

## Species of Concern within the Georgia Basin Puget Sound Marine Ecosystem: changes from 2002 to 2006

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### Abstract

Species of concern are native species, sub-species or ecologically significant units that warrant special attention to ensure their conservation. Within the Georgia Basin Puget Sound marine ecosystem, the Province of British Columbia, the State of Washington, the Canadian Federal Government, and the United States Federal Government each assess which species require special initiatives to ensure protection and survival of the population. As of September 1, 2006, 64 species of concern were listed by one or more jurisdiction in the Georgia Basin Puget Sound marine ecosystem. Each jurisdiction underestimated the total number of species of concern within the entire marine ecosystem. Since 2002 when an ecosystem-based list of species of concern was first compiled, the number of species of concern has slowly advanced from 60 species in 2002, to 63 in 2004 to 64 species but the percentage of total species listed by each jurisdiction has not altered significantly. Using unpublished data on species richness for the ecosystem, approximately 0.1% of invertebrates (3/3000), 12% of fishes (27/219), 19% of birds (24/128) and 45% (9/20) of mammals that utilize the Georgia Basin Puget Sound marine waters are listed by one or more jurisdiction as species of concern. This is concerning and suggestive of ecosystem decay. In light of projected human population growth in the region, efforts need to be enhanced to more rapidly address regional species declines and to institute multi-species ecosystem-based solutions where possible.

### Introduction

Species of concern are native species, sub-species or ecologically significant units that warrant special attention to ensure their conservation. Within ecosystems spanning international boundaries and multiple jurisdictions, an ecosystem-based list of species of concern serves many functions. It acts as a crude indicator of ecosystem health, permits cross checking of species of concern between jurisdictions, suggests where more research is needed and highlights where transboundary approaches could benefit species recovery (Gaydos and Gilardi, 2003). Four jurisdictions within the Georgia Basin Puget Sound marine ecosystem have processes for assessing and listing species that require special initiatives to ensure protection and survival of the population: the Province of British Columbia, the State of Washington, the Canadian Federal Government, and the United States Federal Government. This work compiles listed marine invertebrates, fishes, reptiles, birds and mammals throughout the Georgia Basin Puget Sound ecosystem; compares listings between jurisdictions and updates prior lists developed in 2002 (Gaydos and Gilardi, 2003) and 2004 (Brown and Gaydos, 2005).

### Methods

Species that utilize marine habitat in the Georgia Basin Puget Sound and were listed by one or more jurisdiction were included. Listing status as of September 1, 2006 was used. Specifically, the processes for listing and listing classifications within each jurisdiction are as follows:

#### British Columbia

In the Province of British Columbia, species are assigned a risk of extinction. Species are placed on Red, Blue or Yellow lists. Red-listed species are those that have been legally designated as Endangered or Threatened under the provincial Wildlife Act, are extirpated, or are candidates for such designation. Blue-listed species are those not immediately threatened, but are of concern because of characteristics that make them particularly sensitive to human activities or natural events. Yellow-listed species are all species not included on the Red or Blue lists. For the purpose of this study, Red and Blue-listed species are considered species of concern. When British Columbia ranks species, each species is assigned a global rank (applies across its range), a national rank (for each nation within its range, such as Canada), and a sub-national rank (for each province). In British Columbia, the Conservation Data Centre within the Ministry of Sustainable Resource Management assigns the provincial rank. These provincial ranks are updated annually. Within the marine ecosystem, British Columbia currently only assesses mammals, birds, reptiles and freshwater fishes that also utilize marine habitat. Important to this study, conspicuously absent

are marine fishes and marine invertebrates. All credible sources of information concerning species distribution, abundance, trends, and threats are considered in provincially ranking species in British Columbia.

### **Washington State**

In Washington State species of concern are listed by the Washington Fish and Wildlife Commission (Commission) under the provisions of Washington Administrative Code (WAC) 232-12-297 (Endangered, Threatened, and Sensitive Wildlife Species Classification). Listing occurs in much the same stepwise procedure as occurs at the U.S. federal level. A species could be listed as either endangered (seriously threatened with extinction throughout all or a significant portion of its range within the state), threatened (likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state) or sensitive (vulnerable or declining and likely to become endangered or threatened in a significant portion of its range within the state). Listing can be initiated in one of three ways: (1) the Washington Department of Fish and Wildlife (WDFW) initiates a species status review; (2) the WDFW receives a petition from a citizen (at which point the agency has 60 days to either initiate the classification process or deny the petition, based on the best available scientific data); or (3) the Commission requests the WDFW to review a species of concern. Listings are based solely on the biological status of the species in the wild, as indicated by the preponderance of scientific data available. When the listing process is initiated, the WDFW publishes a public notice in the Washington State Register and calls for scientific information relevant to the species' status. The WDFW prepares a draft species status report, which reviews relevant information on the status of the species in Washington, addresses factors affecting its status, and makes a preliminary listing recommendation. The public and the scientific community is given 90 days to review and comment on the draft status report and listing recommendation, and the WDFW can hold one or more public meetings during the public review period. At the close of the public comment period, the WDFW addresses comments, completes the final status report and listing recommendation and submits them to the Commission. The final species status report, agency classification recommendation, and State Environmental Policy Act (SEPA) documents are made available to the public at least 30 days prior to the Commission meeting. Once a species is listed, the WDFW writes and implements a recovery plan for threatened or endangered species, or a management plan for sensitive species. A review of the species' status is conducted by the WDFW at least once every five years. The WDFW maintains a list of Candidate species by Department Policy, which are those species that will be reviewed for possible listing as endangered, threatened, or sensitive. Marine invertebrates and fishes can only receive candidate status in Washington state. Species listed as candidates, sensitive, threatened or endangered are included in this study.

### **Canada**

In Canada, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) creates a federal listing of species at risk using an international ranking system adapted from the World Conservation Union in Switzerland. COSEWIC is composed of government and non-government members, members from academic institutions, and one member with expertise in Aboriginal traditional knowledge. Species designations are made using formal status report review process. Experts are commissioned to write status reports on the biology, population status, range, and possible threats facing the species or subspecies in question using the best available scientific, community, and Aboriginal traditional knowledge. COSEWIC meets at least once annually to consider new and updated status reports and to make status determinations. If deemed necessary and appropriate, emergency listing can be made ahead of COSEWIC's regular general meeting and decisions made are later ratified based upon a full report. As listed by COSEWIC, risk categories for species include extinct (a species that no longer exists), extirpated (no longer exists in the wild in Canada, but exists elsewhere), endangered (facing imminent extinction or extirpation), threatened (likely to become endangered if limiting factors are not reversed), special concern (characteristics make species particularly sensitive to human activities or natural events), not at risk, or data deficient (insufficient information to support status designation). Species that are suspected of being at some risk of extinction or extirpation, but have not yet been reviewed by COSEWIC are placed on a Candidate List and as time and resources permit, COSEWIC commission's status reports for these species so that an assessment can be undertaken. Currently, species listed by COSEWIC as "endangered," "threatened," or of "special concern" do not receive legal recognition from the federal government. Under the federal Species at Risk Act (SARA), the federal Cabinet ultimately decides whether COSEWIC designated species should get legal protection under SARA. These decisions are made after consultations with affected stakeholders and other groups. In this study, species listed under COSEWIC and SARA are included and are identified accordingly.

## United States

In the United States, the U.S. Fish and Wildlife Service (USFWS, Department of the Interior) and the National Oceanic and Atmospheric Administration (NOAA-Fisheries, Department of Commerce) (hereinafter referred to as “the Agencies”) share responsibility for identifying species of concern under the provisions of the Federal Endangered Species Act (ESA), enacted in 1973. A species is listed either as endangered (a species that is in danger of extinction throughout all or a significant portion of its range) or threatened (one that is likely to become endangered in the foreseeable future) when it is determined to be negatively impacted by any or all of the following factors: 1) current or imminent destruction or degradation of its habitat or range; 2) over-extraction for any purpose or by any means; 3) population-level impacts of disease or predation; 4) existing regulatory mechanisms that are inadequate to protect the species; or 5) other natural or anthropogenic factors significantly impeding the species’ survival. The process for listing as species can be initiated by the Agencies or by a petition from the public. The Agencies initiate the process by publishing a “notice of review” that identifies a “candidate for listing” any species in the United States that it believes meets the definition of threatened or endangered, or for which its status in the wild warrants review and consideration under the ESA. If the Agencies receive a petition for listing a species from the public they have 90-days to review the petition and determine whether or not there is substantial information indicating that the listing may be warranted. At this point, the species is called a “Candidate for Listing,” and the Agencies then have one year to determine whether or not to propose listing for the species. During this review period, the Agencies seek biological information to help complete the status review. If the Agencies decide that a species warrants listing under the ESA, a proposed rule is published in the Federal Register for a 60-day public comment period. Information received is analyzed and considered, and within one year of a listing proposal, one of three possible actions is taken: 1) a species is listed as threatened or endangered because the best available scientific data supports the listing; 2) the proposal is withdrawn because the best available scientific data does not support the listing; or 3) the proposal review period is extended for an additional 6 months if there is substantial disagreement within the scientific community concerning the listing. In addition to being not listed, listed as threatened and listed as endangered, species also can be listed as a species of concern. These are species about which the Agencies have concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the ESA (Federal Register 9 (73): 19975-19979). The status of a listed species is reviewed at least every five years to determine if federal protection is still warranted. This project lists candidate species, species of concern and those listed as threatened or endangered.

## Results

As of September 2006, 64 species in the Georgia Basin Puget Sound marine ecosystem were listed by one or more jurisdiction as species of concern (Table 1). These included 3 invertebrates (Table 2), 27 fishes (Table 3), one reptile (Table 4), 24 birds (Table 5), and 9 mammals (Table 6). As in 2002 and 2004 each jurisdiction underestimated the total number of species of concern within the entire marine ecosystem. Of the 64 species listed by one or more jurisdiction, Washington State listed 72% of them, the Province of British Columbia listed 48%, the Canadian Federal Government identified 39%, and the U.S. Federal Government identified 31% (Table 7).

## Discussion

As previously recognized, there is merit to developing and updating an ecosystem-based list of species of concern that encompasses all jurisdictional listings. One reason is to develop a more comprehensive view of the actual species of concern within the ecosystem. Since 2002, no one jurisdiction has listed all of the species of concern. This is not surprising due to differences in species abundance and distribution within the ecosystem as well as jurisdictional differences in listing criteria. The percentage of total species of concern listed by jurisdiction has not differed significantly since 2002 (Table 7). Assuming that agencies within the different jurisdictions are actively working to keep up with species listing, the consistent percentage of total species listed by jurisdiction suggests that difference in listing, rather than in species abundance and distribution within the ecosystem, are responsible for differences in the percentage of total species listed.

A transboundary, multi-jurisdiction list of species of concern also can be used as an indicator of ecosystem health. The number of species of concern in the Georgia Basin Puget Sound has crept from 60 species in 2002, to 63 in 2004 and now to 64 species in 2006. While some species such as the Aleutian Canada Goose (*Branta canadensis leucopareia*) and the double-crested cormorant (*Phalacrocorax auritis*) have been down-listed within the list, the steady increase in total number of species of concern is disconcerting. Using unpublished SeaDoc Society data on species richness for the ecosystem, approximately 0.1% of invertebrate species (3/3000), 12% of fish species (27/219), 19% of bird species (24/128) and 45% (9/20) of mammal species that utilize the Georgia Basin Puget

Sound marine waters are currently “of concern.” Similar lists are not available for comparison from other marine ecosystems however the high proportion of species of concern is suggestive of ecosystem decay (Bierregard et al., 2001). In light of projected human population growth in the region, efforts need to be enhanced to more rapidly address species declines in the Georgia Basin Puget Sound marine ecosystem and to institute multi-species ecosystem-based solutions where possible.

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#### **References and Citations**

Bierregard, R.O., T.E. Lovejoy, C. Gascon, and R. Mesquita (eds), 2001, *Lessons from Amazonia: The Ecology and Conservation of a Fragmented Forest*, Yale University Press, 544 pp.

Brown, N. and J. K. Gaydos. 2005. Species of concern in the Puget Sound Georgia Basin: changes between 2002 and 2004. *In* Proceedings of the 2005 Puget Sound Georgia Basin Research Conference, March 29-31, 2005, Seattle, Washington.

Gaydos, J. K. and K. V.K. Gilardi. 2003. Species of Concern in the Georgia Basin / Puget Sound Marine Ecosystem: more support for a transboundary ecosystem approach to marine conservation. *In* Droscher, Toni and David A. Fraser (eds.) Proceedings of the 2003 Georgia Basin/Puget Sound Research Conference, March 31-April 3, 2003, Vancouver, British Columbia.

Table 1: Marine ecosystem species identified as species of concern by jurisdiction

	<b>BRITISH COLUMBIA</b>	<b>WASHINGTON STATE</b>	<b>CANADA</b>	<b>U.S.A.</b>	<b>TOTAL</b>
<b>INVERTEBRATES</b>	0	3	2	2	<b>3</b>
<b>FISHES</b>	2	22	7	5	<b>27</b>
<b>REPTILES</b>	1	1	1	1	<b>1</b>
<b>BIRDS</b>	19	11	6	8	<b>24</b>
<b>MAMMALS</b>	9	9	9	4	<b>9</b>
<b>TOTAL</b>	<b>31</b>	<b>46</b>	<b>25</b>	<b>20</b>	<b>64</b>

Table 2: Invertebrate Species of Concern in the Georgia Basin Puget Sound Marine Ecosystem

<b>SPECIES</b>	<b>BRITISH COLUMBIA</b>	<b>WASHINGTON STATE</b>	<b>CANADA</b>	<b>U.S.A.</b>
Newcomb's littorine snail ( <i>Algamorda subrotundata</i> )		Candidate		Species of Concern
Olympia oyster ( <i>Ostrea conchaphila</i> )		Candidate	Special Concern (SARA)	
Pinto (Northern) Abalone ( <i>Haliotis kamtschatkana</i> )		Candidate	Threatened (SARA)	Species of Concern

Table 3: Fish Species of Concern in the Georgia Basin Puget Sound Marine Ecosystem

SPECIES	BRITISH COLUMBIA	WASHINGTON STATE	CANADA	U.S.A.
Eulachon ( <i>Thaleichthys pacificus</i> )	Blue List	Candidate	Not Listed to <b>Candidate (COSEWIC)</b>	
Pacific cod, S. & C. Puget Sound ( <i>Gadus macrocephalus</i> )		Candidate		
Pacific hake, C. Puget Sound ( <i>Merluccius productus</i> )		Candidate		Species of Concern
Pacific herring, Cherry Point ( <i>Clupea pallasii</i> )		Candidate		Candidate to <b>Not Listed</b>
Pacific herring, Discovery Bay ( <i>Clupea pallasii</i> )		Candidate		
Rockfish, Black ( <i>Sebastes melanops</i> )		Candidate		
Rockfish, Bocaccio ( <i>Sebastes paucispinis</i> )		Candidate	Threatened (COSEWIC)	
Rockfish, Brown ( <i>Sebastes auriculatus</i> )		Candidate		
Rockfish, Canary ( <i>Sebastes pinniger</i> )		Candidate		
Rockfish, China ( <i>Sebastes nebulosus</i> )		Candidate		
Rockfish, Copper ( <i>Sebastes caurinus</i> )		Candidate		
Rockfish, Greenstriped ( <i>Sebastes elongatus</i> )		Candidate		
Rockfish, Quillback ( <i>Sebastes maliger</i> )		Candidate		
Rockfish, Redstripe ( <i>Sebastes proriger</i> )		Candidate		
Rockfish, Tiger ( <i>Sebastes nigrocinctus</i> )		Candidate		
Rockfish, Widow ( <i>Sebastes entomelas</i> )		Candidate		
Rockfish, Yelloweye ( <i>Sebastes ruberrimus</i> )		Candidate		
Rockfish, Yellowtail ( <i>Sebastes flavidus</i> )		Candidate	Not Listed to <b>Candidate (COSEWIC)</b>	
Salmon, Chinook ( <i>Oncorhynchus tshawytscha</i> ) (Puget Sound)		Candidate		Threatened
Salmon, Chum ( <i>Oncorhynchus keta</i> ) (summer-run Hood Canal)		Candidate		Threatened

SPECIES	BRITISH COLUMBIA	WASHINGTON STATE	CANADA	U.S.A.
Salmon, Coho ( <i>Oncorhynchus kisutch</i> ) Interior Frasier River			Endangered (COSEWIC)	
Salmon, Coho ( <i>Oncorhynchus kisutch</i> ) Puget Sound and Strait of Georgia				Species of Concern
Salmon, Sockeye ( <i>Oncorhynchus nerka</i> ) Cultus Lake			Endangered (COSEWIC)	
Salmon, Sockeye ( <i>Oncorhynchus nerka</i> ) Sakinaw Lake			Endangered (COSEWIC)	
Shortspine Thornyhead ( <i>Sebastolobus alascanus</i> )			Not Listed to <b>Candidate</b> (COSEWIC)	
Trout, Bull ( <i>Salvelinus confluentus</i> )	Blue List	Candidate		Threatened
Walleye Pollock, S. Puget Sound ( <i>Theragra chalcogramma</i> )		Candidate		

\*Items in bold represent legal status changes made between September 2004 and September 2006.

Table 4: Reptile Species of Concern in the Georgia Basin Puget Sound Marine Ecosystem

Species	British Columbia	Washington State	Canada	U.S.A.
Sea Turtle, Leatherback ( <i>Dermochelys coriacea</i> )	Red List	Endangered	Endangered (SARA)	Endangered

Table 5: Avian Species of Concern in the Georgia Basin Puget Sound Marine Ecosystem

SPECIES	BRITISH COLUMBIA	WASHINGTON STATE	CANADA	U.S. A.
American Golden Plover ( <i>Pluvialis dominica</i> )	Blue List			
Ancient Murrelet ( <i>Synthliboramphus antiquus</i> )	Blue List		Special Concern (SARA)	
Bald Eagle ( <i>Haliaeetus leucocephalus</i> )		Threatened		Threatened
Canada Goose, Aleutian ( <i>Branta canadensis leucopareia</i> )		Threatened to <b>Not Listed</b>		Species of Concern
Caspian Tern ( <i>Sterna caspia</i> )	Blue List			
Cassin's Auklet ( <i>Ptychoramphus aleuticus</i> )	Blue List	Candidate		Species of Concern
Common Loon ( <i>Gavia immer</i> )		Sensitive		
Common Murre ( <i>Uria aalge</i> )	Red List	Candidate		
Cormorant, Brandt's ( <i>Phalacrocorax penicillatus</i> )	Red List	Candidate		
Cormorant, Double-crested ( <i>Phalacrocorax auritus</i> )	Red List to <b>Blue List</b>			
Cormorant, Pelagic ( <i>Phalacrocorax pelagicus pelagicus</i> )	Red List			
Forster's Tern ( <i>Sterna forsteri</i> )	Red List		Data Deficient (COSEWIC)	
Great Blue Heron, Pacific ( <i>Ardea herodias fannini</i> )	Blue List		Special Concern (SARA)	
Long-billed Curlew ( <i>Numenius americanus</i> )	Blue List		Not listed to <b>Special Concern (SARA)</b>	
Long-tailed duck / Oldsquaw ( <i>Clangula hyemalis</i> )	Blue List to <b>removed (Yellow)</b>			
Marbled Murrelet ( <i>Brachyramphus marmoratus marmoratus</i> )	Red List	Threatened	Threatened (SARA)	Threatened
Pelican, Brown ( <i>Pelecanus occidentalis</i> )		Endangered		Endangered

<b>Species</b>	<b>British Columbia</b>	<b>Washington State</b>	<b>Canada</b>	<b>U.S.A.</b>
Peregrine Falcon, American ( <i>Falco peregrinus anatum</i> )	Red List	Sensitive	Threatened (SARA)	Species of Concern
Peregrine Falcon, Peale's ( <i>Falco peregrinus pealei</i> )	Blue List	Sensitive	Special Concern (SARA)	Species of Concern
Phalarope, Northern / Red-necked ( <i>Phalaropus lobatus</i> )	Blue List			
Short-billed Dowitcher ( <i>Limnodromus griseus</i> )	Blue List			
Surf Scoter ( <i>Melanitta perspicillata</i> )	Blue List			
Tufted Puffin ( <i>Fratercula cirrhata</i> )	Blue List	Candidate		Species of Concern
Western Grebe ( <i>Aechmophorus occidentalis</i> )	Red List	Candidate		

**\*Items in bold represent legal status changes made between September 2004 and September 2006.**

Table 6: Mammalian Species of Concern in the Georgia Basin Puget Sound Marine Ecosystem

SPECIES	BRITISH COLUMBIA	WASHINGTON STATE	CANADA	U.S.A.
Gray Whale ( <i>Eschrichtius robustus</i> )	Blue List	Sensitive	Special Concern (SARA)	
Harbor Porpoise ( <i>Phocoena phocoena</i> )	Blue List	Candidate	Special Concern (SARA)	
Humpback whale, N. Pacific ( <i>Megaptera novaeangliae</i> )	Blue List	Endangered	Threatened (SARA)	Endangered
Killer Whales, Offshore ( <i>Orcinus orca</i> )	Not listed to <b>Blue List</b>	Endangered	Special Concern (SARA)	
Killer Whales, S. Residents ( <i>Orcinus orca</i> )	Red List	Endangered	Endangered (SARA)	Candidate to <b>Endangered</b>
Killer Whales, N. Residents ( <i>Orcinus orca</i> )	Red List	Endangered	Threatened (SARA)	
Killer Whales, Transients ( <i>Orcinus orca</i> )	Red List	Endangered	Threatened (SARA)	
Sea Otter, northern ( <i>Enhydra lutris</i> ):	Red List	Endangered	Threatened (SARA)	Species of Concern
Steller Sea-lion (eastern population) ( <i>Eumetopias jubatus</i> )	Red List	Threatened	Special Concern (SARA)	Threatened

\*Items in bold represent legal status changes made between September 2004 and September 2006.

Table 7: Percentage of species of concern listed by jurisdiction over time

	BRITISH COLUMBIA	WASHINGTON STATE	CANADA	U.S.A.	TOTAL SPECIES LISTED
2002*	47%	73%	28%	30%	<b>60</b>
2004**	50%	73%	36%	31%	<b>63</b>
2006***	48%	72%	39%	31%	<b>64</b>

\* Gaydos and Gilardi, 2003

\*\* Brown and Gaydos, 2005

\*\*\* Current data