinental belt of the interior region of the province (as it is moderated by the Pacific ocean). The guide emphasizes the rationale for using indicator plants, how to recognize indicator plants, and demonstration of how indicator plants can be used in site diagnosis.

This guide is organized in six sections: introduction; basic concepts of site diagnosis; concepts and methods related to indicator plants; site attributes and indicator species; indicator plant analysis; and distribution and ecological characteristics of indicator plants. References are listed. Appendices include a synopsis of indicator species groups and indicator value of species, and an index of scientific and common names of species. Materials essential for plant identification are not included, as they are well covered in other guides. Though intended primarily for field foresters, this guide will be useful for a wide range of ecological interests.

75. Krajina, V.J., K. Klinka, and J. Worrall. 1982. Distribution and ecological characteristics of trees and shrubs of British Columbia. The University of British Columbia, Faculty of Forestry, Vancouver, B.C. 131 p.

The distribution and ecological characteristics of thirty-five tree species and eleven shrub species native to British Columbia are presented. Each species is characterized by its geographic distribution, climatic requirements, orographic position, physiognomic type, edatopic requirements, and nutritional type. The biogeoclimatic units in which a species occurs are listed. A summary is presented in the form of: maps of species diversity in British Columbia; and species groups showing similar ecological affinities, derived from cluster analysis.

76. MacKinnon, A., J. Pojar, and R. Coupe. 1992. Plants of northern British Columbia. Lone Pine Publishing, Edmonton, Alberta. 345 p.

This guide includes all the more common species of plants occurring in northern British Columbia. It covers all the plant groups, except algae. Keys are included. Illustrations usually include a color photograph of a leaf with flower or fruit, accompanied by line drawings to illustrate habitat or details. Plant descriptions include: the -characteristics most important for species identification followed by more detailed descriptions; the ecology of the plant, including species habitat, its commonness and abundance, and its geographic range; and notes, including similar species, use of plant by native groups, and/or derivation of the scientific or common names. A glossary and an index of common and scientific names are also included.

77. Packer, J.G. 1983. Flora of Alberta. University of Toronto, Toronto, Ontario., 687 p.

This book is an update to the original Flora of Alberta, by E.H. Moss (1959). The keys to families and species are now all dichotomous and include bracketed couplets, to minimize the chances of keying errors. Plant descriptions include cytological information. Dot distribution maps are provided for Alberta only. The keys and descriptions may be useful in identifying flora of the Rocky Mountains in British Columbia.

78. Porslid, E.A., and W.J. Cody. 1980. Vascular plants of continental Northwest Territories, Canada. Nation. Mus. Can., Nation. Mus. Natur. Sci., Ottawa, Canada., 667 p.

This book is a comprehensive treatment of the ferns and flowering plants of the large area lying between Hudson Bay and the Yukon Territory, and 60 degrees N latitude and the Arctic Coast. Keys, descriptions, habitat, and distributional information are provided for 1112 species found in the region and others which might be expected to occur there. Distributional maps are provided for all the native species. The work also includes a description of the area and its six phytogeographic zones, a tabulation of families, genera, and species, a selected bibliography, a glossary, and an index.

79. Rafiq, M. 1982. An illustrated key to monocotyledon families of British Columbia. B.C. Min. of Envir., Terrestrial Studies Br., and B.C. Prov. Museum, Victoria, B.C., 25 p.

This report is one of a series of keys to the vascular plants of British Columbia. The key carries identification to the family level within the monocotyledons. It initially points to major groups within the Monocotyledonae, each of which is then treated separately leading to family. The key uses pairs of contrasting characteristics as well as illustrations at each step. Appendices include: a glossary of terms, references, and an index of scientific and common names.

80. Rafiq, M., G.F. Harcombe, and R.T. Ogilvie. 1982. An illustrated key to dicotyledon families of British Columbia. B.C. Min. of Envir., Terrestrial Studies Br., and B.C. Prov. Museum, Victoria, B.C., 127 p..

This report is one of a series of keys to the vascular plants of British Columbia. The key indicates major groups within the Dicotyledonae, and then carries identification to the family level and sometimes genus and species level. The key uses pairs of contrasting characteristics as well as illustrations at each step. Appendices include: a glossary of terms, references, and an index of scientific and common names.

81. Szczawinski, A.F. 1975. The heather family (Ericaceae) Royal B.C. Museum, Victoria, B.C., Handb. No. 19. 201p.

This handbook provides a synthesis of available data on the Heather (Ericaceae) Family. The book includes a description of the floral parts of heather as well keys for identifying genera and further keys to the species within those genera which have more than one species. Species descriptions, including habitat, season, and range are provided. This publication is considered up to date with the exception of the genus *Vaccinium* L. (Blueberry).

82. Szczawinski, A.F. 1975. Orchids of British Columbia. Royal B.C. Museum, Victoria, B.C., Handb. No. 16. 124 p.

This handbook provides a synthesis of available data concerning native orchids of British Columbia. The work includes identification keys and information on distribution, description, habitat, and season. Revisions to this handbook being undertaken by Bob Ogilvie the RBCM.

83. Taylor, R.L., and B. MacBryde. 1977. Vascular plants of British Columbia, a descriptive resource inventory. The University of British Columbia Press, Vancouver, B.C. 753 p.

This inventory of the vascular plants of British Columbia, essentially a literature review, was a first step toward the development of a major floristic work for the plants of the province. It provides a checklist and brief description of each species recorded in B.C. collections, but does not distinguish records of exotics from those of native species.

National Museum collections in Ottawa were not analyzed. For a more recent and comprehensive inventory, refer the B.C. Min. For., Res. Br., Special Report Series 1-4, by Douglas et al..

84. Taylor, T.M. C. 1973. The ferns and fern-allies of British Columbia. B.C. Prov. Museum, Victoria, B.C., Handb. No. 12. 172 p.

This handbook provides a popular account of the ferns and fern-allies of British Columbia. They are placed in the class Pteridophyta and about 70 species are known to occur in British Columbia. Keys to families and species within each family are provided. Species descriptions include information on morphology, habitat, and range.

85. Taylor, T.M. C. 1974. The figwort family of British Columbia. Royal B.C. Museum, Victoria, B.C., Handb. No. 33. 237 p.

This handbook provides a synthesis of available monographic information on the Figwort Family (Scrophulariaceae) relevant to British Columbia. The main purpose is to aid in identifying species. A key to the genera is included, along with more specific keys to species within genera having more than one species. Species descriptions include information on habitat, maps of documented distribution, and range.

86. Taylor, T.M. C. 1974. The lily family of British Columbia. Royal B.C. Museum, Victoria, B.C., Handb. No. 25. 109 p.

This handbook provides synthesis of botanical information available on the Lily (Liliaceae) Family. A key to the genera is included, as well as keys to species for genera having more than one species represented. species description include information on habitat, range and distribution. This handbook is undergoing review by Bob Ogilvie of the RBCM.

87. Taylor, T.M. C. 1974. The pea family of British Columbia. B.C. Prov. Museum, Victoria, B.C., Handb. No. 32. 251 p.

This handbook is an attempt to provide an up-to-date account of the Leguminosae, or Pea Family, of British Columbia based on the researches of various specialists whose names appear after the generic descriptions. Monographic details concerning subspecies and smaller units are not included. A key to the genera, and more detailed species keys for each genus are provided. For each species, morphological description, illustration, habitat, and distribution map, is detailed.

88. Taylor, T.M. C. 1973. The rose family of British Columbia. Royal B.C. Museum, Victoria, B.C., Handb. No. 30. 223 p.

This handbook provides a synthesis of available botanical information on the Rose Family relevant to British Columbia. A key to the genera is provided, along with more specific species keys for those genera having more than one species. Species descriptions include information on habitat, distribution, and range. A revision to this edition is planned.

89. Taylor, T.M. C. 1983. The sedges of British Columbia. B.C. Prov. Museum, Victoria, B.C., Handb. No. 43. 375 p.

The main purpose of this handbook is to identify species in the Cyperaceae, or Sedge Family, of which 150 species are known to occur in British Columbia. The book provides a key to 7 genera of Cyperaceae, of which *Carex* is the largest. For each genera, species keys are provided, along with detailed descriptions of each species, including illustrations, morphology, habitat, distribution and range.

90. van Barneveld, J.W., M. Rafiq, G.F. Harcombe, and R.T. Ogilvie. 1980. An illustrated key to gymnosperms of British Columbia. B.C. Min. Envir., Terrestrial Studies Br., and B.C. Prov. Museum, Victoria, B.C. 32 p.

This report is one of a series of keys to the vascular plants of British Columbia. The conifer key initially points to the major groups of conifers, each of which is treated separately leading to the genera. The key uses pairs of contrasting characteristics at each step, and each step in the written key is accompanied by a drawing on the illustration chart.

91. Warrington, P.D. 1980. Aquatic plants of British Columbia. B.C. Min. Envir., Aquatic Studies Br., Victoria, B.C. 865 p.

This interim report consolidates in one source information on vascular aquatic plants of British Columbia. The book is organized into 9 chapters: 1) an introduction in which various definitions of aquatic plants are discussed; 2) listings of aquatic plant species presented in tabular form; 3) technical botanical descriptions of aquatic plant species organized by family, genus and species; 4) illustrations; 5) dichotomous keys to families, genera, and species; 6) aquatic plant ecology; 7) a large section on species distributions including maps for each species; 8) synonymy; and 9) bibliographies. Appendices include a listing of excluded species associated with wet, boggy, marshy, vernal or marginal habitats; glossary; table of genus/species and reference books used; and notes on the derivation of generic names.

Plant Communities

92. Achuff, P.L., W.D. Holland, G.M. Coen, and K. Van Tighem. 1984. Ecological land classification of Mount Revelstoke and Glacier National Parks, British Columbia, Volume I: Integrated resource description. Alberta Institute of Pedology and Environment Canada, Edmonton, Alberta., Publication No. M-84-11. 261 p.

This report provides an integrated resource inventory of landform, soil, vegetation, and wildlife information presented in both report and 1:50,000 map format. Three ecoregions are represented in the two national parks: Interior cedar-Hemlock, Englemann Spruce – Subalpine Fir, and Alpine. The ecoregions are divided into 19 ecosections and 50 ecosites which are described. Within these divisions, 34 vegetation types are recognized. Wildlife information includes the importance of each Ecosite for the most common animals and descriptions of 11 breeding bird communities and 10 small mammal associations.

93. Achuff, P.L., W.D. Holland, G.M. Coen, and K. Van Tighem. 1984. Ecological land classification of Kootenay National Park, British Columbia, Volume I: Integrated resource description. Alberta Institute of Pedology and Environment Canada, Edmonton, Alberta., Publication No. M-84-10. 373 p.

This report provides an integrated resource inventory of landform, soil, vegetation, and wildlife information presented in both report and 1:50,000 map format. Three ecoregions are recognized: Montane, Subalpine, and Alpine. The ecoregions are divided into 31 ecosections and 78 ecosites which are described. Within these divisions, 56 vegetation types are recognized. Wildlife information includes the importance of each ecosite for the most common animals and descriptions of 14 breeding bird communities and 8 small mammal associations.

94. Braumandl, T.F., and M.P. Curran. May, 1992. A field guide for site identification and interpretation for the Nelson Forest Region. B.C. Min. Forests., Victoria, B.C., Land Manage. Handb. No. 20. 290 p.

This guide presents site identification and interpretation information for forest and range ecosystems of the Nelson Forest Region which encompasses most of southeastern British Columbia. The main goals of the guide are to assist the user in classifying sample sites in the field; and to provide interpretation's for these sites that assist the user in preparing management descriptions. The classification system used follows the Biogeoclimatic Ecosystem Classification (BEC)

The guide contains 7 chapters: 1) introduction; 2) description of the classification system; 3) procedures for site description, identification, mapping, and interpretation; 4) general descriptions of the zones of the Nelson Forest Region; 5) tools for identifying biogeoclimatic and site units and general management interpretations for the identified sites; 6) wildlife interpretations; and 7) forest health concerns. A number of appendices are included to provide specific interpretations such as silvicultural standards and forage seeding mixes or technical interpretations such as plant species lists and soil/site interpretations.

This guide replaces the earlier edition by Utzig et al. that was released in 1986. This latest version results from the recent completion of an inter-regional correlation of the BEC system. Appendix 2 presents the correlation between the 1986 ecosystem and biogeoclimatic classification units and this classification.

95. Clement, C.J. E. 1987. Purcell biophysical project: biophysical habitat. B.C. Min. Envir., Wildl. Br., Victoria, B.C., Working Report. 51.

The Purcell Biophysical Project, initiated in 1985, encompasses a wide area in and adjacent to the Wilderness Conservancy. This report describes the vegetation component of the biophysical habitat inventory. It is anticipated that it will be incorporated into a larger report along with information on terrain, soils, and wildlife. Vegetation descriptions are by Biophysical Habitat Units within Biogeoclimatic Subzones.

96. Clement, C.J. 1981. Vegetation resources of the Vernon map sheet area, NTS map 82L. Volume 1 – vegetation and selected interpretations. Volume 2 – technical data. B.C. Min. Env., Assess. and Planning Div., Kelowna, B.C., ADP Bull. No. 19. 82 p. and 150 p.

This report describes a total of 45 vegetation types, representing seral and climax vegetation in the Dry Interior and Wet Belt Interior Regions of the Vernon mapsheet (NTS 82L). Volume 1 contains vegetation summaries and selected interpretations of each vegetation type are made for wildlife, forestry, and recreation values. Volume 2 includes the vegetation type descriptions, soils-vegetation legends, and keys to broad vegetation groups and vegetation types. Appendices include: a list of plant species, a list of mammal species, successional patterns of wildlife use, and maps and data in the study area.

97. Clement, C.J., and J.W. van Barneveld. 1985. Vegetation of Saltspring Island. B.C. Min. Envir., Surveys and Resource Mapping Br., Victoria, B.C., Unpub. 34 p..

This report is a supplement to the Vegetation Map, Saltspring Island (4 mapsheets included), and provides additional information on description of the Vegetation Units, successional patterns and climax vegetation, key to the Vegetation Units, vegetation features and plant species occurring on the Island. Mapping was done at a scale of 1:20 000. A total of 10 different Vegetation Units are identified and described.

98. Coen, G., and P. Kuchar. 1982. Biophysical (ecological) inventory of Yoho National Park, British Columbia, Canada. Agriculture Canada, Research Branch, Edmonton, Alberta., LRRRI Contribution No. 82-20. 92 p.

This report provides a brief introduction to the natural history of Yoho National Park and then discusses the methodology used to prepare the maps. The map unit descriptions comprise the bulk of the report and provide a detailed description of the map document, based on previous reports by the authors.

99. Comeau Ecological Consultants Ltd. 1985. Vegetation resources of the Jarvis Creek–Morkill River Area. B.C. Min. Environment, Victoria, B.C., MOE Techn. Rep. No. 31. 145 p.

The vegetation of the Jarvis Creek–Morkill River area is characterized by three forest regions: the Boreal Region, the Subboreal Region, and the Interior Wet Belt Region. Within each of these regions, several zones and subzones are recognized. A total of 28 vegetation types are delineated and described. The relationship between the vegetation types and environmental factors is examined as are successional trends of the vegetation of the Study Area. Several interpretations are presented for each vegetation type including interpretations for agriculture, conservation, forestry, mine reclamation, recreation, and wildlife. These general interpretations serve to aid the resource manager in making land management decisions.

100. DeLong, C. 1988. A field guide for identification and interpretation of Seral Aspen Ecosystems of the BWBScl, Prince George Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. No. 16. 36 p.

This field guide describes the seral aspen ecosystems of the Murray River variant (BWSBScl), of the Moist Warm Boreal White and Boreal Spruce Zone in the Prince George Forest Region. It presents aids to the identification of these units, and management interpretations of each unit. It is assumed that users of this guide have been trained to identify vegetation and soil and site factors.

101. DeLong, C. 1992. A guide to site identification and interpretation of the Northern Rockies portion of the Prince George Forest Region. B.C. Min. For., Victoria, B.C., Land Manage. Rep. No.____.

This report is in preparation.

102. DeLong, C. 1992. A guide to site identification and interpretation of the Southwest portion of the Prince George Forest Region. B.C. Min. For., Victoria, B.C., Land Manage. Rep. No.____.

This report is in preparation.

103. DeLong, C., A. McLeod, A. MacKinnon, and L. Jang. 1990. A field guide for identification and interpretation of ecosystems of the northeast portion of the Prince George Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. No. 22. 108 p.

This field guide describes the lowland and montane ecosystems in British Columbia's northeastern corner. This area, northeast of the Rocky Mountains, encompasses the Alberta Plateau, Liard Plateau, and Liard Plain physiographic regions. The units in this guide are described in the biogeoclimatic ecosystem classification system. It is assumed that the user has a working knowledge of this system. The guide presents aids to the identification of described units, and management interpretations for each.

104. Enns, K.A., and J.M. Ryder. 1992. Lac Du Bois biophysical habitat analysis. B.C. Min. Envir., Lands, Parks, Wildl. Br., Victoria, B.C. (In preparation).

This report provides a biophysical habitat analysis and habitat management plan for the Lac Du Bois study area, including the Dew Drop and Tranquille River area, in south central British Columbia. Mapping was conducted at a scale of 1:20 000. Patterns of present land use and land use conflicts are indicated. Appendices include: species list; map and folio lists; and biophysical habitat analyses for wildlife, including habitat unit descriptions.

105. Fuhr, B., M. Fenger, L. Lacelle, R. Marsh, and M. Rafiq. 1986. Morice biophysical study: wildlife capability and habitat. B.C. Min. Envir. Parks, Wildl. Br., Victoria, B.C., Wildl. Working Rep. No. WR-18. 58 p. and map.

The Morice Biophysical Study provides reconnaissance biophysical information for the largely remote area of the Morice River, which straddles the Hazelton Mountains and the Nechako Plateau, east of the Coast Mountains. The area comprise four 1:50 000 map sheets: 3L/3, 4, 5, and 6. The map products rely mainly on air photo interpretation and a minimum of ground checking. The report follows the stepwise process of biophysical habitat analysis which integrates information on climate, terrain, soils, vegetation, and wildlife.

106. Haeussler, S., J. Pojar, B.M. Geissler, D. Yole, and R.M. Annas. 1984. A guide to the Coastal Western Hemlock Zone, Northern drier maritime subzone (CWHf), in the Prince Rupert Forest Region, British Columbia. B.C. Min. For., Inf. Serv. Br., Victoria, B.C., Land Manage. Rep. No. 21. 163 p. and map.

The area covered by this guide encompasses most of the lowland and mid-elevation forests of the central part (centred on Terrace) of the Kalum Timber Supply Area (T. S.A.), and some of the middle elevations of the western most Kispiox T.S.A. This guide briefly outlines the principles and methods of the ecosystem classification system, stressing the two primary areas of emphasis within the classification, the biogeoclimatic (zones, subzones, variants), and the ecosystematic (ecosystem associations and their phases and variations). The environmental characteristics of the Northern drier maritime subzone of the Coastal Western Hemlock Zone (CWHf) and two of its variants, a lower (CWHf1) and a higher elevation (CWHf2) variant are summarized. The classification of the subzone at the ecosystem level is then presented in detail. Silvicultural interpretations are presented in the final section of the report.

107. Harcombe, A. 1978. Vegetation resources of the Northeast Coal Study Area 1976-1977. B.C. Envir. Land Use Comm., N.E. Coal Development, Victoria, B.C., 46 p.

This technical supplement to the Northeast Coal Study describes and classifies the vegetation of the Boreal and Sub-boreal regions, and analyses how this vegetation relates to the physical environment. This information is then incorporated into a biophysical framework. Appendices include: plant species lists, vegetation data, vegetation type descriptions, and soils-vegetation (biophysical) legends.

108. Harcombe, A.P., and E.T. Oswald. 1990. Vegetation resources of Vancouver Island. Volume 1, -2, and 3. B.C. Min. Env., Victoria, B.C., MOE Techn. Rep. 27. 72 p. and map.

This three volume report and accompanying forest zonation maps are the product of the vegetation survey of the Vancouver Island mapsheets. Together, they provide basic information about the classification, distribution, and ecology of the vegetation and its related properties. Volume 1 – Forest Zonation, provides descriptions of the regional vegetation, following the biophysical forest zonation classification. Volume 2 – Vegetation Types, contains descriptions of the 106 vegetation types classified for Vancouver Island. It also includes a dendrogram showing hierarchical relationships between the types, and a vegetation-soils table showing the relationships of the vegetation types to soil association components. Volume 3 – Forest Zonation Maps, contains the forest zonation maps which indicate the areal distribution of forest regions, zones, and subzones.

109. Harcombe, A., B. Pendergast, B. Petch, and D. Janz. 1984. Elk habitat management: Salmon River Valley. B. C. Min. Envir., Surveys and Resource Mapping Br., Terrestrial Studies, Victoria, B.C., Working Paper. 83 p.

This report provides descriptions of soils and vegetation types for a portion of the Salmon River floodplain, upstream of its confluence with the White River, on Vancouver, Island, near Sayward, B.C. A total of fifteen soils and vegetation types are described and mapped at a scale of 1:20 000. Interpretations of the mapping units for enhancement or manipulation of Roosevelt Elk habitat, are provided, taking into consideration inherent values of the soils and vegetation resources, as well as habitat management intensity considered practical at the time of writing. Appendices include: plant species lists, vegetation type descriptions, constancy tables, propagation methods, and soils, vegetation type and plot location maps.

110. Hignett, V. 1987. Habitat survey of the Mackenzie Heritage Trail Corridor. B.C. Min. Envir. Parks, Wildl. Br., Victoria, B.C., Wildl. Working Rep. No. WR-29. 19 p. and map.

This report and accompanying maps provide information on ecological zonation and physical landform characteristics of the corridor along the Mackenzie Heritage Trail, which extends west from the Fraser River to the boundary of Tweedsmuir Provincial Park. The entire corridor lies with the Sub-Boreal Spruce biogeoclimatic zone. Descriptions are by subzone variant and by habitat types.

111. Houseknecht, S., S. Haeussler, A. Kokoshke, J. Pojar, D. Holmes, B.M. Geisler, D. Yole, and C. Clement. 1987. A field guide for identification of the Interior Cedar-Hemlock Zone, Northwestern Transitional Subzone (ICHg), in the Prince Rupert Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. 12. 187 p.

This field guide presents a summary of ecological and management information for the Interior Cedar – Hemlock Zone, Northwestern Transitional Subzone (ICHg) in the Prince Rupert Forest Region. Brief explanations of the biogeoclimatic variants, ecosystem units,

and silviculture prescriptions are provided. Ecological information and identification keys are included to assist the user in determining the ecological units and in making silviculture interpretations. It is assumed that the user has a working knowledge of site, soil, and vegetation evaluation.

All field guides of this nature for the Prince Rupert region are currently undergoing revision and are to be compiled into one comprehensive regional guide by late in 1992.

112. Klinka, K., R.N. Green, P.J. Courtin, and F.C. Nuszdorfer. 1984. Site diagnosis, tree species selection, and slashburning guidelines for the Vancouver Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Rep. No. 25. 180 p.

This guide provides technical information for site quality diagnosis, tree species selection guidelines and slashburning guidelines. The guide can be used as a basis for making site-specific tree species and site preparation prescriptions. The site units for tree species selection can also be used in making decisions on planting stock, planting time, stocking standards, regeneration methods, fertilization, and other forestry practices.

The guide is available in two formats, the abridged field guide for field application, and this expanded version containing detailed background information.

113. Lea, E.C. 1984. Biophysical resources of the East Kootenay Area. B.C. Min. Env., Kelowna, B.C., MOE Techn. Rep. No. 5. 75 p.

The vegetation, its successional stages and its relationship with climate, soils and other landscape characteristics was studied as part of a biophysical reconnaissance inventory of the southern Rocky Mountain Trench and the adjacent Rocky Mountains within British Columbia. The vegetation was classified for Forest Regions, Sections, Zones, SubZones, and Vegetation Types. These landscape units are mapped and their significance for planning is discussed. Within the East Kootenay Area, 138 vegetation types, climax and seral communities are described. Resource values and constraints to use are determined for each.

114. Lea, E.C. 1984. Explanatory legend for the Purcell Study Area vegetation maps. B.C. Min. Envir., Surveys and Resource Mapping Br., Kelowna, B.C., MOE Working Rep. No. 5. 45 p.

This legend applies to the vegetation map of the Purcell Study Area of south-eastern British Columbia. The study area and maps cover portions of National Topographic Series mapsheets 82K/1,2,7,8,9,10,14,15,16. For each vegetation landscape, a description is provided, along with a list of dominant species.

115. Lea, E.C. 1986. Vegetation of the Wells Gray Study Area. B.C. Min. Env., Wildl. Br., Victoria, B.C., MOE Techn. Rep. No. 21. 96 p.

This report describes the vegetation of Wells Gray Provincial Park and provides an assessment of present and potential habitat for moose, mule deer, woodland caribou,

mountain goat, and grizzly bear. For each Biogeoclimatic Subzone, Vegetation Landscapes are identified, described, and assessed for successional trends and winter forage potential. Sites observed include areas shortly after disturbance through succession to mature forests. Appendices include a plant species list, and a table of potential availability of key winter forage species after clearing and fire, for vegetation landscapes within the ICHe and ICHm subzones.

116. Lea, E.C. 1988. Explanatory legend for vegetation maps of the Kamloops Lake bio-physical study area. B.C. Min. Envir., Wildl. Br., Victoria, B.C., Wildl. Working Rep. No. WR-36. 72 p.

This legend applies to the vegetation maps of the Kamloops Lake area of south-central British Columbia, and corresponds to National Topographic Series mapsheets 921/9, 10, 15, and 16. Vegetation landscapes of 7 different Biogeoclimatic Zones or Subzones are described. The Appendix includes a plant species list for the area.

117. Lea, E.C. 1988. Bio-physical habitat units and interpretations for moose use of the Upper Cariboo River Wildlife Management Area. B.C. Min. Envir., Wildl. Br., and Fish and Wildl. Br. Williams Lake, Victoria, B.C., Wildl. Working Rep. No. WR-37. 20 p.

This report and the map (Vold and Lea, 1986) covers the Upper Cariboo River Valley in east-central British Columbia, east of Quesnel. Vegetation successional trends and moose winter habitat interpretations are provide for Habitat Units within the Interior Cedar-Hemlock Biogeoclimatic Subzone, the Wet, Central, Interior Cedar-Hemlock Subzone, and the Cariboo River Variant. Habitat units are mapped at a scale of 1:20 000 for part of NTS mapsheet 93A/14.

The study was undertaken to assess moose wintering habitat, to provide an ecological framework for studying moose habitat relationships, and for maintaining or enhancing available forage and cover. This study can also be used to assess habitat for other wildlife species.

118. Lea, E.C. 1990., Biophysical habitat units of the Mosley Creek Study Area: expanded legend and interpretations. B.C. Min. Envir., Wildl. Br., Victoria, B.C., Wildl. Working Rep. No. WR-45. 29 p.

This legend applies to the vegetation maps of the Mosley Creek Study Area in the west-central interior of British Columbia. Successional trends and winter forage for wild ungulates are described for Habitat Units in the Very Dry Montane Interior Douglas-fir Biogeoclimatic Subzone and the Montane Spruce Zone. The study was undertaken to assess habitat for mule deer and to provide an ecological framework for enhancing and maintaining available forage and cover. It can also be used to assess the habitat of other wildlife species.

119. Lea, E.C., D.A. Demarchi, and L.E. H. Lacelle. 1990. Biophysical analysis of the Sheep Mountain Wildlife Area. B.C. Min. Env., Wildl. Br., Victoria, B.C., Wildl. Bull. No. B-66. 68 p.

This report contains descriptions of terrain, soils and vegetation parameters that comprise the Biophysical Habitat definitions of the Sheep Mountain Wildlife Area in the East Kootenay. The report also includes a detailed big game use proposal and a habitat enhancement proposal for managing the wildlife resource.

120. Lea, E.C., B.L. Fuhr, and L.E. H. Lacelle. 1988. Grizzly bear habitat of the Flathead River Area: expanded legend. B.C. Min. Environment, Wildlife Br., Habitat Inventory Sect., Victoria, B.C., Wildl. Working Rep. No. WR-38. 24 p.

This report describes and rates grizzly bear habitat in the Flathead River Valley of southwestern British Columbia. This area is mapped at a scale of 1:50 000, and includes portions of National Topographic Series maps 82G/1 and 82G/2. The study was used as a pilot area to develop a method for mapping habitat and estimating carrying capacity for grizzly bears. Biophysical habitat mapping was used to rate the area for bears. This report and map provide information on the present and potential vegetation within the study area. These can aid in determining habitat protection and enhancement opportunities for bear habitat.

121. Lea, E.C., and L.E. H. Lacelle. 1989. Biophysical habitat units of the Lower Halfway Study Area: expanded legend. B.C. Min. Envir., Wildl. Br., Victoria, B.C., Wildl. Working Rep. No. WR-43. 29 p.

This legend applies to the vegetation maps of the Lower Halfway Study Area, located near Fort St. John, and corresponds to NTS mapsheets 94A/5 and 6, and portions of 94A/3 and 4 not covered by the Pine Moberley Study (Thompson et al. (1980). Vegetation successional trends and potential winter forge for wild ungulates are described for Biophysical Habitat Units within the Moist Cool Southern Boreal White and Black Spruce Biogeoclimatic Subzone. The Appendix includes a plant species list for the area.

122. Lea, E.C., and R.E. Maxwell. 1989. Biophysical habitat units of Mount Robson Park and extension areas. B.C. Min. Envir., Wildl. Br., Victoria, B.C., Unpub.

This study was undertaken to assess terrain, vegetation, and ungulate and grizzly bear habitat of Mount Robson Park and three extension areas to aid park planning. The report and accompanying maps describe Ecoregions, Biogeoclimatic Units and Habitat Units for ungulates and grizzly bears.

123. Lea, E.C., and T. Vold. 1985. Dewdrop–Tranquille River wildlife habitat study, Volume 2: Biophysical inventory. B.C. Min. Environment, Victoria, B.C., MOE Techn. Rep. No. 14., 233 p.

The vegetation of the Dewdrop–Tranquille River Wildlife Study Area is part of the Dry Interior Region, Ashcroft Section. The area includes three Vegetation Zones: the Interior Bunchgrass zone at lower elevations, the Interior Rocky Mountain Douglas-fir zone at middle elevations, and the Subalpine Engelmann spruce-alpine fir zone at upper elevations. Vegetation landscapes, soils, and terrain conditions within these zones are

described. The explanatory legend for the Dewdrop–Tranquille River vegetation map is found in MOE Working Report No. 4, by E.C. Lea.

124. Lewis, T., J. Pojar, D. Holmes, R. Trowbridge, and K.D. Coates. 1986. A field guide for the identification and interpretation of the Sub-Boreal Spruce Zone in the Prince Rupert Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. No. 10. 102 p..

This guide describes the ecosystem units of Sub-Boreal Spruce (SBS) Zone. It is assumed that the user has a working knowledge of the concepts and methods of site, soil, and vegetation evaluation. Consequently the field guide does not include material on plant identification, on hand texturing, or on humus forms. All field guides of this nature for the Prince Rupert region are currently undergoing revision and will be compiled into one comprehensive regional guide by late in 1992.

125. Lloyd, D., K. Angove, G. Hope, and C. Thompson. 1990. A guide to site identification and interpretation for the Kamloops Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. No. 23. 399 p.

This field guide has eight sections. The introduction is followed by a summary of the concepts, principles and structure of BEC. Methods are outlined for identifying biogeoclimatic and site units. The biogeoclimatic section contains overviews and diagnostic keys, plus tables summarizing the vegetation, environment, climate, and forest productivity of most units in the region. The interpretation section contains stocking standards, guidelines for assessing site sensitivity to slashburning, tables summarizing the occurrence of forest pests, and a table of recommended forage seed mixes. The appendices include: classification conversion tables, an indicator species list, and keys for determining soil textures, humus forms, landforms, bedrock geology, soil development, and soil moisture and nutrient regimes.

This guide is available in an office-sized document and as a two-part pocket-sized field guide. Biogeoclimatic maps showing the distribution and extent of zones, subzones and variants in the KFR are available at 1:100 000 and 1:500 000 scales. A 1:250 000 scale map atlas is under preparation. A plant guide has been produced to help identify key indicator species in the field.

126. MacKinnon, A., C. DeLong, and D. Meidinger. 1990. A field guide for identification and interpretation of ecosystems of the northwest portion of the Prince George Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. No. 21. 116 p.

This field guide describes the ecosystems of the northwest portion of the Prince George Forest Region. The area covered by the guide extends from Williston Reservoir and the Rocky Mountain Trench north of it, in the east, to the Prince George/Rupert Forest Region boundary in the west, and from the base of the Williston Reservoir in the south to the Regional boundary again in the north. The area falls within the Rocky Mountain Trench (north), and the Cassiar and Omineca mountains physiographic regions.

The units in this guide are described in the biogeoclimatic ecosystem classification system. It is assumed that the user has a working knowledge of this system. The guide presents aids to the identification of described units, and management interpretations for each.

127. Meidinger, D.V., G.D. Hope, and A.J. McLeod. 1984. Classification and interpretation of some ecosystems of the Rocky Mountain Trench, Prince George Forest Region, British Columbia (First Approximation). B.C. Min. Forests, Victoria, B.C., Land Manage. Rep. No. 22. 294 p.

This manual includes a brief description of the Ecosystem Classification System; a general introduction to the vegetation, soils, and climate of the study area; a characterization of the biogeoclimatic zones and subzones of the area; detailed descriptions of the ecosystem units; and selected management interpretations for these units. These units may be subject to revision as more data are collected.

128. Meidinger, D., A. McLeod, A. MacKinnon, C. DeLong, and G. Hope. 1988. A field guide for identification and interpretation of ecosystems of the Rocky Mountain Trench, Prince George Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. No. 15. 143 p.

This field guide describes the ecological units of the Rocky Mountain Trench, Prince George Forest Region. It presents aids to the identification of these units and management interpretations for each. The units of this guide are described in the biogeoclimatic ecosystem classification (BEC) system. It is assumed that the user has a working knowledge of this system as well as of the identification of vegetation and soil and site factors.

129. Mitchell, W.R., and R. Eremko. 1987. Ecosystem mapping of the Truax Creek Basin in the Kamloops Forest Region. B.C. Min. For. Lands, Victoria, B.C., Res. Rep. RR87007-KL. 125 p.

The purpose of this study is to provide an ecosystem map and interpretations to guide integrated resource development and local resource use planning of the Truax Creek Basin. Thirty-nine map units consisting of 26 ecosystem units were identified, sampled, characterized, and delineated in Truax Creek Basin. These 39 map units are encompassed within 3 forested biogeoclimatic units: the Dry Southern Forested Englemann Spruce-Subalpine Fir Subzone, the Thompson Plateau Dry Montane Spruce Variant, and the Dry Montane Interior Douglas-fir Subzone.

130. Standish, J.T., S. Haeussler, A. Kokoshke, J. Pojar, D. Holmes, B.M. Geisle, and D. Yole. 1987. A field guide for identification and interpretation of the Coastal Western Hemlock Zone, Northern Drier Maritime Subzone (CWHf), in the Prince Rupert Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. No. 14. 63 p.

This guide contains information on the identification and interpretation of biogeoclimatic and ecosystem units in the Coastal Western Hemlock Zone, Northern Drier Maritime

Subzone (CWHf). The area covered includes most of the low and middle elevation forests of the central part of the Kalum TSA and some of the middle elevations of the western Kispiox TSA. It is assumed that the user has a working knowledge of the biogeoclimatic ecosystem classification (BEC) system, plant identification and soil and site factors.

All regional guides of this nature for the Prince Rupert region are currently being revised and will be compiled into one comprehensive regional guide by late 1992.

131. Steen, O.A., and A.L. Roberts. 1988. Guide to wetland ecosystems of the Very Dry Montane Interior Douglas-fir Subzone Eastern Fraser Plateau Variant (IDFb2) in the Cariboo Forest Region, British Columbia. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Rep. No. 55. 101 p.

The objectives of this guide are (1) to present a classification of wetland ecosystem units of the Eastern Fraser Plateau Variant of the Very Dry Montane Interior Douglas-fir (IDFb2) biogeoclimatic subzone; and (2) to summarize range and wildlife habitat management interpretations for each of the ecosystem units.

132. Technical Subcommittee. 1981. Resources of the Graystokes. B.C. Min. Envir., Min. For., Victoria, B.C., APD Bull. No. 10. 104 p.

This report summarizes the available information of a biophysical nature concerning the Graystokes Plateau, in southcentral British Columbia. Resource values and interpretations are made for the area as a whole, followed by resource interpretations at the sub-basin level.

133. Thompson, C.E. 1984. Mount Timothy succession study. B.C. Min. Environment, Kelowna, B.C., MOE Techn. Rep. No. 12. 70 p.

Mount Timothy, an extinct volcano, lies within the eastern portions of the Fraser Plateau, in the rainshadow of the Coast Mountains.

This succession study compares the vegetation classification determined for a portion of the area in the summer of 1970, before it was clearcut, to the floristics observed in 1981, nine years after it was clearcut. Soils of the project area are also characterized.

134. Vold, T., R.F. Ferster, T.K. Ovanin, R.D. Marsh, and G.P. Woods. 1980. Soil and vegetation resources of the Pend-D'Oreille Valley, British Columbia. B.C. Min. Env., Assess. and Planning Div., Victoria, B.C., APD Bull. 2. 92 p.

This report contains detailed information and maps on the soil and vegetation resources of the Pend-D'Oreille Valley in south-eastern British Columbia. It also provides biophysical interpretations for the management of white-tailed deer winter range. It includes information on geology, climate, human history, and land use, and soil interpretations for agriculture, forestry, recreation, and engineering uses. The report is

primarily aimed at complementing the soil and vegetation maps so that they can be used most effectively for resource management.

135. Yole, D., T. Lewis, A. Insberg, J. Pojar, and D. Holmes. 1989. A field guide to the identification and interpretation of the Englemann Spruce – Subalpine fir Zone of the Prince Rupert Forest Region of British Columbia. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. No. 17. 83 p.

This field guide describes the forest ecosystems and silvicultural interpretations for the Engelmann Spruce – Subalpine Fir Zone (ESSF) in the Prince Rupert Forest Region. The area covered by this guide encompasses subalpine forests of the Kalum, Kispiox, Bulkley, Morice, and Lakes TSA's. The guide uses the Biogeoclimatic Ecosystem Classification (BEC) system, which integrates and organizes climatic, soil, and vegetation information into recognizable management units for use in the field. The guide includes ecological information, maps, and identification keys to assist the user in the identification and interpretation of the ecological units of the ESSF zone. It is assumed that the user has a working knowledge of the BEC system and of plant identification and soil and site factors.

All field guides of this nature for the Prince Rupert Forest Region are currently under review and will be compiled into one comprehensive regional guide by late 1992.

Zonal Ecosystems

136. Demarchi, D.A., R.D. Marsh, A.P. Harcombe, and E.C. Lea. 1990. The environment. (chapter in) *The birds of British Columbia, Volume 1: Nonpasserines, introduction and loons through waterfowl*. Royal B.C. Museum in assoc. with Environ. Can., Can. Wildl. Serv., Vancouver, B.C., pp. 55-151.

This chapter provides an extensive treatment of the Ecoregion classification system of the province. According to the authors, this system provides a systematic view of the small scale ecological relationships in the province. It is based on macroclimatic processes, and physiography, and it brings into focus the extent of critical habitats and their relationship with adjacent areas. This system divides the province into Ecodomains, Ecodivisions, Ecoprovinces, Ecoregions, and Ecosections which are arranged in a hierarchical classification. An overview of this system is provided, including maps and photographs. For each Ecoprovince, location, climate, physiography, vegetation, and subdivisions are described.

137. Ecoregions Working Group. 1989. *Ecoclimatic regions of Canada, first approximation*. Environment Canada, Canadian Wildl. Serv., Conserv. and Protection, Ottawa, Ontario., Ecological Land Classification Series, No. 23. 119 p. and map.

This publication attempts to describe the roles and influences that climate has had in moulding the patterns and inherent qualities of the ecosystems in Canada. Ecoclimatic provinces and ecoclimatic regions are described. The broad ecoclimatic regions are characterized on the basis of "normal" sites in which the local effects of soil or landform differences are minimized. For each ecoclimatic region, a brief description of vegetation and soils on normal sites, drier-than-normal sites, and wetter-than-normal sites, is provided along with climatic information. Appendices include: a species list, and a selected bibliography.

138. Harcombe, A.P., and E.C. Lea. 1990. *Wildlife habitats of British Columbia, first approximation*. B.C. Min. Envir., Wildl. Br., Victoria, B.C. 156 p.

These wildlife habitat classifications were first created for the *Wildlife Habitat Handbook for the Southern Interior Ecoprovince*, and expanded to cover the Province for the *Regional Wildlife Plans*. Hence, the information on distribution and description for each Habitat Class is ordered by administrative rather than ecological regions. This present draft has not yet been extensively edited.

These habitats could be mapped at relatively broad scales (probably smaller than 1:250 000). Additional factors, such as slope and moisture, might be incorporated as phases. At the same time, combinations of Habitat Classes into Habitat Complexes has also occurred. The present list of Habitat Classes might still be incomplete; this is one aspect that will be studied during preparation of the next draft.

139. Holland, S.S. 1964. Landforms of British Columbia: a physiographic outline. B.C. Dept. of Mines and Petr. Resources, Victoria, B.C., Bull. No. 48. 138 p. and map.

This bulletin is an authoritative account of the major land subdivisions of British Columbia. It defines the boundaries of the various mountain, plateau, or plain areas with references to the principle geological processes that have been at work. Chapter I provides an introduction to the geological development of landforms and the system of classifying them. Chapter II describes the physiographic subdivisions of the province in detail. Chapter III describes some of the special aspects of the provincial landscape. Appendices include: the geologic time scale, and a glossary.

140. MacKinnon, A., D. Meidinger, and K. Klinka. February 1992. Use of the biogeoclimatic ecosystem classification system in British Columbia. *For. Chron.* 68(1):100-120.

Biogeoclimatic ecosystem classification (BEC) is a hierarchical system that organizes ecosystems at three levels of integration – local, regional and chronological. The system is used by silviculturalists and range, recreation and wildlife managers in British Columbia. Based on the study of both vegetation and sites, the system reveals ecological potentialities and limitations of particular sites, and combined with the accumulation and widespread dissemination of ecological knowledge provides an ideal framework for integrated resource management. The ways in which the BEC system is adapted for, and used by, resource managers are described and demonstrated. ongoing activities, including classification of seral ecosystems, quantification of soil moisture and nutrient regimes, identification of relationships between forest productivity and site quality, and provincial correlation of the six Regional classifications, are outlined.

141. Meidinger, D., and J. Pojar: 1991. Ecosystems of British Columbia. B.C. Min. For., Res. Br., Victoria, B.C., 330 p.

This report provides up to date descriptions of the terrestrial ecosystems of British Columbia within the framework of the British Columbia Ministry of Forests' biogeoclimatic ecosystem classification. This system of classification is widely used in British Columbia and gives foresters, ecologists, biologists, agrologists, and other resource managers, and naturalists a common framework for a fundamental knowledge of landscape ecology. As such, it provides a basis for ecosystem management and other practical decision-making.

This report includes an introduction to the philosophy, principles, and methods of biogeoclimatic ecosystem classification and reinforces the concept of the ecosystem as the fundamental unit of ecology and management. This is followed by 15 subsequent sections, covering the 14 biogeoclimatic zones, and a final section on non-tidal wetlands. For each zone, information includes: location and distribution, ecological conditions, notes on classification, subzone descriptions, some representative site associations, wildlife habitats, resource values, and -literature cited. Appendices include: a preliminary list of site associations in British Columbia and a list of plant species. References are grouped by biogeoclimatic zone where appropriate. For more specific applications of the

Biogeoclimatic Ecosystem Classification system, readers should consult the regional field guides which are listed under regional ecosystems in this bibliography.

142. Valentine, K.W. G., P.N. Sprout, T.E. Baker, and L.M. Lavkulich. 1978. The soil landscapes of British Columbia. B.C. Min. Envir., Resource Anal. Br., Victoria, B.C. 19 p.

This report describes and explains the variety of soils found in the 6 soil landscapes of the province. These landscapes are based on Holland's 1964 publication of the Landforms of British Columbia. The report is divided into 4 parts. Part 1 describes the regional variations in climate, geology and vegetation which contribute to soil formation. Part 2 describes the major soils and soil processes of British Columbia. In Part 3 the 6 soil landscapes are described at the great group level. Lastly, Part 4 provides a brief history of soil survey in the province which explains how and why survey methods and soil classification have changed through the years.

Invertebrates

143. Belton, P. 1983. The mosquitoes of British Columbia. B.C. Prov. Mus., Victoria, B.C., Handb. No. 41. 189 p.

This handbook includes a keys to identifying the genera and species of mosquitoes which are known to occur in British Columbia. The introduction includes general information on their biology and methods for collecting and preserving specimens. For each species, life history information and descriptions, including illustrations for the adult and larval stages, are detailed. Information regarding management of mosquito populations is also provided.

144. Biosystematics Research Centre. 1977-1987. The insects and arachnids of Canada. Part 1-15. Agriculture Canada, Research Br., Ottawa, Ontario., 15 vol.

This series begins the treatment of the insects and arachnids of Canada. Volumes completed to date include: Part 1. Collecting, preparing, and preserving insects, mites, and spiders; Part 2. The bark beetles of Canada and Alaska (Coleoptera: Scolytidae); Part 3. The Aradidae of Canada (Hemiptera: Aradidae); Part 4. Anthocoridae of Canada and Alaska (Heteroptera: Anthocoridae); Part 5. The crab spiders of Canada and Alaska (Araneae: Philodromidae. and Thomisidae); Part 6. The mosquitoes of Canada (Diptera: Culicidae); Part 8. The plant bugs of the prairie provinces of Canada (Heteroptera: Miridae); Part 9. The sac spiders of Canada and Alaska (Araneae: Clubionidae and Anyphaenidae); Part 10. The spittlebugs of Canada (Homoptera: Cercopidae); Part 11. The genera of larval midges of Canada (Diptera: Chironomidae); Part 12. The families and subfamilies of Canadian Chalcidoid wasps; Part 13. The carrion beetles of Canada and Alaska; Part 14. The grasshoppers, crickets, and related insects of Canada and adjacent regions; Part 15. The metallic wood-boring beetles of Canada and Alaska (Coleoptera: Buprestidae).

145. Cannings, R.A., and K.M. Stuart. 1977. The dragonflies of British Columbia. R.B.C. Mus., Victoria, B.C., Handb. No. 35. 254 p.

This book contains keys and descriptions identifying the adults and larvae of the 80 species of the Odonata, or dragonfly, known to occur in British Columbia. The keys for the identification of larvae should be especially useful to workers engaged in stream and lake surveys. However, the book is intended to be useful to professional biologists and amateur naturalists alike. Keys to suborders, families, genera, and species are provided. For each species, life history descriptions include distinguishing characteristics, adult and larval morphological characteristics, range, distribution in British Columbia, and field notes.

146. Cornwall, I.E. 1975. Barnacles of British Columbia. B.C. Prov. Museum, Victoria, B.C., Handb. No. 7. 68 p.

This handbook provides information on the life-history of barnacles. Keys to species of the acorn barnacles, goose barnacles, and whale barnacles, followed by species descriptions. A list of possible additional species, a glossary, and a bibliography are included.

147. Griffith, L.M. 1975. The intertidal univalves of British Columbia. B.C. Prov. Museum, Victoria, B.C., Handb. No. 26. 101 P.

This handbook deals primarily with the marine snails, and univalves or gastropods which belong to the phylum Mollusca. It includes Keys to families and species, followed by species descriptions. Final sections include a glossary of terms and a glossary of approximate meanings of scientific names.

148. Hart, J.F. L. 1982. Crabs and their relatives of British Columbia. B.C. Prov. Museum, Victoria, B.C., Handb. No. 40. 267 p.

Crabs and other decapod crustacea which are "crawlers" are grouped together under the Suborder name Reptantia, or reptant, as opposed to the swimmers, or Natantia, which are the true shrimps and prawns. This book is concerned with the Reptantia only. It deals with all known species of the three Sections of this Suborder in British Columbia. These are: the Macrura, or "large tails"; the Anomura, or "asymmetrical tails"; and the Brachyura, or "short tails".

149. Hatch, M. 1953-1962. The beetles of the Pacific Northwest. University of Washington publications in biology, Volume 16. University of Washington Press, Seattle, Washington., 5 vol.

This treatise aims to provide a descriptive analysis for the separation and naming of the species and varieties of the beetles or Coleoptera that are known to inhabit British Columbia, Washington, Idaho, and Oregon. Part I provides an introduction and covers the Suborder Adephaga. Part II covers the Suborder Staphyliniformia which are predominantly predators and scavengers. Part III covers the Family Pselaphidae of the Staphyliniformia, and part of the Suborder Diversicornia, which are also predators. Part IV covers the Palpicornes and Heteromera. Part V covers the Phytophaga, Rhynchophora, and Lamellicornes.

150. Kevan, D.K., and G.G. E. Scudder. 1989. Illustrated keys to the families of terrestrial arthropods of Canada. Volume 1. Myriapods (millipedes, centipedes etc.). Biological Survey of Canada, Ottawa, Canada., 88 p.

The Biological Survey of Canada has recognized that there is a great need for keys to the families of the terrestrial arthropods of Canada. Several separate keys to the various groups of arthropods are planned. The following will serve to identify the major groups that will be considered in the forthcoming publications. This publication, the first in the

planned series, considers the Myriapoda of Canada, the arthropods commonly known as centipedes and millipedes.

151. Lambert, P. 1981. The sea stars of British Columbia. B.C. Prov. Museum, Victoria, B.C., Handb. No. 39. 152 p.

The aim of this handbook is to bridge the gap between popular and technical handbooks and provide a reference for identifying the sea stars of British Columbia. It includes a introductory section describing the structure and life history of sea stars. A key to families and a checklist of species are included. A checklist of species found deeper than 200 meters is also included.

152. McAlpine, J.F. 1981. Manual of Nearctic Diptera. Agriculture Canada, Research Branch, Biosystematics Research Institute, Ottawa, Ontario., Monograph No. 27-28, 32. 1581 p. in 3 vol.

The main purpose of this 3 volume manual is to provide an up-to-date, well-illustrated, easily interpretable means of identifying the families and genera of two-winged flies of America north of Mexico. It is also designed to be a basic reference to a wide spectrum of biosystematic information on the Diptera for professional biologists, teachers, students, and informed amateurs. An introduction, describing the morphology and terminology of the adult and larval stages, and providing keys to the families of the order based on both adults and larvae., is contained in volume 1.

153. Merrit, R.W., and K.W. Cummins. 1978. An introduction to the aquatic insects of North America. Kendall/Hunt Publishing Company, Dubuque, Iowa., 441 p.

This treatment is intended to provide a standard guide to North American families of aquatic insects: their taxonomy, phylogeny, morphology, ecology, and distribution, as well as collecting and rearing techniques. The coverage should allow a variety of groups, both lay and professional, to identify and categorize the immatures or adults they collect and, having done so, to associate the pertinent ecological and distributional information with the group in question.

154. Pennak, R.W. 1978. Fresh-water invertebrates of the United States. Ronald Press Company, New York., 769 p.

This book treats the free-living, freshwater invertebrates that occur in the United States. Natural history, ecology, and taxonomy are emphasized. Keys are provided to genera, and to species where necessary for the larger, or less well-known taxonomic groups.

155. Quayle, D.B. 1973. Intertidal bivalves of British Columbia. B.C. Prov. Museum, Victoria, B.C., Handb. No. 17. 104p.

The purpose of this handbook is to provide identification of some common lamellibranch or bivalve molluscs living in the intertidal zone along the British Columbia coast. Little is known of the natural history of these molluscs, but where possible this information is

given. A key to families is given. Descriptions and figures are used to identify species within families, as illustrations are considered the best means of identification. The handbook includes short sections on shellfish toxicity and parasites and commensals. A glossary of term and a glossary of approximate meanings of scientific names are included.

156. Scott, J.A. 1986. The butterflies of North America, a natural history and field guide. Stanford University Press, Stanford, California., 583 p.

The first two sections of this book provide a review of the biology and ecology of butterflies, as well as information on the identification of eggs, larvae, pupae, and adults. The remainder of the book provides a field guide to the butterflies of North America organized by Superfamilies, Families, and Subfamilies.

157. Tilden, J.W., and A.C. Smith. 1986. Western Butterflies. Peterson Field Guides. R.T. Peterson. Houghton Mifflin Company, Boston, Massachusetts., 370 p.

This field guide contains written descriptions, photographs, and line drawings of over 500 species of butterflies found in western North America. Descriptions include information on identification, similar species, early stages, range, habitat, and subspecies.

Nonvascular Plants

158. Arora, D. 1986. *Mushrooms demystified*. Ten Speed Press, Berkeley, California., 959 p.

This publication is considered one of the most useful broad treatments of the mushrooms of western North America.

159. Bandoni, R.J., and A.F. Szczawinski. 1976. *Guide to common mushrooms of British Columbia*. Royal B.C. Mus., Victoria, B.C., Handb. No. 24. 242 p.

This handbook provides a synthesis of available data on the more conspicuous fleshy species of mushrooms which are most commonly researched. The authors acknowledge that the species described herein make up only a fraction of the larger fungi known in British Columbia. It is estimated that there are more than 200,000 species of fungi, most being inconspicuous or actually microscopic. This latest edition includes colour plates. A second revision is required to incorporate recent research.

160. Berch, S. 1991. *The diversity of soil organisms – a British Columbia perspective*. 15th Workshop of the Pacific Region Soil Science Society. 16 p.

In this paper the author emphasizes two principle points: that life in all its diversity is our most precious resource; and that we must do all we can to preserve soil diversity because life in the soil is the foundation on which all terrestrial life is based. In doing so, biodiversity is discussed in general terms followed by how it applies to soils. In essence, soil is considered as a habitat for life. British Columbia is presented as the centre of biodiversity in Canada. The author reviews what is known and not known about the diversity of life in the soil, focusing on the situation in British Columbia. Finally, the value of this biodiversity and how it can be preserved is discussed.

161. Brodo, I.M. *Bibliography to the lichens of North America*. National Museums of Canada, Nation. Mus. Natur. Sci., Ottawa, Canada., Syllogeus No. 56.

As an aid to the identification of North American lichens, especially those from Canada, various categories of lichens and every lichen genus known to occur in North America are listed together with the references found to be most useful in lichen determination. The categories include: general articles and books, geographic regions; crustose, foliose, and fruticose genera and species; and individual generic treatments. The bibliography has approximately 360 entries.

162. Chanway, C.P., and F.B. Holl. 1992. *Biodiversity of forest soil microflora: should we care?* in *Biodiversity Symposium*. 1991, Royal B.C. Museum, Victoria, B.C. University of British Columbia, Vancouver, B.C., 28 p.

In forest ecosystems, the diversity of microfloral species below-ground may be even greater than the diversity of plant species observed above-ground. However, because we can see only a small portion of it with the unaided eye, we tend to ignore below-ground biodiversity in our changing view of the forest. To provide this underground perspective, the major categories of soil microflora (ie. bacteria, fungi, algae, viruses) will be described in this review, and their potential importance to forest-ecosystem function will be emphasized. Furthermore, we will identify some critical gaps in our knowledge of soil microflora with particular reference to current forestry practices in British Columbia.

163. Douglas, G.W., A. Ceska, and G.G. Ruyle. March, 1983. *A floristic bibliography for British Columbia*. B.C. Min. For., Research Br., Victoria, B.C., Land Manage. rep. No. 15. 143 p.

This bibliographic publication is directed towards assisting resource managers with various floristic problems. The report is divided into 7 major sections: general floras; general texts; taxonomic vascular plant papers; floristic vascular plant papers; bryophyte papers; lichen papers; and general vegetation papers. Other government researchers, university scientists and graduate students and interested "lay persons" will also find the references helpful.

164. Goward, T. 1992. Macrolichens and their zonal distribution in Wells Gray Provincial Park and its vicinity, British Columbia. Teuvo Ahti, University of Helsinki, Botanical Museum, Helsinki, Finland., Not yet published.

The distribution and general ecology of 292 macrolichen taxa are recorded for approximately 600,000 hectares of mountainous terrain in Wells Gray Provincial Park and its vicinity in south-central British Columbia. Thirty-one taxa are documented for the first time from British Columbia. The Biogeoclimatic Zone System is used to indicate zonal distribution for the species considered. Summaries of total ranges in the northern hemisphere are also provided.

165. Goward, T. 1992. Notes on the lichens and allied fungi of British Columbia. *The Bryologist* 95(1):33-37.

Based on field studies, herbarium research, and previously overlooked reports, *Hypogymnia pseudophysodes* and *Leptogium rivale* are deleted from the British Columbia checklist, while 27 species are either confirmed or reported as new. A total of 6 species are documented in Canada for the first time and 3 species are new to North America. Each species is discussed in this paper.

166. Hale, M.E. 1969. How to know the lichens. W.M. C. Brown Company, Dubuque, Iowa., 246 p.

This book provides a popular account of the lichens. A total of 427 species are treated in this edition. Keys to genera and species are provided. Distribution maps are limited to the United States. Crustose forms are not included. Illustrations include high magnification photographs.

167. Ireland, R.R. 1982. Moss flora of the Maritime Provinces. Nat. Mus. Canada, Nat. Mus. Natur. Sci., Ottawa, Ontario.,

This manual treats the moss flora of the maritime provinces. However, since many of these species are pan-boreal in distribution, this publication provides a useful reference for the study of mosses in British Columbia as well. The manual contains a good material on the structure and life-cycle of mosses; collection and herbarium techniques; nomenclature and classification; and a fully illustrated glossary.

168. Ireland, R.R., G.R. Brassard, W.B. Schofield, and D.H. Vitt. 1987. Checklist of the mosses of Canada II. *Linbergia* 13:1-62.

The present checklist is a revision of the first checklist of the mosses of Canada published in 1980. The list is based on verified herbarium specimens and literature reports. The mosses are reported for each of the 10 provinces and two territories, with Labrador and the Arctic Archipelago listed separately. A total of 965 species, 6 sub-species, 101 varieties, and 5 forms in 223 genera and 53 families are recognized for Canada.

169. Noble, W.J. 1982. The lichens of the Coastal Douglas-Fir Dry Zone of British Columbia. University of British Columbia, Dept. of Botany, Vancouver, B.C., Doctoral Thesis

This study is a preliminary flora of the lichens of the Coastal Douglas-fir Dry Zone treats. It treats a total of 448 species in 114 genera, including 26 species from adjacent zones. Keys and concise descriptions are provided plus information on substratum preferences, abundance within the subzone, and taxonomic problems. Spore diagrams are supplied for many of the crustose genera. Local distributions within the subzone are discussed. Analysis of world distributions revealed that the majority of these species are very widespread with an essentially continuous range.

170. Noble, W.J., T. Ahti, G.F. Otto, and I.M. Brodo. 1987. A second checklist and bibliography of the lichens and allied fungi of British Columbia. *Nat. Mus. Can., Nat. Mus. Natur. Sci., Canada., Syllogeus* No. 61. 95 p.

A total of 1013 species in 205 genera, 18 subspecies, 33 varieties, and 2 forms are reported for British Columbia. Synonyms and unreliable records are also recorded. The

40 taxa originally described from the province are listed. The checklist is based upon reports in approximately 300 papers as well as herbarium specimens at CANL, H, and UBC. These papers are listed in the bibliography at the conclusion of the list.

171. Redfearn, P.L. (Revised by). 1979. How to know the mosses and liverworts. Wm. C. Brown Company Publishers, Dubuque, Iowa., 302 p.

The book describes the majority of common mosses and liverworts of North America. Keys to-genus and species are provided.

172. Scagel, R.F. 1967. Guide to common seaweeds of British Columbia. B.C. Prov. Museum, Victoria, B.C., B.C. Prov. Museum Handb. No. 27. 330 p.

This report provides a popular account of the seaweeds of British Columbia. Information on distribution and ecology, collection and preservation, life histories, identification, structure and reproduction are provided in short chapters. Keys to classes and genera are provided. Descriptions of the most common green algae, brown algae, red algae, and marine seed plants form the bulk of the handbook. Selected references are provided.

173. Schalkwijk-Barendson, H. 1991. Mushrooms of Western Canada. Lone Pine Publishing, Edmonton, Alberta., 414 p.

This field guide describes 550 species of mushrooms typical of Western Canada. Picture guides to morphological features, an overview of the classification scheme, and a key to families and genera are provided to assist in identification. Species are illustrated in watercolor. Brief notes on each species accompany the illustrations, followed by more detailed descriptions in the next section of the book. These include information on substrate, mycorrhizal association, distribution, seasonal occurrence, and edibility or toxicity.

174. Schofield, W.B. 1969. Some common mosses of British Columbia. Royal B.C. Mus., Victoria, B.C., Handb. No. 28. 262 p.

Mosses belong to their own class of the plant kingdom, the Musci. This handbook includes a detailed introduction to mosses including information on their morphology, life cycle, collection, ecology, distribution and identification key. species descriptions include gametophytes, sporophytes, habitat, similar species, distribution and range. Printing of a new revised edition, by the RBCM, is imminent.

175. Smith, A.H., H.V. Smith, and N.S. Weber. 1981. How to know the non-gilled mushrooms. Wm. C. Brown Company Publishers, Dubuque, Iowa., 324 p.

This revised volume provides information on a selection of common, distinctive, or intriguing species of non-gilled mushrooms growing in North America.

176. Stotler, R., and B. Crandall-Stotler. 1977. A checklist of the liverworts and hornworts of North America. *The Bryologist* 80(3)

This list includes the species, subspecies, and varieties of Hepatics and Anthocerotales reported from the contiguous United States, Canada, Alaska, and Greenland. A systematic arrangement of the 119 genera found in this area is followed by an alphabetical list of the taxa. This is appended by a catalog of synonyms and excluded names. Essential annotations conclude the checklist.

177. Thomson, J.W. 1984. American Arctic lichens: 1. The macrolichens. Columbia University Press, New York., 504 p.

This text is the first of a two-volume work on the lichens of the American Arctic. It covers the macrolichens which are generally foliose and fruticose in growth habit of the thallus. The second volume will cover the microlichens which are generally squamulose and crustose in growth habit. Many of the species described are known to occur in British

Columbia and are indicated on the excellent range maps which are based on collected data.

178. Tylutki, E.E. 1979. *Mushrooms of Idaho and the Pacific Northwest: Discomycetes*. – The University Press of Idaho, Moscow, Idaho., 132 p.

This work provides a popular account of the Discomycetes which include the morrels, the saddle fungi, the cup fungi, the earth tongues, and related forms. The unifying feature of this group is the presence of a microscopic sac-like cell called the ascus, in which the ascospores are produced. Keys to species, written descriptions and illustrations are included.

179. Tylutki, E. E. 1987. *Mushrooms of Idaho and the Pacific Northwest: non-gilled Hymenomyces*. The University Press of Idaho, Moscow, Idaho., 154 p.

Mushrooms of Idaho is a five-volume series designed to provide a practical guide to the large, common, and most conspicuous species of the area. This second volume covers the Hymenomyces which make up a small part of the large class known as Basidiomycetes. This group includes the coral fungi, the spine or tooth fungi, the polypores and boletes, and the chanterelles. Keys, descriptions and illustrations are provided.

180. Vitt, D.H., J.E. Marsh, and R.B. Bovey. 1988. *Mosses, lichens and ferns of Northwest North America*. Lone Pine Publishing, Univ. Washington Press, Edmonton, Alberta., 296 p.

This is the first popular field guide to the mosses, lichens and ferns and their allies, of Northwestern North America. This group is collectively known as the green cryptogams and are of significance to boreal, montane and northern ecosystems. These plants are often critical indicators of nutrient conditions in aquatic habitats. This book deals with 15% of the species found in our area and these along with other common species are found in the keys. These species are representative of the northwestern portion of North America. Special attention is paid to species occurring in the Canadian Rocky Mountains and to those found in lowland west coast rain forests.

Fish

181. Cannings, S. 1992. Rare freshwater fish of British Columbia. B.C. Min. Envir., Lands and Parks, Fisheries Br., Victoria, B.C., (In preparation).

The purpose of this report is to bring together the scattered information on the rare freshwater fish of British Columbia, and to present it to biologists, resource managers, and the interested public. It will be a dynamic report; the Conservation Data Centre data bank on which it is based will be continually updated as new information is received and revised chapters will be distributed periodically.

182. Carl, C.G. 1967. Some common marine fishes of British Columbia. B.C. Prov. Museum, Victoria, B.C., Handb. No. 23. 86 p.

This report provides identification keys and life history information for some of the more common marine fishes off the coast of British Columbia.

183. Carl, G.C., W.A. Clemens, and C.C. Lindsey. 1977. B.C. Prov. Mus., Victoria, B.C., Handb. No. 5. 192 p.

This booklet provides a basic reference to the identification, distribution, and life-history of species and subspecies of fishes in the fresh waters of British Columbia.

184. Eschmeyer, W.N., and E.S. Herald. 1983. A Field guide to Pacific Coast Fishes, North America. Houghton Mifflin Company, Boston., 336 p.

This field guide describes the fishes occurring in the marine coastal waters of the Pacific Coast of North America from the Gulf of Alaska to Baja California. It is designed for use in the field for making species identifications. Species accounts include description, range, remarks, and similar species.

185. Hart, J.L. 1988. Pacific fishes of Canada. Min. Supply and Services Canada, Ottawa, Ontario., 740 p.

This book contains detailed species accounts for the fishes found in salt water off the Canadian coast. It succeeds and partly replaces "Fishes. of the Pacific Coast of Canada" (Clemens and Wilby) with more than 50 additional species and up to date nomenclature. Analytical keys allow the identification of all recorded kinds of fishes. Species accounts contain new illustrations, and expanded information on life history, distribution, and role in the economy. A gazetteer and new glossary are included as well as specially prepared colour photographs of all Pacific salmon and selected other species. It is intended to meet the needs. of both resource managers, students, and lay persons.

186. Jean, Y., A.E. Peden, and D.E. McAllister. 1981. English, French and scientific names of Pacific fish of Canada. B.C. Prov. Museum, Victoria, B.C., Heritage Rec. No. 13. 51 p.

This paper provides a revised species list and classification of fishes within the 200-mile limit of the Pacific coast of Canada. The list brings up to date the species and classifications in Hart's (1973) *Pacific Fishes of Canada* and presents French vernaculars and English vernaculars for each species. Species are indexed to species and families.

187. McPhail, J.D., and C.C. Lindsey. 1970. Freshwater fishes of northwestern Canada and Alaska. Fisheries Research Board of Canada, Ottawa, Ontario., 381 p.

This book describes the occurrence, life history, and characteristics of northern freshwater fishes. Chapters on history and recent geology provide an introduction to the northern region of Canada. Zoographic patterns and dispersal routes are first described for the whole region, followed by detailed descriptions for each species. Keys are provided for families and species. For each species, distinguishing characteristics, description, distribution (Written and map form), taxonomic notes, postglacial dispersal, and biology are detailed.

188. Scott, W.B., and E.J. Crossman. 1973. Freshwater fishes of Canada. Dept. of Environment, Fisheries Res. Brd. Canada, Ottawa, Canada., 966 p.

This book provides an extensive account of the identification, distribution, biology, and economic importance of the freshwater fishes of Canada. Keys are included for families and species. Species accounts include morphological description, colour, systematic notes, distribution (in written and map form), biology, relation to humans, nomenclature, and suggested reading for further information.

Methodologies

189. Carey, A.B., B.L. Biswell, and J.W. Witt. March, 1991. Methods for measuring populations of arboreal rodents. (in) *Wildlife habitat relationships: sampling procedures for Pacific Northwest vertebrates*. in A. B. Carey, and L. F. Ruggiero (Technical Editors). USDA For. Ser., Pac. Northwest Res. Stn., Portland Oregon., PNW-GTR 273. 23 p.

Three arboreal rodents are sensitive indicators of forest ecosystem function in the Pacific Northwest. The northern flying squirrel (*Glaucomys sabrinus*) is mycophagous, cavity-nesting, and a major prey of the spotted owl (*Strix occidentalis*). The red tree vole (*Phenacomys longicaudus*) is restricted to trees and may prove sensitive to forest fragmentation. The Douglas' squirrel (*Tamiasciurus douglasii*) responds sharply to fluctuations in conifer seed abundance. Live trapping and mark and recapture methods can be used to estimate densities of northern flying squirrels and some other rodents in contiguous areas of homogeneous vegetation (stands). We recommend 10- by 10-meter grids with 40-meter spacing and two traps per station – one in a tree and one on the ground. Trapping should be done in spring or fall. Techniques are lacking for red tree voles; searching felled trees for nests holds promise. Direct observation can be used to obtain indexes of abundance for Douglas' squirrels.

190. Cooperrider, A.Y., R.J. Boyd, and H.R. Stuart. 1986. Inventory and monitoring of wildlife habitat. U.S. Dept. Inter., Bur. Land. Manage, Service Center, Denver, Co., 858 p.

This book is intended to guide field biologists and managers in planning, organizing, and administering wildlife inventory and monitoring projects. The book is divided into six major sections: 1) covers general procedures for planning, designing, and organizing wildlife habitat inventory and monitoring programs; 2) provides guidelines for inventorying and monitoring particular habitats; 3) provides guidance on inventorying and monitoring habitat for particular animal groups; 4) describes techniques for measuring habitat variables; 5) covers special monitoring studies; and 6) covers techniques and procedures for analysis, evaluation, interpretation, and presentation of data and results.

191. Corn, P. S., and B.R. Bury. 1990. Sampling methods for terrestrial amphibians and reptiles (in) *Wildlife-habitat relationships: Sampling procedures for Pacific Northwest vertebrates*. in A. B. Carey, and L.F. Ruggiero (Techn. ed.) USDA For. Serv., Pac. Northwest Res. Stn., Portland, Oregon., PNW-GTR 256. 34 p.

This report describes methods for sampling amphibians and reptiles in Douglas-fir forests in the Pacific Northwest. These include pitfall trapping, time-constrained collecting, and surveys of coarse woody debris. The herpetofauna of this region differ in breeding and non-breeding habitats and vagility, so that no single techniques is sufficient for a community study. A combination of pitfall trapping and hand collecting is the most effective approach.

192. Davis, D.E. 1982. CRC handbook of census methods for terrestrial vertebrates. CRC Press, Inc., Boca Raton, Florida., 395 p.

This publication seeks to summarize under one cover the most satisfactory census procedures for terrestrial vertebrate populations, developed by wildlife professionals working with a wide variety of vertebrates. Species specific methods are described for a wide variety of amphibians and reptiles, birds, mammals, and species in particular habitats.

193. Demarchi, D.A., B. Fuhr, B.A. Pendergast, and A.C. Stewart. 1983. Wildlife capability classification for British Columbia: an ecological (biophysical) approach for ungulates. B.C. Min. Envir., Surveys and Resource Mapping Br., Victoria, B.C., MOE Manual, ISSN 0821-0640; No. 4. 56 p.

This report is intended to help generate information on ungulate production that is comparable to information currently being collected for forage production, forests, and agricultural crops. The foundation of this program is the biophysical habitat classification system and emphasis is placed on habitat factors rather than on existing wildlife populations. While this report deals specifically with ungulate habitat classification, much of the philosophy and methodology can be applied to other wildlife species.

194. Demarchi, D.A., E.C. Lea, M.A. Fenger, and A.P. Harcombe. 1990. Biophysical habitat mapping methodology. B.C. Min. Env., Wildl. Br., Victoria, B.C., 90 P.

This manual is designed to provide guidance to those who want to conduct wildlife resource surveys and evaluations in a biophysical context, as well as for those who want to conduct ecological surveys which recognize and incorporate wildlife resource values. Current methods and procedures for ecosystem mapping projects carried out by, or funded by, the Ministry of Environment, Lands, and Parks, Wildlife Branch are described. From this report the reader should gain, an understanding of the relationships between classification and mapping; survey intensity and scale; setting up legends; the procedures for conducting a mapping project; and the design of maps. Appendices include information on relevant reference materials and where they can be obtained.

195. Demarchi, D.A., and A.A. Harcombe. April, 1982. Forage capability classification for British Columbia: a biophysical approach. B.C. Min. Env., Terrest. Studies Br., Victoria, B.C., APD Techn. Paper No. 9. 50 p.

This report is a proposal for the classification of forage potential for the province. This system is intended to generate information on herb, shrub, and lichen production that is comparable to information being collected for agricultural crops, forests, wildlife and recreation. This information will be useful in developing grazing and wildlife management programs of a regional and sub-regional nature.

The first chapter describes the biophysical classification program and the forage classification program. The theory and application of the forage capability classification system are explained in the next two chapters. The final summary chapter describes the

highlights of the classification methodology. Appendices include a list of problematic species and field methods.

196. Fuhr, B.L., and D.A. Demarchi. June, 1990. A methodology for grizzly bear habitat assessment in British Columbia. B.C. Min. Envir., Wildl. Br., Habitat Inv. Sect., Victoria, B.C., Wildl. Bull. No. B-67. 28 p.

This report offers a consistent method of mapping the extent and quality of grizzly bear habitat in British Columbia. Habitat quality is defined in terms of its rank on a provincial scale and its carrying capacity. It is intended for reconnaissance level inventory. Habitat units are delineated through a progressive stratification of ecoregions, biogeoclimatic zonation, and biophysical habitat units with successional stages. Different methods for the assessment of grizzly bear habitat are described for small map scales (1:250 000 and 1:500 000) to large map scales (1:5000 and 1:20 000). These maps are useful for providing habitat descriptions, season of use, an importance ranking, and a method of calculating present and potential carrying capacity.

197. Habitat Monitoring Committee. 1990. Procedures for environmental monitoring in range and wildlife habitat management. B.C. Min. For., and Min. Envir., Victoria, B.C., 196 p.

The goal of this manual is to provide a standard system-for monitoring changes to natural ecosystems that result from operational activities. Procedures for monitoring and assessing all conventional habitat enhancement techniques are documented. The intended users of the manual are professional field staff and their contractors. The procedures integrate existing data collection methodologies within the two ministries as much as possible, as the intent of the manual is to complement rather than replace existing methodologies.

The manual has three components: 1) a description of major habitat management techniques and the data required to monitor those activities successfully; 2) a standardized sampling system; and 3) specific data attributes and a methodology for data collection. For each habitat management technique, information is included on: definitions, purpose and objectives, scope and application, and monitoring requirements. Form requirements for each habitat management technique are provided to guide the user in collection of standard data sets.

198. Hunter, R.A., L.E. Jones, M.M. Wayne, and B.A. Pendergast. October, 1983. Estuarine habitat mapping and classification system manual. B.C. Min. Envir., Surveys and Resource Mapping Br., Victoria, B.C., MOE Manual 3. 33 p.

The mapping and classification system described in this report is intended to provide guidance on the collection of estuarine biophysical information in a systematically mapped form. It is based on the refinement and synthesis of estuary classification approaches initiated within federal and provincial government agencies during the last ten years. It is intended to assist regional land use planners, fisheries and wildlife managers, and other coastal resource information users in making informed decisions regarding estuarine environments.

199. Klinka, K., R.N. Green, R.L. Trowbridge, and L.E. Lowe. 1981. Taxonomic classification of humus forms in ecosystems of British Columbia. B.C. Min. For., Victoria, B.C., Land Manage. Rep. No. 8. 54 p.

A hierarchical system for the classification of humus forms is proposed. The proposed system has been developed because of difficulties encountered with previous systems in discriminating between humus forms, and in relating them to ecosystems.

The classification and methodology for description are based on morphological properties of humus forms. Keys to the taxa and descriptions of representative humus form profiles are presented and are intended as practical Aids to ordering knowledge, stimulating research and improving interpretations about humus forms and ecosystems. Appendices include methods of describing humus forms and methods of sampling and analysis. This classification system is considered to be a first approximation and is open to refinement upon further testing and further studies. A revision of this system is in progress.

200. Luttmerding, H.A., D.A. Demarchi, E.C. Lea, D.V. Meidinger, and T. Vold. 1990. Describing ecosystems in the field. B.C. Min. Environment and Min. For., Victoria, B.C., MOE Manual No. 11. 213 p.

The purpose of this manual is to standardize approaches and definitions for ecological data collection. The manual is designed for use with the site, soil, humus form, vegetation, mensuration, and wildlife field description forms 'shown in each chapter. The manual and field forms will help ensure there is consistency in the collected data. This manual and the field data forms can be used by ecologists, pedologists, biologists, foresters and other involved in ecological data collection.

201. Manuwal, D.A., and A.B. Carey. 19910. Methods for measuring populations of small, diurnal forest birds. (in) Wildlife-habitat relationships: sampling procedures for Pacific Northwest vertebrates. in A. B. Carey, and L. F. Ruggiero (Technical Editors). USDA For. Serv., Pac. Northwest Res. Stn., Portland, Oregon., PNW-GTR 278. 23 p.

Before measuring a bird population, the objective of the study should be clearly defined. Important factors that should be considered in designing a study are study site selection, plot size or transect length, distance between sampling points, duration of counts, and frequency and timing of sampling. Selection of highly qualified field personnel is especially important. Assumptions that apply to all bird-counting techniques and their applications are discussed.

202. Mitchell, W.R., R.N. Green, G.D. Hope, and K. Klinka. 1989. Methods for biogeoclimatic ecosystem mapping. B.C. Min. For., Res. Br., Victoria,, B.C., Res. Rep. 89002-KL. 33 p.

The purpose of this report is to propose a set of methods to ensure that ecosystem maps are prepared consistently in quality and utility and are completed efficiently. These methods have been developed on the basis of several ecosystem pilot studies. From this report, the reader should gain an understanding of: the relationship between ecosystem

classification and mapping; the criteria required for mapping, including how to determine survey intensity, establish map units, select appropriate nomenclature, and set up legends; the procedures for undertaking a mapping project; and design of maps and reports. Methods for ecosystem mapping developed by the Ministry of Environment, Lands and Parks have yet to be integrated with those of this report. This should occur prior to publishing.

203. Peden, A.E. 1992. Collection procedure for fishes at Royal British Columbia Museum. Royal B.C. Museum, Victoria, B.C., (in preparation).

This report summarizes methods of acquisition, preserving, cataloguing and maintenance of collections for Fishes at the Royal British Columbia Museum. Where possible, procedures are compatible with those of the National Museum of Canada and with University of British Columbia. Requirements of the American Society of Ichthyology and Herpetology and the Association of Systematics collection are accommodated as best possible as well.

204. Ralph, J.C., and M. Scott. (Editors). 1981. Studies in avian biology. No. 6 Estimating numbers of terrestrial birds. October 26-31, 1980, Asilomar, California. Allen Press, Inc., Lawrence, Kansas., 630 p.

This international symposium brought together biologists and statisticians in order to assess critically the methods and assumptions used in data gathering and analysis. As such, the papers presented in this volume cover a broad range of material on the subject of estimating the abundance of birds. This material is organized into the following sections: estimating relative abundance; estimating birds per unit area; comparison of methods; species variability; environmental influences; observer variability; sampling design; data analysis; and overviews.

205. Thomas, D.W., and S.D. West. 1989. Sampling methods for bats. (in) Wildlife-habitat relationships: sampling procedures for Pacific Northwest vertebrates. in A. B. Carey, and L. F. Ruggiero (Technical Editors). USDA For. Ser., Pac. Northwest Res. Stn., Portland, Oregon., PNW-GTR 243. 20 p.

Bats represent the second most diverse group of mammals inhabiting the western slopes of the Cascade Range in southern Washington and the Oregon Coast Range. Bat populations may well be sensitive to changes in forest age, structure, or distribution, but their nocturnal habits and high mobility render the study of the habitat requirements of bats problematical. Unlike most other groups of vertebrates, bats are difficult to either observe or capture, and survey methods are poorly known. This paper reviews techniques for surveying bat populations and presents the methodology used in the Old Growth Forest Wildlife Habitat Program in the Pacific Northwest.

Selected Journals

206. Institute for Environmental studies – University of Washington. Northwest Environmental Journal. Allen Press, Lawrence, Kansas.

The Northwest Environmental Journal is a forum for environmental research and analysis for northwestern North America. It is a semi-annual, refereed, multidisciplinary publication. Papers included tend to offer a comprehensive look at a major environmental problem or topic, in which the results of particular studies are interpreted in a broad context. The journal is available from the Engineering Annex (FM-12), University of Washington, Seattle, WA 98195.

207. McAllister, D.E. (Scientific Editor). Canadian Biodiversity. Canadian Centre of Biodiversity, Canadian Museum of Nature, Ottawa, Ontario.

The goals of this journal are to: publish articles, views and news on biodiversity; bridge the gap between professional disciplines and the public; communicate information on Canadian and world biodiversity; express views on the needs and value of biodiversity research; discuss methods and philosophy of biodiversity conservation; and review books and major articles on biodiversity.

Canadian Biodiversity is published quarterly by the Canadian Centre of Biodiversity, Canadian Museum of Nature, P.O. Box 3443, Station D., Ottawa, Ontario, K1P 6P4.

208. Natural Areas Association. Natural Areas Journal. Natural Areas Association, Rockford, Illinois.

This journal provides a forum for communication among persons involved in the identification, preservation, protection, and management of natural areas and elements of natural diversity. The journal focuses on articles relating to research or management for natural areas, parks, rare species, land preservation, and theoretical approaches to natural areas work; book reviews; and editorial and other reviews. It is published quarterly.

209. Society for Conservation Biology. Conservation Biology. Blackwell Scientific Publications, Inc., Cambridge, Massachusetts.

This is an interdisciplinary journal devoted to the subject of conservation biology. It is published quarterly.