

Office of Shellfish and Water Protection

2010 Annual Report:
**COMMERCIAL AND RECREATIONAL
SHELLFISH AREAS**
in Washington State

July 2011

Office of Shellfish and Water Protection

**2010 Annual Report:
COMMERCIAL AND RECREATIONAL
SHELLFISH AREAS
in Washington State**

July 2011



The Department of Health works to protect and improve the health of people in Washington State

For more information or additional copies of this report contact:

Office of Shellfish and Water Protection
PO Box 47824
Olympia, Washington 98504-7824
Phone: (360) 236-3330
FAX: (360) 236-2257
Office web site: www.doh.wa.gov/ehp/sf

Mary Selecky
Secretary of Health

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND
HEALTHIER WASHINGTON

Contents

Introduction	1
Definitions and Process for Classifying Commercial Shellfish	
Growing Areas	3
Growing Area Definitions	3
Process	4
Status of Commercial Shellfish Growing Areas	7
Emergency Closures.....	7
Threatened Shellfish Growing Areas	9
Shellfish Growing Area Restoration Program	14
Puget Sound Assessment and Monitoring Program	15
Licensing and Certification Program	16
Washington State Shellfish Industry	16
Tribal Shellfish Sanitation Program	17
<i>Vibrio parahaemolyticus</i> in Washington State.....	18
Vibrio Illnesses.....	19
Marine Biotoxin Monitoring Program	19
PSP.....	20
Sentinel Mussel Monitoring Program	21
Domoic Acid.....	21
Recreational Shellfish Program	23

List of Figures

Figure 1. Shoreline Surveys Completed in 2010.....	6
Figure 2. Reclassifications of Intertidal Shellfish Growing Areas in 2010	8
Figure 3. Emergency Shellfish Growing Area Closures in 2010	9
Figure 4. Threatened Shellfish Growing Areas Identified in 2010.....	10
Figure 5. Map: Threatened Shellfish Growing Areas for 2011 (Identified in 2010)	11
Figure 6. History of Shellfish Growing Area Reclassifications, 1981-2010	12-14
Figure 7. <i>Vibrio parahaemolyticus</i> Illnesses in 2010.....	19
Figure 8. Areas of Highest PSP Levels in 2010	21
Figure 9. Areas of Highest Domoic Acid Levels in 2010	22

INTRODUCTION

This report describes several of the main programs and services of the Washington State Department of Health's Office of Shellfish and Water Protection. It includes the office's work monitoring and classifying the state's prized shellfish harvest areas and related efforts to safeguard these areas for continued use by current and future generations.

The report fulfills elements of the *2000 Puget Sound Management Plan* and the *2007-2009 Puget Sound Conservation and Recovery Plan*. The Puget Sound Partnership's *2020 Action Agenda* charts a new course for protecting and restoring Puget Sound and shapes some of the essential services and programs described in this report.

A poster-size map of the state's shellfish growing areas accompanies this publication. The map includes information on commercial growing area classifications, major water bodies and cities, sewage treatment plants, and recreational shellfish beach classifications. Comments or suggestions are welcome for future editions. The map data is available in electronic GIS (shapefile) format.

Please contact Jan Jacobs at jan.jacobs@doh.wa.gov or (360) 236-3316 with any comments or requests for this publication. An electronic copy of this publication and the accompanying map can be found online at www.doh.wa.gov/ehp/sf/pubs.

DEFINITIONS AND PROCESS FOR CLASSIFYING COMMERCIAL SHELLFISH GROWING AREAS

Clams, mussels, oysters, and other bivalve shellfish are filter feeders. They can accumulate and concentrate disease-causing organisms that are harmful to humans. Because of this, it is important that the public be protected from consuming shellfish located near actual and potential sources of pollution.

We are responsible for evaluating commercial shellfish growing areas to determine if shellfish are safe to eat. Commercial shellfish growing areas in Washington State are classified as Approved, Conditionally Approved, Restricted, or Prohibited. These classifications have specific standards that are derived from the [National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish](#) (Chapter IV, 2007 Revision).

Growing Area Definitions

Approved

The Approved classification authorizes the harvesting of shellfish for direct marketing. We classify a growing area as Approved when pollution source evaluations and the bacteriological water quality data show that fecal material, pathogenic microorganisms, and poisonous or otherwise harmful substances are not present in dangerous concentrations.

The bacterial quality of marine water samples collected from an Approved growing area must satisfy both parts of the following standard:

- 1) The concentration of fecal coliform bacteria (the indicator organisms) cannot exceed a geometric mean of 14 per 100 milliliters (ml); and
- 2) The estimated 90th percentile cannot exceed 43 organisms per 100 ml in areas potentially impacted by nonpoint pollution. If sampling where point sources of pollution may impact the growing area, not more than 10 percent of the samples can exceed 43 organisms per 100 ml.

A minimum of 30 samples is used for these calculations. The Washington State Public Health Laboratory uses the A-1 modified, 5-tube/3-dilution method to estimate the most probable number of fecal coliform bacteria.

Even if the Approved bacterial criteria are met, we may classify a growing area as Conditionally Approved, Restricted, or Prohibited if pollution sources could impact the sanitary condition of shellfish in the area. Because fecal coliform bacteria are not always good indicators of the presence of disease-causing viruses and other pathogens, we

depend on thorough evaluations of pollution sources. We temporarily close Approved shellfish growing areas when events such as floods or biotoxin blooms occur.

Conditionally Approved

A growing area that meets Approved criteria only during predictable periods may be classified as Conditionally Approved. For example, in some growing areas the Approved criteria are met except for a period of several days following a particular amount of rainfall. In those cases, we manage the area by closing harvests for a specified time period following that quantity of rainfall.

Restricted

If the bacterial water quality of a commercial growing area does not meet the standard for an Approved classification, but the sanitary survey indicates only a limited degree of pollution, the area may be classified as Restricted. Shellfish harvested from Restricted growing areas cannot be marketed directly, but must be relayed (moved) to an Approved growing area where they will naturally purge themselves of contaminants. The cleansing period required is a few weeks to several months. Restricted classifications are only considered in areas where pollution levels are low and relay times are shown to purify the shellfish prior to marketing.

Prohibited

We must classify a growing area as Prohibited when information indicates that fecal material, pathogenic microorganisms, or otherwise harmful substances may be present in dangerous concentrations. Marine waters adjacent to sewage treatment plant outfalls, marinas, and other persistent or unpredictable pollution sources must be classified as Prohibited. Commercial harvests of shellfish are not allowed from Prohibited areas.

Under the National Shellfish Sanitation Program, we must classify a growing area as Prohibited if a sanitary survey has not been completed.

Process

The commercial growing area classification process is called a “sanitary survey” and consists of three parts: a shoreline survey, a marine water quality evaluation, and a meteorological and hydrographic evaluation. Each component is further defined later in this section.

The purpose of a sanitary survey is to ensure that an area complies with its classification, to modify the classification when needed, and to notify the responsible agencies when contamination sources are identified. Monitoring data and reports resulting from these studies are shared with tribes, local governments and state agencies. Annual reports are

available online at www.doh.wa.gov/ehp/sf/grow.htm. For more information, contact Bob Woolrich at bob.woolrich@doh.wa.gov or (360) 236-3329.

In addition to water quality monitoring and shoreline surveys, paralytic shellfish poisoning and domoic acid samples are collected in classified areas on a routine basis. (See Marine Biotxin Monitoring Program, page 19.)

Shoreline Survey

The shoreline survey component of the sanitary survey consists of the periodic evaluation of all point and nonpoint pollution sources. We identify and evaluate these by conducting field surveys in cooperation with local health departments, tribes, and the Department of Ecology. We evaluate on-site sewage systems, animal farms, drainage ways, and wildlife activity. When pollution problems are found, pollution control agencies are notified. We also evaluate the actual and potential impacts of point sources and establish closure zones around wastewater treatment plants and marinas.

During 2010, we completed shoreline surveys within thirteen classified commercial shellfish growing areas and five new areas requested for harvest. The surveys encompassed 99 marine shoreline miles, 770 shoreline parcels, and 717 drainage/discharge points. Figure 1 (page 6) lists the areas, shoreline miles, parcels, and drainage/discharge points evaluated. For more information regarding shoreline surveys, or to request a copy of a shoreline survey report, contact Scott Berbells at scott.berbells@doh.wa.gov or (360) 236-3324.

Marine Water Quality Evaluation

Marine water samples are collected to measure the concentration of fecal coliform bacteria in the growing waters. Fecal coliform bacteria can indicate the presence of pathogens that cause diseases and illnesses in humans. We conduct water quality sampling throughout the year in all active commercial shellfish growing areas. In 2010, we collected over 13,000 marine water quality samples from approximately 1,600 sampling stations. For more information regarding marine water quality sampling and station locations, contact Clyde Bill at clyde.bill@doh.wa.gov or (360) 236-3304.

Meteorological and Hydrographic Evaluation

We use meteorological information to help us determine if pollution is brought into growing areas with rain or increased river flows. Hydrographic information on tides and marine water circulation patterns are also used to determine where pollution travels and how much it is diluted. This information is obtained from studies performed by DOH and other agencies. For more information regarding meteorological and hydrographic factors, contact Scott Berbells at scott.berbells@doh.wa.gov or (360) 236-3324.

Figure 1. Shoreline Surveys Completed in 2010

<i>Area</i>	<i>Marine Shoreline Miles</i>	<i>Parcels Evaluated</i>	<i>Drainages / Discharges Evaluated</i>
Bainbridge Island South	2	42	34
Burley Lagoon	5	130	126
Cedar River	14	259	33
Dabob Bay	20	42	26
Dyes Inlet	6	86	112
Naselle River	23	16	146
North River	5	0	30
Oro Bay	6	43	4
Padilla Bay (March Point)	7	6	45
Port Blakely	5	53	89
Port Madison	1	0	36
Similk Bay	4	93	26
Swinomish	1	0	10

Closure Zone Determinations

We establish closure zones around sources of pollution to prevent harvest and consumption of contaminated shellfish. There are more than 90 sewage treatment plant outfalls discharging to the marine waters of the state, some near shellfish growing areas. Daily discharges from these treatment plants vary greatly, ranging from tens of thousands of gallons at small plants to over one hundred million gallons at the larger plants.

We conduct a technical evaluation for each sewage treatment plant and marina located near a commercial or recreational shellfish harvest area. A DOH engineer inspects these facilities. The engineer evaluates the dilution and dispersion of wastewater discharged from sewage treatment plants, and gathers information on water currents and characteristics near the site. We conduct our own studies to better understand the movement of marine waters in the area if such information is not available, working with the operators of these facilities in gathering the information. Dye injected into a treatment plant’s discharge and fixed-depth floats are used to study current speed and directional flow in nearby marine waters. Using computer models to assess the data that has been collected, we calculate the size of the closure zone for each facility using the protective assumption that an unplanned upset event or waste discharge may occur.

Sewage treatment plant operators are required to call DOH immediately if a bypass occurs, or if a problem occurs with the treatment system. In these circumstances we may close shellfish harvesting near a pollution discharge. Stakeholders such as local health departments, tribal and non-tribal shellfish harvesters, and the Washington State Department of Fish and Wildlife are notified of the pollution event and closure. Using this approach, the public is protected from consuming contaminated shellfish near potential pollution sources even during unusual conditions. For more information, contact Mark Toy at mark.toy@doh.wa.gov or (360) 236-3321.

STATUS OF COMMERCIAL SHELLFISH GROWING AREAS

At the end of 2010, there were 101 commercial shellfish growing areas in the state covering about 900 miles of shoreline. Many of the classified harvest areas had multiple classifications. For example, Henderson Inlet in Thurston County has different portions classified as Approved, Conditionally Approved, and Prohibited.

We managed the classification of 325,000 commercial shellfish harvesting acres. There were 250,000 acres with Approved classifications, nearly 7,000 acres with Conditionally Approved classifications, 400 acres with Restricted classifications, and over 60,000 acres with Prohibited classifications.

In 2010, we downgraded the classification of 35 acres in 1 commercial shellfish area. Over the same time, 3,096 acres in 10 growing areas were upgraded in classification due to improved pollution control. Approximately 1,600 acres in the Port Susan shellfish growing area were changed from Unclassified to Approved due to pollution control efforts and improved marine water quality. Figure 2 summarizes reclassifications done in 2010.

Over the past 29 years, we've downgraded the classification of about 51,000 acres and upgraded the classification of about 45,000 acres. Most of the downgrades took place between 1981 and 1995, when 45,000 acres were downgraded and 7,000 acres were upgraded. Since 1995, we have downgraded only 6,000 acres while upgrading 38,000 acres.

Emergency Closures

Emergency closures of shellfish growing areas are imposed to protect the health of shellfish consumers. Certain incidents can put pollutants into a growing area, and shellfish there may become unsafe to eat. When this happens we place an emergency closure in effect until the growing area's water quality returns to normal.

Emergency closures seldom last more than a few weeks. They can occur for a number of reasons, and often include more than one factor. Emergency closures can be caused by:

- heavy rainfall or flooding;
- spills or discharges of sewage (commonly caused by system failures, overloads, bypasses, or power outages);
- spills or discharges of oil, hazardous substances, and industrial or animal waste;
- elevated sampling results in either the area itself or nearby tributaries or drainages;
- other natural disasters; and
- illness outbreaks.

In 2010 we closed 21 commercial shellfish growing areas due to pollution problems caused by excessive rainfall. Figure 3 lists the areas affected and the reasons for closure. For more information contact Scott Berbells at scott.berbells@doh.wa.gov or (360) 236-3324.

Figure 2. Reclassifications of Intertidal Shellfish Growing Areas in 2010

Growing Area	County	Classification Change	Acres
<i><u>Upgrades</u></i>			
Drayton Harbor	Whatcom	Prohibited to Conditionally Approved	345
Harstine East	Mason	Prohibited to Approved	187
Henderson Inlet	Thurston	Conditionally Approved to Approved	240
Hood Canal 3	Jefferson	Restricted to Approved	70
Mystery Bay	Jefferson	Conditionally Approved to Approved	44
Naselle River	Pacific	Restricted to Approved	462
North Bay	Mason	Conditionally Approved to Approved	25
Pickering Passage	Mason	Prohibited to Approved	43
Port Susan	Snohomish	Unclassified to Approved	1,600
Similk Bay	Skagit	Prohibited to Approved	80
<i><u>Downgrades</u></i>			
Burley Lagoon	Pierce	Conditionally Approved to Restricted	35

Threatened Shellfish Growing Areas

Every year we review the classification of each commercial shellfish growing area and develop an annual report for each area. During this process, we identify the shellfish growing areas that marginally meet their classification. These areas are considered to be “threatened” with downgrades.

Figure 3. Emergency Shellfish Growing Area Closures in 2010

Growing Area	Date Closed	Days Closed	Reason
Annas Bay	8 closures	108	Flooding
Burley Lagoon	12/12/10	7	Excessive Rainfall
Dungeness Bay	12/12/10	8	Flooding
Dyes Inlet	12/12/10	7	Excessive Rainfall
Hammersley Inlet	10/10/10	7	Excessive Rainfall
	12/12/10	5	Excessive Rainfall
Henderson Inlet	12/12/10	5	Excessive Rainfall
Hood Canal 7	12/12/10	5	Excessive Rainfall
Hood Canal 8	12/12/10	7	Excessive Rainfall
Hood Canal 9	12/12/10	7	Excessive Rainfall
Jamestown	12/12/10	8	Flooding
Lummi Bay	12/13/10	3	Flooding
North Bay	12/12/10	7	Excessive Rainfall
Portage Bay	12/13/10	5	Flooding
Quilcene Bay	12/13/10	7	Flooding
Reach Island	12/12/10	7	Excessive Rainfall
Rocky Bay	12/12/10	7	Excessive Rainfall
Samish Bay	14 closures	63	River Rise / Flooding
Skookum Inlet	10/10/10	4	Excessive Rainfall
	12/12/10	5	Excessive Rainfall
South Skagit Bay	12/13/10	7	Flooding
Totten Inlet	10/10/10	4	Excessive Rainfall
	12/12/10	4	Excessive Rainfall
Vaughn Bay	12/12/10	7	Excessive Rainfall

The list of threatened areas and the annual reports are sent to shellfish growers, tribes, local governments, conservation districts, the Puget Sound Partnership, the Department of Ecology, and others. The objective is to alert stakeholders about the status of the growing area and to encourage efforts to prevent and control pollution.

Classification downgrades are bad news. Downgrades restrict or eliminate commercial and recreational harvesting of shellfish and indicate that pollution in the area is getting worse. They also require a response by county governments and state agencies. When an area is downgraded due to nonpoint pollution, state law requires local governments to form shellfish protection districts to address the problem.

Based on data collected through the end of 2010, we identified 9 areas as “threatened” and two growing areas (Samish Bay and Pacific Coast) that failed to meet the standard for Approved classification. Figure 4 lists those areas by county. The map in Figure 5 shows their locations. For more information on threatened shellfish growing areas, contact Lawrence Sullivan at lawrence.sullivan@doh.wa.gov or (360) 236-3320.

Figure 4. Threatened Shellfish Growing Areas Identified in 2010

County	Growing Area	Status
Grays Harbor	Pacific Coast	Threatened, Failing
Jefferson	Port Townsend	Threatened
Kitsap	Burley Lagoon*	Threatened
	Dyes Inlet	Threatened
Mason	Pickering Passage	Threatened
Pacific	Naselle River	Threatened
Pierce	Burley Lagoon*	Threatened
	Filucy Bay	Threatened
Skagit	Padilla Bay	Threatened
	Samish Bay	Failing
Snohomish	South Skagit Bay	Threatened

* Area located in more than one county

Figure 5. Threatened Shellfish Growing Areas for 2011 (Identified in 2010)

2011 Threatened Shellfish Growing Areas

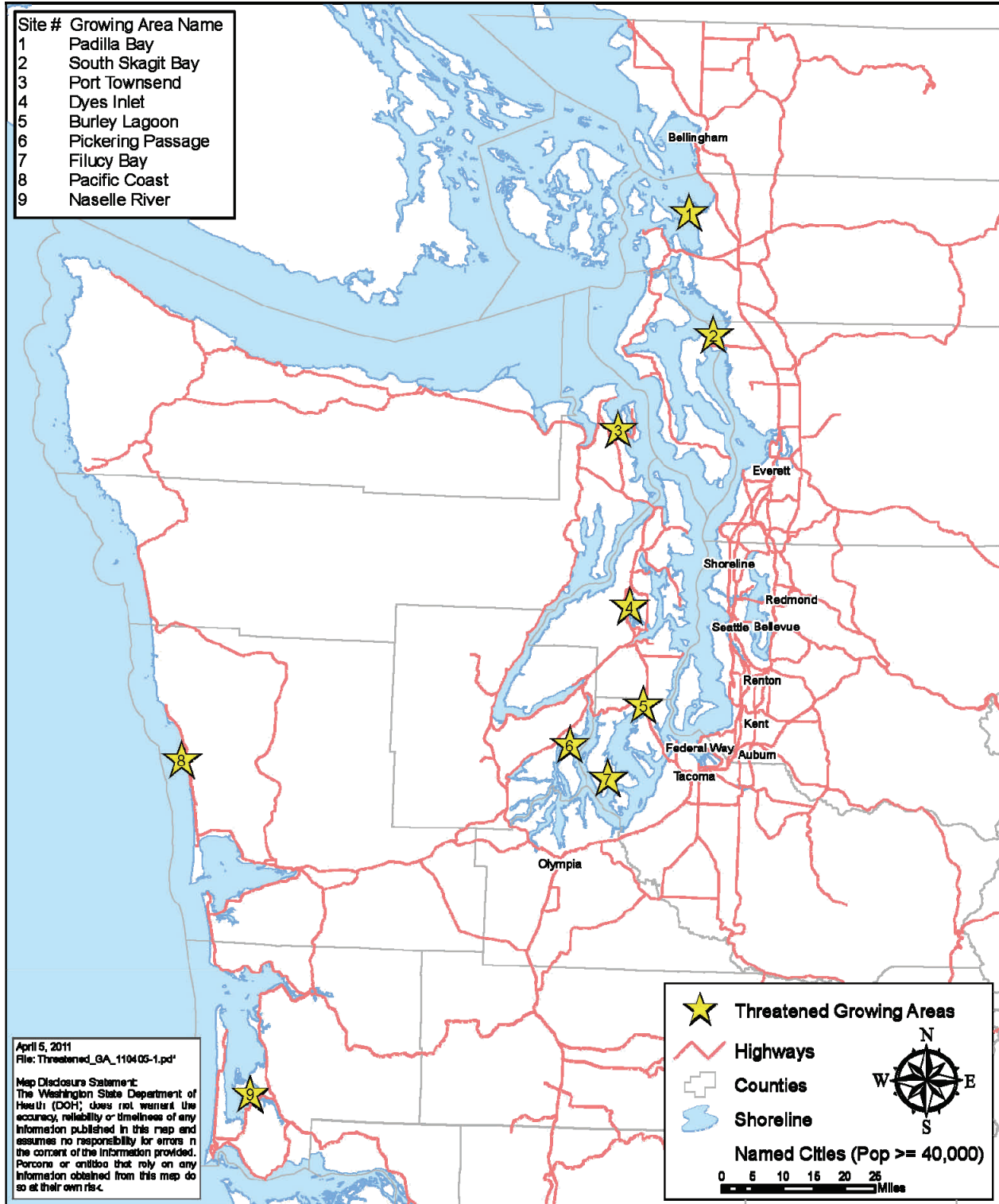


Figure 6. History of Shellfish Growing Area Reclassifications, 1981-2010

This table includes only classification changes resulting from improving or declining sanitary conditions.

Key: A = Approved C = Conditionally Approved P = Prohibited R = Restricted

Growing Area	Upgrades			Downgrades		
	Year	From - To	Acres	Year	From - To	Acres
Annas Bay	2009	P - A	300	2005	A - P	300
Bay Center	1992	P - C	1,030	1989	A - P	1,590
	1999	C - A	340			
	2000	C - A	690			
	2004	R - A	64			
Birch Bay				2008	A - P	146
Blake Island	2008	P - A	42			
Burley Lagoon	1993	R - C	210	1981	A - R	210
	2001	R - A	110	1999	C - R	230
	2005	R - C	99	2005	A - C	27
				2008	A - C	21
				2010	C - R	35
Discovery Bay	2008	R - A	50	2007	A - R	50
Drayton Harbor	2004	P - C	575	1988	A - P	620
				1995	A - R	30
				1995	A - P	1,010
				1999	A - P	920
	2010	P - C	345			
Dungeness Bay	2003	P - C	92	2000	A - P	300
				2001	A - P	100
				2003	A - C	1,062
				2003	A - P	227
Dyes Inlet (Chico Bay)	1993	P - R	150	2006	C - P	20
	2003	P - C	1,498			
	2003	P - R	16			
	2007	R - A	120			
	2008	P - A	20			
	2009	R - A	25			
East Passage	2007	P - A	160			
	2009	P - A	104			
Eld Inlet	1998	C - A	450	1983	A - C	690
Filucy Bay				2001	C - P	7
Grays Harbor	2002	P - A	109			
	2002	C - A	370			
	2006	C - A	2,560			
	2009	C - A	14,293			
Hammersley Inlet	2005	P - A	50			
	2008	P - A	30			
Harstine East	2010	P - A	187			
Henderson Bay (Minter Bay)				1982	A - P	60
	2007	R - A	40	2006	A - R	40

continued next page

Figure 6 (cont'd) . History of Shellfish Growing Area Reclassifications, 1981-2010

This table includes only classification changes resulting from improving or declining sanitary conditions.

Key: A = Approved C = Conditionally Approved P = Prohibited R = Restricted

Growing Area	Upgrades			Downgrades		
	Year	From - To	Acres	Year	From - To	Acres
Henderson Inlet				1984	A - C	180
				1985	C - P	120
				2000	C - P	8
				2001	A - C	300
				2005	C - P	49
	2010	C-A	240			
Holmes Harbor				2006	A - P	7
Hood #1				2009	A - P	1
Hood #3						
(Dosewallips)	1994	R - A	30	1987	A - R	180
(Dosewallips)	2010	R - A	70			
(Duckabush)	2001	R - A	630	1988	A - R	630
Hood #5						
(Lilliwaup Bay)	2007	P - A	22	1998	A - P	22
Hood #6						
(Alderbrook)	2006	P - A	70			
	2006	P - C	40			
Hood Canal #9						
(Lynch Cove)	1996	P - A	530	1987	A - P	630
	1998	P - A	394	1993	A - P	960
	2004	P - A	138			
	2006	P - A	55			
Liberty Bay	1994	R - A	70	1991	C - R	260
Mystery Bay				2009	A - C	44
	2010	C - A	44			
Naselle River				2008	A - R	462
	2010	R - A	462			
Nisqually Reach	2000	C - A	20	1992	A - C	1,000
	2002	R - A	60	2000	C - R	74
	2002	C - A	900	2006	A - P	120
	2006	R - A	37	2006	U - P	197
	2009	R - A	12			
North Bay	1991	P - C	450	1991	A - P	1,260
	1992	P - C	710	2009	A - C	25
	1992	P - R	100			
	2002	C - A	1,110			
	2005	C - A	50			
	2010	C - A	25			
North River	1998	P - A	901			
North Skagit Bay				1989	A - R	9,540
Oakland Bay	1989	R - C	1,380	1987	C - R	1,380
				2006	C - R	55
	2008	R - C	55			
Penn Cove	1995	P - C	450	1983	C - P	500

continued next page

Figure 6 (cont'd) . History of Shellfish Growing Area Reclassifications, 1981-2010

This table includes only classification changes resulting from improving or declining sanitary conditions.

Key: A = Approved C = Conditionally Approved P = Prohibited R = Restricted

Growing Area	Upgrades			Downgrades		
	Year	From - To	Acres	Year	From - To	Acres
Pickering Pass				2008	A - C	46
	2010	P - A	43			
Port Gamble	1999	P - A	20	1996	A - P	20
Portage Bay	2003	R - A	480	1997	A - R	240
	2006	R - A	115	1999	A - R	520
Port Orchard Pass	2005	P - A	50	2005	A - P	292
	2009	P - A	121			
Port Susan				1987	A - R	11,900
	2010	U - A	1,600			
Quilcene Bay				1984	A - P	200
Rocky Bay	2001	P - A	15	1995	A - P	30
Samish Bay	1998	R - A	485	1994	A - R	490
	1998	P - C	350	1994	A - P	2,220
	2002	C - A	350			
Sequim Bay	1998	C - A	2,800	1992	A - P	200
	2000	P - A	750	1992	A - C	2,830
	2008	R - A	24			
Similk Bay				2000	A - P	60
	2010	P - A	80			
South Skagit Bay	1993	R - C	2,280	1987	A - R	6,140
	2006	C - A	1,344			
Squaxin Island	1993	P - A	50			
Vaughn Bay	2008	P - A	104			
Yukon Harbor	2008	P - A	935			
Total Acreage since 1981			45,180	Total Acreage Since 1981		50,887

SHELLFISH GROWING AREA RESTORATION PROGRAM

The goal of the restoration program is to reopen commercial and recreational shellfish beds that have been closed or degraded by pollution. The program also works to prevent the contamination and closure of shellfish beds that are open to harvest but are threatened by pollution.

In 2010, we supported efforts or tracked water quality data in numerous areas, including:

- Dungeness Bay and Jamestown (Clallam County)
- Grays Harbor and Pacific Coast (Grays Harbor County)
- Holmes Harbor and South Skagit Bay (Island County)
- Hood Canal 3 and Mystery Bay (Jefferson County)
- Dyes Inlet (Kitsap County)
- Annas Bay, Hood Canal 9, Oakland Bay, and Pickering Pass (Mason County)
- Burley Lagoon, Filucy Bay, Henderson Bay, and Vaughn Bay (Pierce County)

- Naselle River (Pacific County)
- Samish Bay, Similk Bay, and South Skagit Bay (Skagit County)
- Henderson Inlet and Nisqually Reach (Thurston County)
- Birch Bay and Drayton Harbor (Whatcom County)

This work involves close partnerships with local governments, tribes, Department of Ecology, Department of Agriculture, Puget Sound Partnership, shellfish growers, and other organizations and individuals. Key activities include water quality monitoring, notifying affected parties when conditions deteriorate and classifications are threatened (“early warning system”), conducting circulation studies and other special studies to diagnose pollution problems and impacts, surveying shoreline and upland areas to identify pollution sources, and serving on watershed committees. Other key activities include helping to develop and implement shellfish protection districts and programs, closure response plans, watershed management plans, and other pollution control strategies.

This focused, collaborative work has achieved significant results and produced a net gain in harvestable acreage over the past 15 years. Figure 6 on the preceding pages shows classification changes resulting from improving or declining sanitary conditions from 1981 through 2010.

PUGET SOUND ASSESSMENT AND MONITORING PROGRAM

The Puget Sound Assessment and Monitoring Program (PSAMP) is a regional network of scientists from State and local agencies who track and assess specific conditions and indicators of Puget Sound’s health. These indicators include water quality, sediment quality, nearshore habitat, and key species of fish, marine mammals, seabirds, and other marine life in Puget Sound. The scientists use this information to assess the health of the ecosystem and changes in conditions over time (trends). Resource managers use PSAMP assessments to plan and guide activities to protect and restore the Sound’s prized habitats, species, and resources. PSAMP scientists contributed substantially to the *2009 State of the Sound* report (available at www.psp.wa.gov/documents.html).

DOH draws on data from our commercial growing area program to assess fecal pollution in Puget Sound for PSAMP. The assessments gauge the effects of fecal pollution, and analyze trends at different scales in the region. Findings were included in both *2009 State of the Sound* and *Status and Trends in Fecal Coliform Pollution in Shellfish Growing Areas of Puget Sound: Year 2008* (www.doh.wa.gov/ehp/sf/Pubs/fecalreport.pdf). The assessments are also used in our annual commercial growing area reports (www.doh.wa.gov/ehp/sf/growreports.htm). These reports help guide watershed groups, local and tribal governments, and others who work to protect and restore shellfish harvest.

The former Puget Sound Water Quality Authority created PSAMP in 1988. The new Puget Sound Partnership is developing a new, more comprehensive monitoring program for Puget

Sound. PSAMP's role in the new program has not yet been defined. Whatever the outcome, DOH will continue its mission to inform stakeholders about the status and trends in fecal pollution in Puget Sound. Contact Tim Determan at tim.determan@doh.wa.gov or (360) 236-3311 for more information.

LICENSING AND CERTIFICATION PROGRAM

The DOH Shellfish Licensing and Certification Program is a statewide program designed to protect public health by licensing and inspecting all commercial shellfish companies and certifying all harvest sites in Washington State. This program ensures that standards are met in the harvesting, handling, processing, packaging, buying, storage, and distribution of shellfish. The Department of Fish and Wildlife, through formal agreement with us, patrols shellfish growing areas to prevent illegal harvest.

Each company that harvests shellfish receives a Harvest Site Certificate that lists all the locations from which the company can harvest. Each site is approved by us and must undergo a water quality assessment to become certified. Specific identifiers are assigned to each site; these identifiers must be placed on harvest tags and transaction records. This makes it possible to track and recall shellfish if a growing area or harvest site is closed due to a pollution or biotoxin event, or if shellfish are implicated in an illness.

Washington State is among the top shellfish producing states in the nation, and is recognized as having one of the nation's safest supplies of shellfish. This distinction can be attributed to the collaborative efforts of DOH, the Washington tribes, and the shellfish industry.

Washington State Shellfish Industry

Washington's shellfish industry currently includes 348 licensed, certified shellfish operations. Of these, 23 firms are certified as shucker-packers (shellfish processing firms), 241 are shellstock shippers, and 84 are harvesters (these categories are further defined on the following page). Licenses are effective October 1 through September 30 for shellstock shipper and shucker-packer operations, and April 1 through March 31 for harvester operations. We performed 673 routine inspections of licensed shellfish operations during the 2009-2010 license year.

Shucker-Packers

Shucker-packer firms either harvest or purchase shellstock, then process it in their plants by shucking, washing, and packing the meat for sale to retail markets. These processing plants are inspected for shellfish sanitation compliance a minimum of four times a year.

Shellstock Shippers

Shellstock shipper firms either harvest, purchase, or reship shellstock for sale to retail markets or to other shellfish dealers. These firms are not permitted to shuck shellfish. Shellstock-shipper firms are inspected a minimum of two times per year; once per year for those that qualify for the Performance-based Inspection Program (PIP). To qualify for PIP, a licensed

shellstock shipper must meet specific criteria *and* have an excellent inspection record for three consecutive years.

Harvesters

Harvester firms are limited to harvesting shellstock and selling it within the state of Washington to licensed shellstock shipper or shucker-packer firms. They cannot purchase shellstock, and they cannot sell it at the retail level. Harvesters cannot shuck or store shellstock. Harvester operations are inspected once per license year.

For more information on the licensing program, contact Rick Porso at rick.porso@doh.wa.gov or (360) 236-3302.

TRIBAL SHELLFISH SANITATION PROGRAM

Washington State treaty tribes and DOH participate in cooperative efforts to protect public health on issues surrounding shellfish sanitation. Regularly scheduled tribal technical meetings are held to share information. Tribal representatives actively participate in the National Interstate Shellfish Sanitation Conference (ISSC) and the Pacific Rim Shellfish Sanitation Conference, and provide valuable input on issues relating to the sanitary control of molluscan shellfish. Joint protocols on all shellfish related issues are developed between DOH and the tribes.

Tribes routinely work with the Shellfish Program to monitor shellfish growing areas and share water quality and pollution source information. In 2010 we opened one new tribal requested growing area, 1800 acres in Port Susan. Five additional geoduck tracts were classified as Approved in Port Blakely & Port Madison. Six additional geoduck tracts and three Unclassified portions of growing areas were requested to be classified in 2010.

In 2010 we issued 47 tribal shellfish licenses, which included 14 tribes and 33 individual companies owned by tribal members. Tribes licensed as “harvesters” were the Lower Elwha Klallam Tribe, Muckleshoot Tribe, Nisqually Tribe, Port Gamble S’Klallam Tribe, Puyallup Tribe, Skokomish Tribe, Squaxin Island Tribe, and The Tulalip Tribe. Those licensed as interstate “shellstock shippers” were the Jamestown S’Klallam Tribe, Lummi Indian Nation, Suquamish Tribe, Upper Skagit Indian Tribe, and Swinomish Indian Tribal Community. Those licensed as interstate “shucker packers” were the Quinault Indian Nation and the Squaxin Island Tribe.

Tribal involvement increases public protection through compliance with national and state shellfish sanitation requirements. Tribes work with us through contracts for biotoxin laboratory sampling, supplying shellfish collected throughout Puget Sound and several north Pacific Coast beaches for testing for paralytic shellfish poison (PSP) and domoic acid. The test results are shared with all shellfish harvesters, both tribal and non-tribal. With respect to their treaty harvest rights, we provide information to the tribes about commercial harvest site applications and approvals.

Tribes also assist with water quality monitoring for growing area classification efforts. Tribal monitors and patrol officers work with us to enforce rules and ensure that harvesting occurs only in open, approved areas. These cooperative efforts benefit commercial, subsistence, and recreational shellfish harvesters.

For more information, contact Cathy Barker at cathy.barker@doh.wa.gov or (360) 236-3303.

***VIBRIO PARAHAEMOLYTICUS* IN WASHINGTON STATE**

Vibrio parahaemolyticus (*Vp*) is a naturally occurring marine water bacteria that can cause illness through the consumption of raw or undercooked molluscan shellfish, typically during the warmer months of the year. These illnesses are of moderate severity, generally lasting 1-7 days, and are characterized by watery diarrhea and abdominal cramps.

Little is known about the environmental factors that contribute to the growth and virulence of *Vp* bacteria in marine waters. However, proper temperature control during harvest, shipping, and storage minimizes growth of *Vp* within the shellfish.

A serious *Vp* outbreak in Washington occurred in 2006, proving that a major change in existing control measures was needed. With extensive input from the shellfish industry and the approval of the State Board of Health, we implemented an emergency rule for *Vp* control for the months of June through September of 2007. In 2008 the emergency rule was made permanent and included enhanced temperature control measures, additional recordkeeping requirements, and mandatory training for companies harvesting oysters intended for raw consumption.

Vibrio Illnesses

In 2010 all of the Washington cases were sporadic cases. The recreational share of cases increased slightly in 2010, for a total of seven cases; there were also four reported cases of *Vp* resulting from exposure to other species. There were no voluntary recalls associated with *Vp* in 2010. In total, 29 Washington commercial shellfish growing areas were associated with *Vibrio parahaemolyticus* illnesses in 2010, with the majority, as it was last year, originating from Hood Canal. Figure 7 lists the vibrio illnesses in 2010.

Girontia (formerly *Vibrio*) *hollisae*, a new genus in the *Vibrionaceae* family, may be an emerging pathogen associated with molluscan bivalve shellfish. In 2010 there were six illness cases caused by *hollisa*; four of which were laboratory confirmed.

For more information contact Richard Lillie at richard.lillie@doh.wa.gov or (360) 236-3313.

MARINE BIOTOXIN MONITORING PROGRAM

Filter-feeding shellfish rely on microscopic planktonic algae as a food source. Some algal species produce toxins that can accumulate in shellfish. Humans and other warm-blooded

Figure 7. *Vibrio parahaemolyticus* illnesses in 2010

Origin	Number of Persons Ill	Percent of Total
Washington Residents	40	49%
Washington Visitors	4	5%
Other States*	38	46%

* AK, AZ, CA, ID, ND, NY, OR

animals can become ill if they consume shellfish that contain sufficiently high amounts of these “biotoxins”.

We regularly monitor biotoxin levels in both recreational and commercial shellfish areas in Washington’s Puget Sound and coastal areas. When high levels are detected, we close harvest areas in order to protect shellfish consumers from biotoxin-related illness. An all-species closure is placed from April through October each year on the coastal ocean beaches. The vast area involved and remoteness of some beaches do not allow for adequate biotoxin testing during the busy summer months, so the regulatory closure is placed as a public health protective measure. A recreational razor clam season may be held each spring and fall on designated ocean beaches, depending on biotoxin levels and availability of resource.

PSP

Washington routinely experiences seasonal restrictions on commercial and recreational shellfish harvest due to paralytic shellfish poisoning (PSP), more commonly known as "red tide." The biotoxin that causes PSP temporarily interferes with the transmission of nerve impulses in warm-blooded animals. The primary symptoms of PSP in humans are numbness and tingling of the lips, tongue, face, and extremities; difficulty talking, breathing, and swallowing; and loss of muscle coordination. In severe cases victims stop breathing because the chest muscles become paralyzed. Symptoms develop quickly, usually within 1-2 hours of consumption (very high levels of toxin can produce symptoms within 30 minutes), and typically disappear within 12-24 hours. There is no known antidote for the toxin, and the toxin is not destroyed by cooking. Treatment is basically supportive, e.g., artificial respiration, in life threatening cases.

PSP toxin is produced by several microscopic organisms that naturally exist in marine water. The species that causes PSP in Washington marine waters is *Alexandrium catenella*. *Alexandrium* is usually present in small numbers; however, when environmental conditions are favorable, rapid reproduction can occur, and shellfish can accumulate the toxin to dangerous levels during these bloom events.

We regularly monitor PSP toxin levels in shellfish. Commercial operations submit PSP samples as a condition for commercial certification. Recreational beaches are sampled as a

cooperative effort between DOH, other state agencies, tribes, health departments, private organizations, and citizen volunteers. Areas are closed for shellfish harvest when PSP toxin levels equal or exceed the Food and Drug Administration standard of 80 micrograms (μg) of toxin per 100 grams of shellfish tissue. Areas are not reopened until testing has confirmed that the PSP toxin has declined to a safe level. Butter clams and varnish clams may experience extended closures because they typically retain PSP toxin longer than other shellfish.

We provide recreational beach closure information through a toll free 24-hour Biotoxin Hotline, 1-800-562-5632, and web mapping site at www.doh.wa.gov/shellfishsafety.htm. Local health jurisdictions also issue notices through local newspapers and radio. Beach posting is irregular depending on jurisdiction, beach ownership, and susceptibility to vandalism and theft, and is not a reliable method of notification.

2010 PSP Summary

The Washington State Public Health Laboratory analyzed 3,135 PSP samples in 2010. PSP levels in 2010 were very high. Twenty six locations had PSP test results of over 1,000 micrograms; twenty four of these set new records. Despite the high toxin levels, there were no reported PSP illnesses in 2010. The record PSP blooms occurred on the outside coast, in the Strait of Juan de Fuca, and in North Puget Sound. There was an unusual bloom in South Puget Sound; although test results were not real high, the bloom caused a number of closures and was troublesome for the commercial shellfish industry.

There were eleven commercial shellfish growing area closures in 2010 and 20 commercial geoduck tract closures. There were two commercial recalls due to PSP. Figure 8 lists the highest PSP levels in 2010.

Sentinel Mussel Monitoring Program

The Sentinel Mussel Monitoring Program is an early warning system for marine biotoxins. Mussels generally register PSP levels sooner than other types of shellfish, so they are used as “sentinels” to determine if PSP is on the rise in a given area. Mussels are placed in cages and set in strategic growing areas throughout Puget Sound. Mussel samples are then collected either biweekly or monthly and tested for levels of PSP. Rising PSP levels in these mussels trigger more specific and frequent sampling regimens in other shellfish species in the affected area.

With assistance from local health jurisdictions, tribes, Puget Sound Restoration Fund, and volunteers, we maintained and monitored 70 collection sites in 2010. In addition to the sentinel mussel locations, commercial mussels were routinely monitored at Westcott Bay in San Juan Island and at Penn Cove in Whidbey Island.

Domoic Acid

Domoic acid is a naturally occurring toxin produced by a species of microscopic marine diatoms of the genus *Pseudonitzschia*. The human illness known as amnesic shellfish poisoning (ASP) or domoic acid poisoning (DAP) is caused by eating fish, shellfish or crab

Figure 8. Areas of Highest PSP Levels in 2010

Date	Harvest Area	Species	* Toxin Level
07/13/2010	Fidalgo Bay, Crandell Spit (March Point)	Blue Mussel	10,932
07/13/2010	San Juan Channel, Friday Harbor	Blue Mussel	8,283
07/06/2010	Birch Bay, Birch Bay Village	Blue Mussel	7,565
07/13/2010	South Lopez, Barlow Bay	Blue Mussel	7,248
07/13/2010	Rosario Strait, Odlin Park	Blue Mussel	7,182
06/29/2010	Drayton Harbor, Semiahmoo Marina	Blue Mussel	6,990

* Micrograms per 100 grams of shellfish meat tissue

containing the toxin. Symptoms include vomiting, nausea, diarrhea, and abdominal cramps and usually occur within 24 hours of ingestion. In more severe cases, neurological symptoms develop within 48 hours and include headache, dizziness, confusion, disorientation, loss of short-term memory, motor weakness, seizures, profuse respiratory secretions, cardiac arrhythmias, coma and possibly death. There is no antidote for domoic acid poisoning. The toxin is not destroyed by cooking.

ASP was first characterized in 1987 on the Atlantic coast of Canada. Domoic acid was first detected on the Pacific coast in California in the summer of 1991 when a number of pelican and cormorant deaths were linked to domoic acid in anchovies. In the fall of 1991, domoic acid was detected in razor clams off the coast of Washington and caused several mild cases of ASP. This prompted us to begin monitoring all major shellfish growing areas for domoic acid. Until 2003, unsafe levels of domoic acid had only been detected in coastal razor clams, mussels, and Dungeness crab. The first unsafe domoic acid levels detected in Puget Sound was in September 2003; unsafe levels were again detected in 2005.

Research shows that razor clams accumulate domoic acid in the edible tissue (foot, siphon, and mantle) and are slow to rid themselves of the toxin. In Dungeness crab, domoic acid primarily accumulates in the viscera. The level of domoic acid determined to be unsafe for human consumption is 20 parts per million (ppm) in molluscan shellfish and 30 ppm for Dungeness crab viscera. Dungeness crab harvest areas are closed when three out of six individual crab viscera equals or exceeds 30 ppm.

2010 Domoic Acid Summary

Approximately 6 crab and 1,339 molluscan shellfish samples were tested for domoic acid in 2010 (the lack of toxin in the crab samples prompted us to halt further testing of Dungeness crab for the winter season). There were no shellfish closures due to high levels of domoic acid in 2010, nor any reported ASP illnesses. All scheduled recreational razor clam openings occurred as planned. The highest domoic acid levels for the year are listed in Figure 9.

For more information, contact Frank Cox at frank.cox@doh.wa.gov, (360) 236-3309 or Jerry Borchert at jerry.borchert@doh.wa.gov, (360) 236-3328.

Figure 9. Areas of Highest Domoic Acid Levels in 2010

Date	Harvest Area	Species	* Toxin Level
07/11/2010	Penn Cove	Blue Mussel	5
01/29/2010	Mocrocks	Razor Clam	4
02/04/2010	Quinault Reservation	Razor Clam	3
01/29/2010	Copalis	Razor Clam	3

* parts per million per 1 gram of shellfish meat tissue

RECREATIONAL SHELLFISH PROGRAM

The goal of the recreational shellfish program is to provide clear information to the public on safe harvest practices and to protect and restore water quality in recreational shellfish harvest areas. Recreational shellfish harvesting is a popular activity for Washington residents and visitors. In 2010, about 348,000 recreational fishing/shellfishing licenses were purchased in Washington State.

Local health jurisdictions (LHJs) play an important partnership role in the recreational shellfish program. We distribute funds to LHJs through contracts to help support their activities. DOH, LHJs, and other partner organizations provide information to recreational harvesters through beach walks and educational events, brochures, web-accessible harvest maps, biotoxin hotlines, news releases, and beach signs. These approaches are designed to reach harvesters throughout the region, and are also tailored to reach high-risk audiences based on harvest practices, language barriers, pollution threats, and other factors.

For more information, contact Greg Combs at greg.combs@doh.wa.gov or (360) 236-3308.

