

The Status of Marine Protected Areas in Puget Sound

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Introduction

In recent years, a strong interest in marine protected areas (MPAs) has emerged and taken hold in Washington State and British Columbia. In 1994, the British Columbia/Washington Marine Science Panel recommended, with high priority, that MPAs be established in Puget Sound and Georgia Basin to protect marine habitat and resource populations (Marine Science Panel, 1994). The Washington Marine Protected Areas Work Group formed in 1995 with a goal of developing a common strategy for identifying and establishing a network of MPA sites (Washington MPA Work Group, 1998).

Sound planning for the development a system of MPAs requires a basic understanding of existing protected sites and supporting institutional arrangements. However, the collection of MPAs in Puget Sound is poorly understood, scarcely documented, and not yet represented in any comprehensive map or geographic information system (GIS). Furthermore, existing MPAs have evolved from a fragmented and confusing mix of management policies, independent programs, and legislative and administrative actions.

A marine protected area, as defined by the International Union for the Conservation of Nature and Natural Resources (IUCN), refers to "any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment" (IUCN, 1988). MPAs are areas specially managed to protect species, habitats and ecosystems; they are marine areas set aside from otherwise unrestricted human activities. World-wide, MPAs have been described by a wide variety of protected area titles, including marine reserves, preserves, parks, sanctuaries, refuges, wilderness areas, protected areas and many other terms.

MPAs may range along scales of size and protection level from small "no-intrusion" areas, to "no-take" reserves prohibiting all consumptive human uses, to large multiple-use areas balancing a whole range of conservation, economic and social objectives, and innumerable possibilities in between (Kelleher and Kenchington, 1992; Sobel, 1993; Eichbaum et al., 1996; Gubbay, 1995; Agardy, 1997). Though often controversial, MPAs are credited with a long list of potential benefits. MPAs can help to: protect biodiversity and ecosystem structure, function and integrity; improve fishery yields and management; expand knowledge and understanding of marine ecosystems; provide recreation and tourism opportunities; and provide socio-economic benefits for coastal communities (Salm and Clark, 1984; Ballentine, 1991; Bohnsack, 1993; Sobel, 1993, 1996; Gubbay, 1995; Agardy, 1997).

Objectives

The purpose of the study, as commissioned by the Puget Sound Water Quality Action Team (PSWQAT) with funds from the U.S. Environmental Protection Agency, was to compile a centralized information source on Puget Sound marine protected areas for the Washington MPA Work Group. Compiled as a comprehensive document, a report is currently (as of March 1998) under final review by the PSWQAT. Primary objectives of the study were to:

- Identify and profile existing MPAs in Puget Sound;
- Identify and review existing institutions and designation mechanisms responsible for the establishment and management of the current system of MPAs; and
- Summarize and evaluate the overall system of MPA sites and institutional arrangements.

Methods

Intertidal and subtidal protected areas in Puget Sound were identified from a review of available literature, which proved to be limited and scattered. Numerous interviews were also conducted with protected area site managers or staff, government agency staff involved with protected area programs, state and local government planners, researchers, volunteers, and many others. Protected areas investigated were primarily those of state or federal designation, established through December, 1997. To keep the study at a manageable size, local government and private sector designations were not fully investigated in this preliminary assessment. Primary institutional focus was placed on state and federal agency roles in MPA establishment and management; less detailed reviews were conducted on the MPA involvement and efforts of Treaty Tribes, local governments, and various private sector organizations.

In profiling MPAs, the type of information sought for each site can be roughly characterized as fitting into three categories: 1) general site information; 2) geographic information; and 3) site protection and management. General information collected included site name; designation type; date of establishment, establishing and managing agency or organization, purpose and objectives, and legal authority. Geographic information collected included location; marine boundary identification and description; identification of overlapping or abutting MPAs; and size/acreage breakdown (if possible) for upland, intertidal and subtidal components. Finally, in order to understand the level of protection specifically provided to marine species and habitats, and to gain perspective on the extent and nature of on-site management activities, the following information was sought for each site: legal citation and description of site-specific restrictions on human activities to protect marine resources; description of other marine resource protection mechanisms (proprietary access controls, voluntary compliance approaches, etc.); management or master plan status, and marine resource emphasis therein; extent and nature of site supervision and enforcement; and general information on site-specific programs for research, monitoring, education, or public involvement. Detailed ecological assessments or information related to site effectiveness were not pursued.

Results

Results presented here are a sub-set of highlights from the findings and analysis contained in the 1996–97 study. Primary emphasis is placed on MPA site characteristics, with less discussion of institutional arrangements.

MPAs Identified

A total of 102 Puget Sound intertidal and subtidal protected areas were identified as existing MPAs (Table 1). Also identified were five proposed sites under consideration for designation as of December 1997. Additionally, a variety of “possible” MPAs were identified. For these sites MPA determination was questionable due to lack of available data or uncertainty as to whether or how the site provides marine area protection.

Detailed site profiles were created for 42 of the 102 identified sites; state parks were not individually profiled because a centralized collection of similar information is already documented and maintained by the Washington State Parks and Recreation Commission (WSP&RC, 1996).

Table 1. Puget Sound Marine Protected Areas.

Name or Location	Designation	Agency/Organization
1. Friday Harbor to Point Caution	San Juan Islands Marine Preserve Area	WDFW; FHL
2. Yellow and Low Islands	San Juan Islands Marine Preserve Area	WDFW; FHL
3. False Bay	San Juan Islands Marine Preserve Area	WDFW; FHL
4. Argyle Lagoon	San Juan Islands Marine Preserve Area	WDFW; FHL
5. SW Shaw Island	San Juan Islands Marine Preserve Area	WDFW; FHL
6. San Juan County/Cypress Is.	Marine Biological Preserve	FHL
7. Padilla Bay	National Estuarine Research Reserve	Ecology
8. Edmonds Underwater Park	Underwater Park	City of Edmonds
9. Sund Rock	Marine Preserve Area	WDFW
10. Haro Strait	Special Management Fishery Area	WDFW
11. San Juan & Upright Channel	Special Management Fishery Area	WDFW
12. Point Lawrence	Voluntary No-Take Bottom Fish Recovery Area	San Juan County
13. Bell Island	Voluntary No-Take Bottom Fish Recovery Area	San Juan County
14. Charles Island	Voluntary No-Take Bottom Fish Recovery Area	San Juan County
15. Pile Point	Voluntary No-Take Bottom Fish Recovery Area	San Juan County
16. Lime Kiln Lighthouse	Voluntary No-Take Bottom Fish Recovery Area	San Juan County
17. Kellett Bluff	Voluntary No-Take Bottom Fish Recovery Area	San Juan County
18. Gull Rock	Voluntary No-Take Bottom Fish Recovery Area	San Juan County
19. Bare Island	Voluntary No-Take Bottom Fish Recovery Area	San Juan County
20. Dabob Bay	Natural Area Preserve	DNR
21. Kennedy Creek	Natural Area Preserve	DNR
22. Skookum Inlet	Natural Area Preserve	DNR
23. San Juan Islands (83 rocks, reefs and islands)	National Wildlife Refuge	USFWS
24. Protection Island	National Wildlife Refuge	USFWS
25. Zella M. Schultz/Protection Is.	Seabird Sanctuary	WDFW & USFWS
26. Tongue Point	Marine Life Sanctuary	Clallam County
27. Yellow Island	Nature Conservancy Preserve	TNC
28. Chuckanut Island	Nature Conservancy Preserve	TNC
29. Foulweather Bluff	Nature Conservancy Preserve	TNC
30. Goose Island	Nature Conservancy Preserve	TNC
31. Deadman Island	Nature Conservancy Preserve	TNC
32. Sentinel Island	Nature Conservancy Preserve	TNC
33. Waldron Island	Nature Conservancy Preserve	TNC
34. Lummi Island	Natural Area Preserve	WDFW
35. Kimball Preserve, Decatur Is.	San Juan Preservation Trust Preserve	SJPT
36. South Puget Sound	Wildlife Area	WDFW
37. Titlow Beach	Marine Park / Marine Preserve	METRO/Tacoma
38. Cypress Island	Natural Resources Conservation Area	DNR
39. Woodard Bay	Natural Resources Conservation Area	DNR
40. Dungeness	National Wildlife Refuge	USFWS
41. Nisqually	National Wildlife Refuge	USFWS
42. Skagit	Wildlife Area	WDFW
43. Sequim Bay State Park	State Park	WSP&RC
44. Camano Island State Park	State Park	WSP&RC
45. Deception Pass State Park	State Park	WSP&RC

Table 1 (cont.). Puget Sound Marine Protected Areas.

Name or Location	Designation	Agency/Organization
46. Ebey's Landing	State Park	WSP&RC
47. Fort Casey State Park	State Park	WSP&RC
48. Fort Ebey State Park	State Park	WSP&RC
49. Joseph Whidbey State Park	State Park	WSP&RC
50. South Whidbey State Park	State Park	WSP&RC
51. Dosewallips State Park	State Park	WSP&RC
52. Fort Flagler State Park	State Park	WSP&RC
53. Fort Worden State Park	State Park	WSP&RC
54. Mystery Bay Marine State Park	State Park	WSP&RC
55. Old Fort Townsend State Park	State Park	WSP&RC
56. Pleasant Harbor State Park	State Park	WSP&RC
57. Triton Cove State Park	State Park	WSP&RC
58. Dash Point State Park	State Park	WSP&RC
59. Saltwater State Park	State Park	WSP&RC
60. Blake Island State Park	State Park	WSP&RC
61. Fay Bainbridge State Park	State Park	WSP&RC
62. Fort Ward State Park	State Park	WSP&RC
63. Harper State Park	State Park	WSP&RC
64. Illahee State Park	State Park	WSP&RC
65. Kitsap Memorial State Park	State Park	WSP&RC
66. Manchester State Park	State Park	WSP&RC
67. Old Man House State Park	State Park	WSP&RC
68. Scenic Beach State Park	State Park	WSP&RC
69. Belfair State Park	State Park	WSP&RC
70. Harstine Island State Park	State Park	WSP&RC
71. Hope Is. (S.) Marine State Park	State Park	WSP&RC
72. Jarrell Cove State Park	State Park	WSP&RC
73. McMicken Is. Marine State Park	State Park	WSP&RC
74. Potlatch State Park	State Park	WSP&RC
75. Squaxin Island State Park	State Park	WSP&RC
76. Stretch Point State Park	State Park	WSP&RC
77. Twanoh State Park	State Park	WSP&RC
78. Cutts Island Marine State Park	State Park	WSP&RC
79. Eagle Island Marine State Park	State Park	WSP&RC
80. Joemma Beach State Park	State Park	WSP&RC
81. Kopachuck State Park	State Park	WSP&RC
82. Penrose Point State Park	State Park	WSP&RC
83. Blind Island Marine State Park	State Park	WSP&RC
84. Clark Island Marine State Park	State Park	WSP&RC
85. Doe Island Marine State Park	State Park	WSP&RC
86. James Island Marine State Park	State Park	WSP&RC
87. Jones Island Marine State Park	State Park	WSP&RC
88. Lime Kiln State Park	State Park	WSP&RC
89. Matia Island Marine State Park	State Park	WSP&RC
90. Moran State Park	State Park	WSP&RC
91. Patos Island Marine State Park	State Park	WSP&RC
92. Posey Island Marine State Park	State Park	WSP&RC
93. Spencer Spit State Park	State Park	WSP&RC
94. Stuart Island Marine State Park	State Park	WSP&RC
95. Sucia Island Marine State Park	State Park	WSP&RC

Table 1 (cont.). Puget Sound Marine Protected Areas.

Name or Location	Designation	Agency/Organization
96. Turn Island Marine State Park	State Park	WSP&RC
97. Bay View State Park	State Park	WSP&RC
98. Larrabee State Park	State Park	WSP&RC
99. Saddlebag Is. Marine State Park	State Park	WSP&RC
100. Mukilteo State Park	State Park	WSP&RC
101. Tolmie State Park	State Park	WSP&RC
102. Birch Bay State Park	State Park	WSP&RC

DNR = Washington Dept. of Natural Resources
 Ecology = Washington Dept. of Ecology
 FHL = University of WA Friday Harbor Laboratories
 METRO/Tacoma = Metropolitan Park District of Tacoma
 SJPT = San Juan Preservation Trust
 TNC = The Nature Conservancy
 USFWS = United States Fish & Wildlife Service
 WDFW = Washington Department of Fish & Wildlife
 WSP&RC = Washington State Parks and Recreation Commission

MPA designation types are highly varied, with 14 different institutional designations represented. These protected area designations are associated with a variety of federal, state and local government programs, as well as some private sector mechanisms (Table 2).

Table 2. Institutions and designation mechanisms associated with existing MPAs in Puget Sound.

Institution	Designation Types (for existing MPAs only)
WASHINGTON STATE	
Department of Natural Resources (DNR)	Natural Area Preserve Natural Resources Conservation Area
Department of Fish and Wildlife (WDFW)	Marine Preserve Area Special management fishery area Wildlife Area Seabird Sanctuary
Parks and Recreation Commission (WSP&RC)	State Parks (developed)
Department of Ecology	National Estuarine Research Reserve
University of Washington Friday Harbor Laboratories	Marine Biological Preserve
FEDERAL	
U.S. Fish and Wildlife Service (USFWS)	National Wildlife Refuge
National Oceanic and Atmospheric Administration (NOAA)	National Estuarine Research Reserve
LOCAL GOVERNMENT	
City of Edmonds	Underwater Park
City of Tacoma	Marine Preserve
Clallam County	Marine Life Sanctuary
San Juan County	Voluntary Bottomfish Recovery Area
PRIVATE SECTOR	
The Nature Conservancy	Preserve
San Juan Preservation Trust	Preserve

Missing Site Information

At the site level, much information was found to be missing or unobtainable within the scope of this study. There is a general lack of documented details concerning the marine components (intertidal and subtidal portions) of many protected areas. Site elements of interest for this study that were most commonly unavailable or unclear included the following:

- Clear identification and description of marine boundaries.
- Size/acreage breakdown for intertidal and subtidal components. Surveys to measure, or existing information on, the size of marine areas contained within protected areas is often not performed or available. With scattered data, information on size and area is often inconsistent.
- Information on marine resources (natural and/or cultural) and resource values, specific to the site. The resource information base from which many protected areas operate, especially but not exclusively those that are primarily land-attached, lacks emphasis on the marine environment contained within and adjacent to site boundaries.

Geographic Distribution and Characteristics

Geographic distribution of MPAs is varied, with roughly equal distribution between northern and southern Puget Sound. A high concentration of sites is located in the San Juan Archipelago, while there is a relative lack of sites along the Strait of Juan de Fuca. MPAs that are part of terrestrial protected areas dominate in number (82% of total), while subtidal sites are minimal (18%). The sizes of Puget Sound MPAs vary dramatically. Subtidal sites with legal closures on harvest are small (10 to 200 acres) relative to large intertidal protected areas (ranging from 2000 to 13,000 acres).

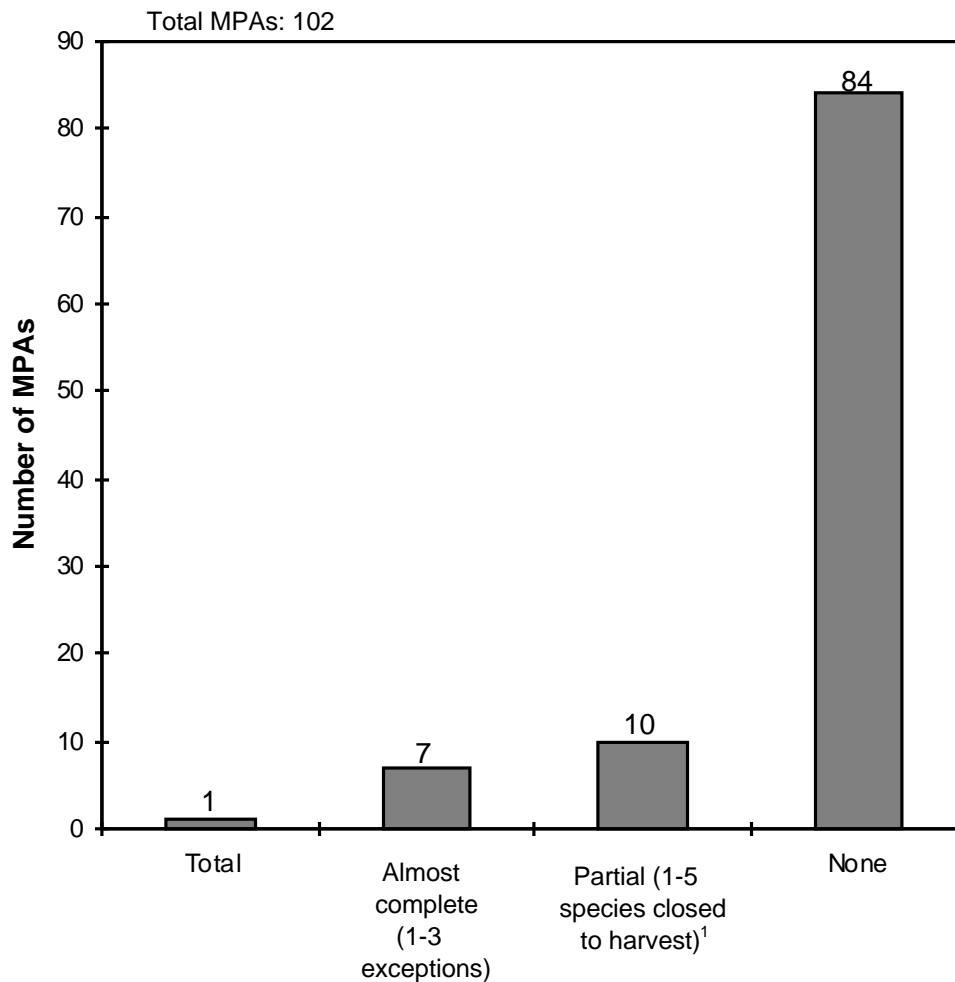
Marine Area Protection Approaches

Most MPAs in Puget Sound contribute to the protection of marine species, habitats or ecosystems through one of two distinct approaches: regulatory mechanisms (based in specific laws, such as prohibitions on harvest) or proprietary mechanisms (based on property ownership or lease). To a limited extent, regulatory approaches have been used in the subtidal environment to provide long-term area-specific harvest closures to manage fisheries, provide non-consumptive recreational opportunities, or facilitate scientific research. More common among Puget Sound MPAs is the application of a proprietary approach to marine area protection. This can involve the acquisition and set-aside of intertidal areas, placing of limits on land-based human access or activities, and/or the withdrawal (by DNR) of certain public aquatic lands from availability for lease. In recent years, some MPAs have been planned and established through an integration of these two historically separate approaches (e.g., Titlow Beach Marine Preserve). Additionally, the recent establishment of eight Voluntary No-take Bottom Fish Recovery Areas in San Juan County has introduced a possible third approach to marine area protection: voluntary compliance MPAs.

Protection Of Fished And Unclassified Marine Species

Only 18 (18%) of the 102 MPAs identified in the study provide protection from harvest for fished species (those classified as food fish, game fish and shellfish by the Washington Department of Fish and Wildlife) (Figure 1). Eight of these 18 harvest refugia sites are voluntary compliance MPAs; thus, only 10% of identified MPAs actually provide legally based harvest closures for fished species. The vast majority of MPAs (82%) do not directly restrict fishing activities, although some sites limiting public access do so indirectly.

The harvest or collection of unclassified species is legally prohibited at 62 MPAs (60% of sites), with State Parks representing 97% of that total (Figure 2). As of 1997, there is only one no-take MPA in Puget Sound (Edmonds Underwater Park) prohibiting the extraction of all marine life.



Extent of harvest closure for classified species or groups

Figure 1. Extent of protection from harvest for classified species provided by MPAs in Puget Sound. Includes eight voluntary MPA's. Classified species are those designated as game fish, food fish, or shellfish by the Washington Department of Fish and Wildlife, which represents San Juan County Cypress Island Marine Biological Preserve, administered by the University of Washington's Friday Harbor Laboratories.

MPA Site Management

The nature and extent of on-site management activity occurring at MPAs in Puget Sound is highly varied. Significant management differences exist among sites that range from set-aside areas with minimal supervision and management activity, to research reserves featuring continuous on-site management developments and activity.

Many MPAs are observed as being actively managed on site, with, at a minimum, management staff present and regular maintenance and supervision provided. Examples of such sites include the Padilla Bay National Estuarine Research Reserve (NERR), the Nisqually and Dungeness National Wildlife Refuges, Edmonds Underwater Park, State Parks, and other sites. A number of other protected areas, however, receive significantly less management attention. Examples of MPAs where site management attention is considered low include Natural Area Preserves at Dabob Bay, Kennedy Creek, Skookum Inlet, and Lummi Island; the San Juan Islands National Wildlife Refuge; and the Sund Rock Marine Preserve. While at some sites active management is not an objective or need, in most cases resource

limitations have prevented implementation of originally intended or envisioned levels of management.

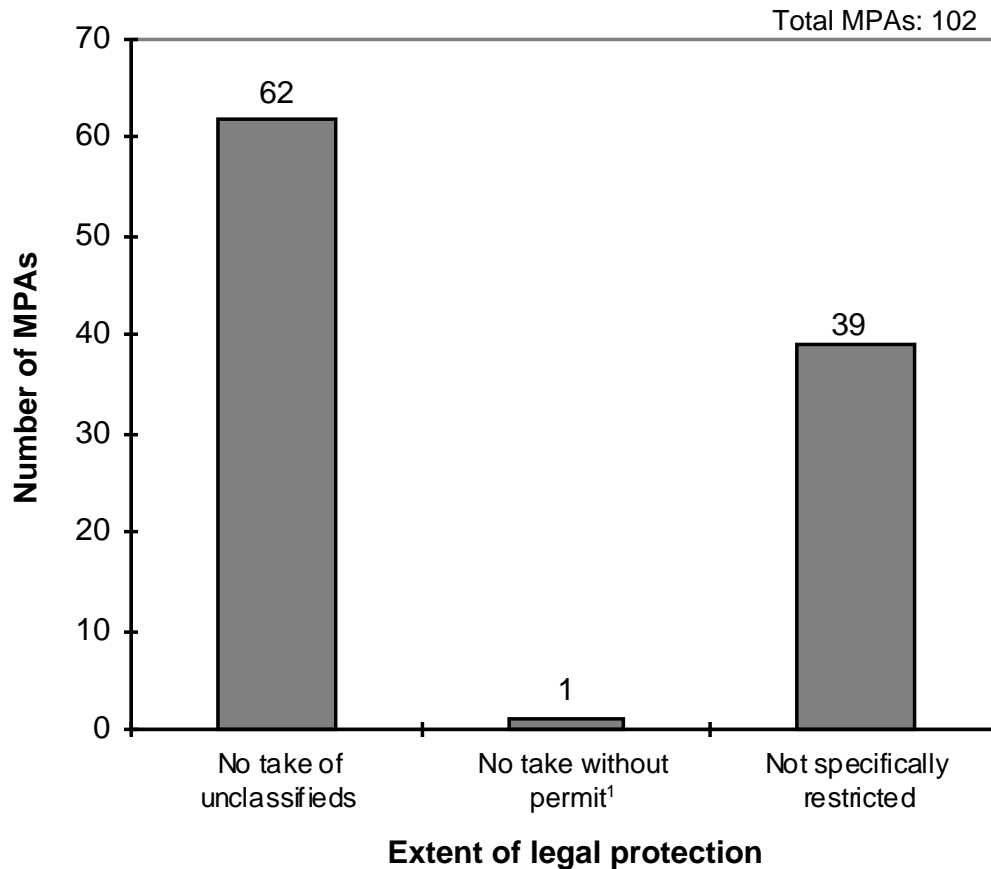


Figure 2. Number of MPAs that prohibit the harvest or collection of unclassified marine species by law. Unclassified marine species are those that have not been designated by the Washington Department of Fish and Wildlife (WDFW) as food fish or shellfish. As used here, protected by “law” refers to harvest or collection restrictions specified in state laws or local ordinances, and as such is not inclusive of management attempts to prohibit intertidal harvesting through proprietary access restrictions or other management measures.

More than 75% of the MPAs identified in this study are managed without the guidance of a completed site-specific management plan. For most of these sites, site management is guided by centralized planning or direction contained within geographically broader plans. However, approximately nine MPAs appear to have no management plan at all, specific or general. At many sites, new or updated management plans are currently being developed (e.g., four National Wildlife Refuges, two Wildlife Areas, Padilla Bay NERR, some State Parks, and others).

Year-round on-site management presence is found at approximately 71 sites. Remaining sites are visited by management staff on an infrequent basis, such as seasonally, a few times per year, or as incidents require. For those MPAs with harvest prohibitions in place, very few have developed site-specific enforcement programs. When interviewed, management staff and others familiar with particular MPAs most often characterized official enforcement presence and site supervision as light.

Educational approaches to achieve compliance are more commonly employed. Beach watch programs in place at MPAs such as Edmonds Underwater Park and Titlow Beach Marine Preserve provide site supervision and enforcement notification. The regular presence of volunteer divers and educational efforts of citizen park stewards at Edmonds have created strong peer pressure and an environmental ethic. As a result, the site is generally “self-policing.”

Indirect or unofficial supervision is also common at many MPAs, whereby various parties keep watch, reporting violations and often approaching and educating potential violators. These parties include local residents, volunteers, researchers, maintenance staff, and others, but they are usually not responsible for site supervision or enforcement.

Conclusions

The diverse set of protected intertidal and subtidal areas found in Puget Sound have developed incrementally and inconsistently into a patchwork of MPAs which vary considerably in designation, purpose, resource protection offered and level of management provided. Many organizations are involved in governing and managing resources and activities in Puget Sound. The study found that five state government institutions and two federal agencies are primarily responsible for the majority of the existing 102 MPAs identified. Local governments and various private sector organizations can also establish several types of MPAs.

The existing institutional structure to support MPA establishment and management in Puget Sound is fragmented and complex. There has been no clear policy or coordinated program to guide the region's establishment and management of MPAs. Designations have occurred without systematic consideration of overall objectives, site identification criteria, design, financing, designation, management, monitoring and evaluation.

However, a diverse set of marine area protection mechanisms and tools do exist. Among the various entities involved, adequate authority exists to create MPAs ranging from small strictly regulated no-take or no-intrusion areas, to larger multiple use protected areas providing for the management of many uses. MPAs are a tool available to many agencies and organizations that may be useful for a variety of management functions.

In Puget Sound, most existing MPAs have been established and are operated through the independent efforts of a single agency or organization pursuing the fulfillment of a particular mandate or goal. Multi-institutional planning for and operation of sites is not the standard, but is found at some MPAs.

The most common type of MPA observed in Puget Sound is one that is attached to a terrestrial park or other protected area containing a fringing intertidal border. The extent and nature of resource protection focused on the intertidal portion of such areas is highly variable. In terms of the number and size of site designations and depth of management experience, it is clear that MPA developments in Puget Sound (especially for subtidal areas) lag well behind terrestrial protected area developments. Only 18 subtidal- and intertidal-only MPAs are identified, and of these, 15 have been established within the last 10 years. These areas are truly special features, rather than the standard.

At subtidal sites where fishing is restricted, it is uncommon for all forms of harvest to be prohibited. With only one complete no-take site (Edmonds Underwater Park), the region has as of yet little experience in establishing and managing areas reserved from all extractive use.

Recommendations and Applications

Moving Toward a Complete MPA Inventory

Building on the data collected, it is recommended that steps be taken to move this preliminary assessment toward a more complete MPA inventory for Puget Sound. A geographic information system (GIS) and database for MPAs should be developed and maintained. Additionally, research should be undertaken to identify various additional MPA sites and designation mechanisms of local government and private sector origin. Consideration might also be given to expanding MPA identification and profiling efforts state-wide, and integrating results with British Columbia. For existing MPAs where site data is scarce, it would be wise to gather additional information on such basic elements as marine area boundaries and site-specific marine resource features and values.

Puget Sound Research '98

Ultimately, if a coordinated system or network of MPAs is to be developed throughout Puget Sound and the Georgia Basin, all programs, potential partners and protected sites should be represented within a comprehensive MPA inventory. Ideally, it is recommended that development of a distributed, possibly on-line, system for gathering, maintaining and sharing new and updated basic information on protected areas be investigated. In short, it would seem wise to take necessary steps to maintain and build on the study's data, thus preventing or reducing the future possibility of a large scale effort to reassess the basic status of MPAs in Puget Sound.

Applications

While the study's compilation of information does not simplify the complexity of the existing system, it can help eliminate some confusion about Puget Sound MPAs. It is hoped that this information can help interested individuals to better understand the system as it currently exists.

As efforts advance toward the design of a system or network of MPAs, the information collected in this study can serve as a preliminary baseline measure of the extent of marine area currently protected. As much focus is given to the establishment of new sites, this information can also help draw attention to existing protected areas in Puget Sound. To this end, opportunities may be explored to improve, enhance, build upon and learn from existing MPAs. This may help increase dialog between groups, and bring to light potential cooperative and partnership opportunities within and between agencies and organizations.

The centralized source of information on Puget Sound MPAs may also serve as a base from which higher level studies and system analysis work can begin. In addition to research and work directed at expansion and improvement of an MPA inventory for the region, this information base might invite additional studies on such topics as MPA effectiveness or funding sources and needs.

Overall, it is hoped that the compilation of information on existing MPAs can provide a foundation upon which to build a more rational, effective, coordinated and manageable system of MPAs in Puget Sound.

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References

- Agardy, T.S. 1997. *Marine Protected Areas and Ocean Conservation*. R.G. Landes Company: Georgetown, Texas. 240 pp.
- Ballentine, B. 1991. *Marine reserves for New Zealand*. University of Auckland, Leigh Laboratory Bulletin No. 25.
- Bohnsack, J.A. 1993. *Marine reserves: They enhance fisheries, reduce conflicts, and protect resources*. *Oceanus* 36(3):63-71.
- Eichbaum, W.M., M.P. Crosby, M.T. Agardy and S.A. Laskin. 1996. *The role of marine and coastal protected areas in the conservation and sustainable use of biological diversity*. *Oceanography*. 9(1):60-70.
- Gubbay, S. (ed). 1995. *Marine Protected Areas: Principles and Techniques for Management*. Chapman and Hall, London, UK. 232 pp.

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- International Union for the Conservation of Nature and Natural Resources (IUCN). 1988. Proceedings of the 17th Session of the General Assembly of IUCN and 17th Technical Meeting. San Jose, Costa Rica, 1–10 February, 1988. Gland, Switzerland.
- Kelleher, G. and R. Kenchington. 1992. Guidelines for Establishing Marine Protected Areas. A Marine Conservation and Development Report. IUCN, Gland, Switzerland. vii + 79 pp.
- Marine Science Panel. 1994. The Shared Marine Waters of British Columbia and Washington—A Scientific Assessment of Current Status and Future Trends in Resource Abundance and Environmental Quality in the Strait of Juan de Fuca, Strait of Georgia, and Puget Sound. British Columbia/Washington Marine Science Panel. Report to the British Columbia/Washington Environmental Cooperation Council. Victoria, BC, CANADA and Olympia, Washington. 119 pp.
- Salm, R.V. and J.R. Clark. 1984. Marine and Coastal Protected Areas: A Guide for Planners and Managers. IUCN. Gland, Switzerland. 302 pp.
- Sobel, J. 1993. Conserving biological diversity through marine protected areas: A global challenge. *Oceanus* 36(3):19–26.
- Sobel, J. 1996. Marine Reserves: Necessary Tools for Biodiversity Conservation? *Global Biodiversity* 6(1): 8–18.
- Washington Marine Protected Areas (MPA) Work Group. 1998. Draft Puget Sound Marine Protected Area Discussion Paper. Puget Sound/Georgia Basin Task Force. January.
- Washington State Parks and Recreation Commission (WSP&RC). 1996. 1995–97 Biennium Area Reports: A brief description of areas administered by the Washington State Parks and Recreation Commission. January, 1996. 402 pp.