

**NMAI: WA Shellfish Production and Restoration –  
Environmental, Economic and Social Benefits and Costs  
Task 8b - Drayton Harbor Community Oyster Farm  
Community and Ecosystem Benefits**

**Prepared for the  
Pacific Shellfish Institute**

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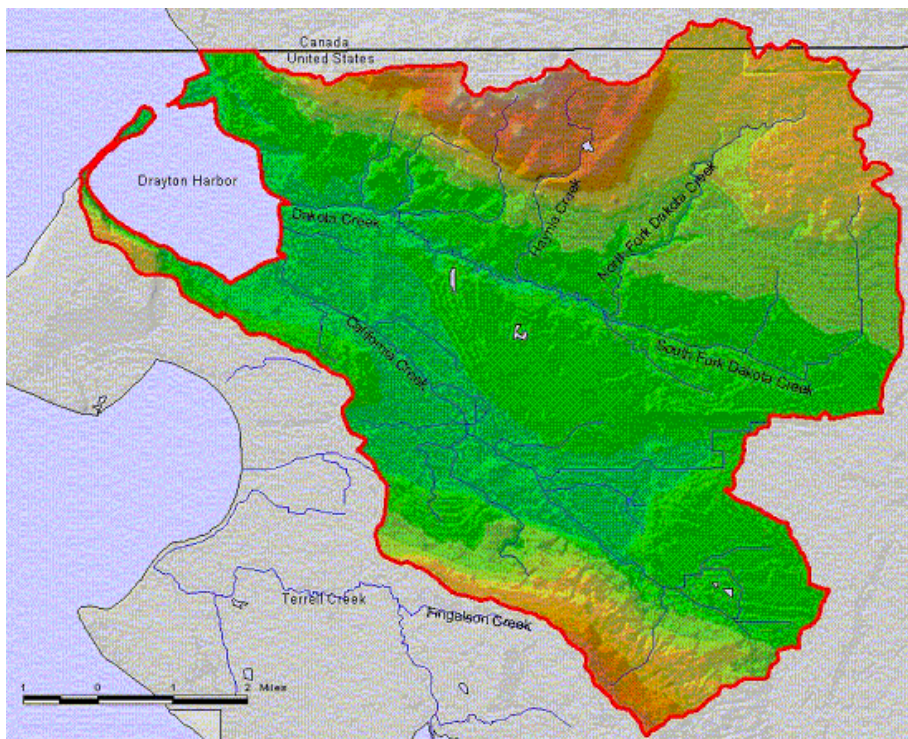
## Table of Contents

Objective .....	3
Content .....	3
Background .....	4
Benefits of the Drayton Harbor Community Oyster Farm .....	15
Identifying the Types of Benefits of the Drayton Harbor Community Oyster Farm....	15
Categorizing the Benefits of the Drayton Harbor Community Oyster Farm.....	16
Quantifying and Qualifying Benefits.....	18
Methodologies for Valuing Benefits.....	18
Methodologies for Quantifying Benefits .....	18
Qualifying Benefits .....	20
Applying the Valuation Framework to the Drayton Harbor Community Oyster Farm .....	22
Possible Futures for the Drayton Harbor Community Oyster Farm .....	24
Recommendations for Future Work.....	24
References.....	26
Appendix A Detail Description of Twenty Years of Drayton Harbor Restoration Efforts .....	30
Appendix A Detail Description of Twenty Years of Drayton Harbor Restoration Efforts .....	33
Appendix A Detail Description of Twenty Years of Drayton Harbor Restoration Efforts .....	32

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## Objective

The third case study selected for the NMAI report on Washington Shellfish Production and Restoration focuses on the Drayton Harbor Community Oyster Farm (DHCOF). The purpose of this task is to memorialize the benefits of developing and operating the Drayton Harbor Community Oyster Farm to both the ecosystem and the community of Drayton Harbor and surrounding Whatcom County Washington (see **Figure 1**). The study develops and presents a methodology to identify, describe and categorize the many types of benefits available from the DHCOF. Two of these types of benefits are quantified, including some of the water quality improvements and the oyster harvest benefits. The social capital benefits are qualified.



**Figure 1. Drayton Harbor Watershed, Whatcom County Washington.**

Source: Whatcom County, undated Fact Sheet on Drayton Harbor.

## Content

This report is organized as follows. The section entitled Background summarizes the aquaculture and restoration activities that have occurred in Drayton Harbor over the last 19 years (see **Appendix A** for a detailed history). Following the Background section is a discussion about the Benefits provided by the DHCOF. The Benefits section begins with a list of various types of benefits provided by the DHCOF and related restoration efforts, describes the methodology used to qualify and/or quantify two of the specific types of benefits and concludes with the estimate of benefits to Drayton Harbor and surrounding Whatcom County. Following the benefits is an update about possible futures for the DHCOF. The last section is the Recommendations for Future Work.

## Background

Drayton Harbor possesses ideal conditions for growing shellfish (Whatcom County, not-dated). The first commercial oyster farm began operations over a hundred years ago. From 1980 to 1992 a Canadian firm, Neptune Aqua Farms, was farming 100 acres of tidelands. Records of revenue and jobs supported by that operation are not available, however, it is estimated that one acre of Pacific oysters produces between \$10,000 and \$20,000 of gross revenue (personal communication with Geoff Menzies). Using that estimate, a 100-acre farm would gross between **one million dollars and two million dollars annually**. In addition to the commercial Pacific oyster operation, **the Lummi Nation annually harvested over 30,000 pounds of clams** from Drayton Harbor in the early 1990s (Whatcom County). The commercial value of this tribal harvest is estimated to be approximately \$50,000 (in 2006 dollars) using data from Washington State Fish and Wildlife’s Economic Analysis of the Non-Treaty Commercial and Recreational Fisheries in Washington State (WDFW, 2008). Besides shellfish, the harbor also provides habitat for salmon populations including Coho, chum, fall Chinook, steelhead, and cutthroat trout (Whatcom County).

The abundant natural resources of Drayton Harbor and its watershed provide livelihoods to many area residents. The watershed comprises 36,278 acres of which 48 percent of the land is devoted to agricultural uses and 37 percent is in upland forest (Whatcom County). Drayton Harbor is home to 10,600 people and 10 percent of the jobs in the largest community, Blaine, are in farming, fishing, forestry or extraction, construction and maintenance occupations (Bellingham Whatcom Economic Development Council). The Drayton Harbor watershed is also rural – with only 10.9 percent of the land developed – and of that development less than 3.9 percent is commercial or industrial.

Despite the relatively undeveloped nature of the Drayton Harbor watershed the health of the Harbor has been the focus of restoration efforts for nearly 20 years (see the timeline in **Appendix B**). In 1988 a countywide process ranked the Drayton Harbor watershed as the top priority for non-point pollution control. A study completed in 1991 by a team of state agencies found the following bacteria sources were significant threats to water quality:

- Livestock waste from noncommercial agriculture.
- On-site sewage systems (septic systems).
- Boats and marinas.
- Blaine sanitary sewer system.

By 1995 **the majority of the Harbor was classified as Prohibited to shellfish harvesting** (see **Figure 2**).<sup>1</sup> As a result, the last commercial oyster farm in Drayton Harbor closed.

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<sup>1</sup> One area in the Harbor was classified as Restricted, allowing a local commercial shellfish grower access to its oysters which were relayed to Approved waters prior to harvest.



**1988 – Map 1**

Prime shellfish growing areas in Drayton Harbor were **Approved** for direct harvest after the City of Blaine built its first secondary sewage treatment plant.

Harbor entrance was **Prohibited** due to potential threats from two marinas and proximity to the underwater sewer line.

500 acres in the south portion of the harbor were downgraded to **Prohibited** due to failing septic systems and livestock waste.



**1995 – Map 2**

Two thirds of the harbor was **Prohibited** because water quality failed to meet the fecal coliform standard for **Approved** areas.

Known or potential pollution sources included failing septic systems, livestock waste, two marinas, sewage bypasses from Blaine’s collection system, potential leaks from the underwater sewage force main and the Blaine sewage treatment plant outfall in Semiahmoo Bay.

Commercial oysters in the **Restricted** area had to be relayed to the **Approved** area for cleansing before harvest and final sale. This downgrade forced Drayton Harbor Oyster, Inc. out of business.



**1999 – Map 3**

All of Drayton Harbor was downgraded to **Prohibited** because water quality failed to meet the fecal coliform standard for **Approved** areas.

Known or potential pollution sources included failing septic systems, livestock waste, two marinas, sewage from Blaine’s sewage collection system, stormwater runoff from Blaine, marine mammals, and Marine Drive seafood processor wastewater discharges.

Degraded water quality associated with the flood tide cycle with impairment being unpredictable under a variety of environmental or seasonal conditions.



**2004 – Map 4**

A portion of the prime shellfish growing area in Drayton Harbor is upgraded to **Conditionally Approved** depending on rainfall. (A half-inch rain in a 24-hour period suspends harvest for 5 days due to bacterial runoff.)

During the prime harvest months (October through April) of the 2004 –2005 season, rainfall stops harvest by the Community Oyster Farm on 26 occasions – a total of almost 4 months when shellfish are unsafe to eat.

This upgrade is an improvement but will not support a commercial shellfish venture or routine recreational or tribal shellfish harvesting.

Most of the harbor remains **Prohibited**.

**The future** – In 2006 the rainfall amount that triggered temporary closure was increased from 0.5” in 24 hours to 0.75” in 24 hours. Based upon recent reviews of water quality data it is likely that the criteria for rain-induced closures in the Conditionally Approved area will be downgraded to 0.5” in a 24-hour period by December 2009.

**Figure 2 History of Shellfish Harvest Classification in Drayton Harbor**

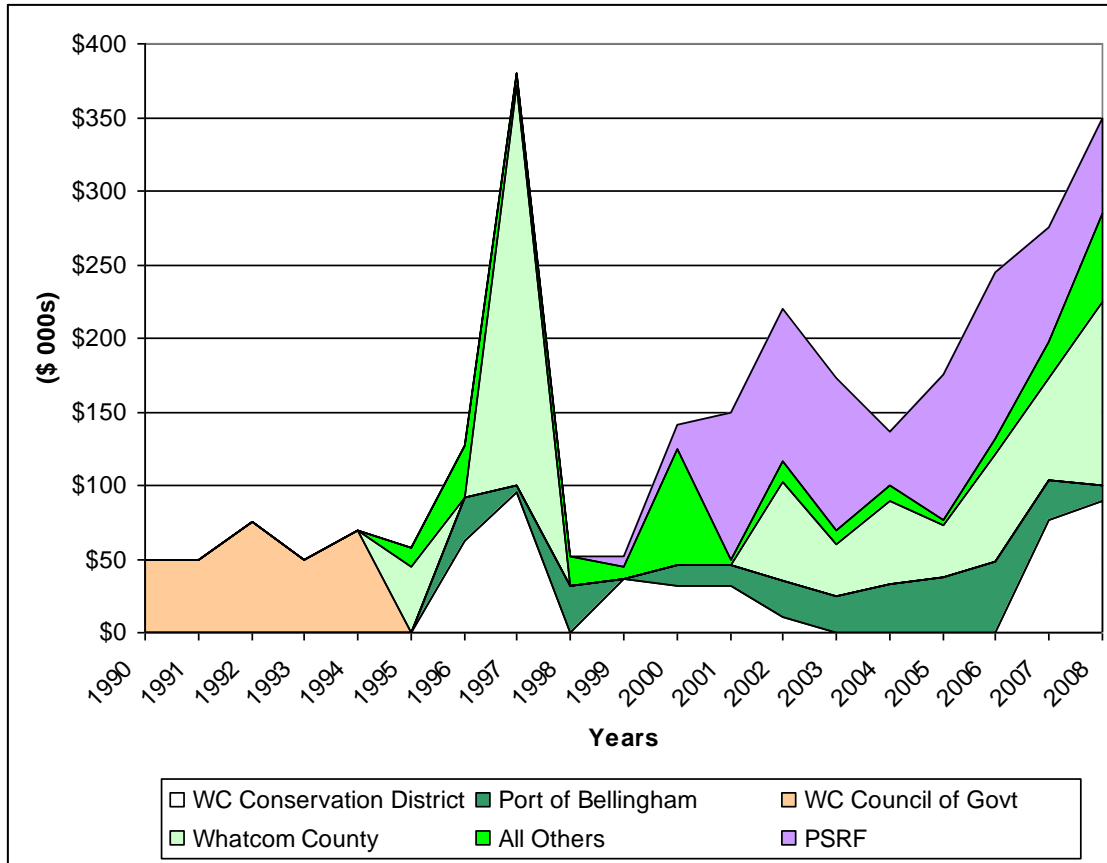
Demonstrating the value of Drayton Harbor and its shellfish resource to local residents and the state are the contributions of time and money from nearly 30 various entities during the past 19 years. These entities (see call-outbox) have included local businesses and governments, state and federal agencies, foundations and local citizens collaborating to improve water quality and reopening a commercially viable shellfish farm in Drayton Harbor. In 19 years these entities have spent over \$2.8 million in time and dollars to restore Drayton Harbor (personal communication with Geoff Menzies). Over 38,000 volunteer hours were spent between 1998 and 2008 – the equivalent of one full-time person per year.

The Puget Sound Restoration Fund (PSRF) has been spearheading the restoration effort in Drayton Harbor. **In 2001, PSRF launched the Drayton Harbor Community Oyster Farm (DHCOF),** fostering the community’s resolve to reopen shellfish beds. At that time, PSRF had a three-year plan to reestablish recreational, tribal, and commercial shellfish harvest in Drayton Harbor. The plan included three years of financial support for commercial oyster operations, after which time it was assumed that harvest levels would be high enough to support the operation. Conditional harvest was achieved in 2004 and for almost a decade, the effort has continued to address the ongoing sources of bacterial contamination that threaten shellfish harvest in Drayton Harbor.

The total investment from the multiple entities, both money and volunteer time, directly targeted at restoring water quality and shellfish in Drayton Harbor is shown in **Figure 3**. The majority of the investment has been managed by five entities: 1) Whatcom County Conservation District; 2) Whatcom County (including the Departments of Public Works and Public Development Services and Health); 3) Whatcom County Council of Governments; 4) the Port of Bellingham; and 5) PSRF.

**Entities Funding, Volunteering and/or Implementing Restoration Projects in Drayton Harbor**

- Blaine Seafood Processors
- British Petroleum
- City of Blaine
- Drayton Harbor Shellfish Protection District Advisory Committee
- Environmental Canada
- Horizons Foundation
- Northwest Indian College
- Ocean Trust
- Port of Bellingham
- Puget Sound Action Team
- Puget Sound Restoration Fund
- Puget Sound Water Quality Authority
- ReSources
- Rock Point Oysters
- The Russell Family Foundation
- Semiamoo Ladies Club
- Semiamoo Marina
- Star Fish
- Trillium
- U.S. Environmental Protection Agency
- Washington State Department of Health
- Washington State Department of Ecology
- Washington State Centennial Clean Water Fund
- Whatcom County
- Whatcom County Council of Governments
- Whatcom County Conservation District
- Whatcom Community Foundation
- Whatcom County Marine Resources Committee



Source: Personal Conversation with Geoff Menzies

**Figure 3. Investment in Drayton Harbor Water Quality and Shellfish Restoration by Implementing Entity.**

A summary of some of the restoration projects managed by these five entities follows.

- From 1990 to 1995 the **Whatcom County Council of Governments (COG)** managed a \$210,000 grant provided by the Washington State Centennial Clean Water Fund (CCWF) to develop a Drayton Harbor Watershed Management Plan. This planning process represented the initial community voluntary process to protect water quality in Drayton Harbor. The volunteers’ in-kind contribution of time (2,400 hours) was valued at \$40,000 and considered as a match to the \$210,000 CCWF grant. The grant funds were used to support staff from the Puget Sound Cooperative River Basin Team, which included representatives from the USDA Soil Conservation Service, USDA Forest Service, Washington State Department of Fisheries, Ecology, and USEPA. Their 1991 report provided the scientific basis for the watershed management committee to develop its Watershed Action Plan, which was approved by the Washington Department of Ecology (DoE) in 1995. This Plan continues to be useful to support ongoing shellfish recertification efforts in Drayton Harbor.
- The **Whatcom Conservation District (WCD)** with grant funds from multiple sources, including the CCWF, developed outreach and education programs for

small farms in the watershed. Additionally the WCD undertook a water quality monitoring study conducted by Western Washington University (WWU) in 1997 and a surface water testing program conducted by the Northwest Indian College (NWIC). The 1997 study concluded that fecal coliform bacteria exceeded freshwater standards at most of the sites that were studied. WCD programs have been effective strategies to reduce livestock pollution on small farms where landowners seek their advice by attending workshops and contacting them directly. Through these grant programs, Farm Resource Management Plans were developed for 15 small farms and informational materials on Best Management Practices were distributed to over 100 small farms in the watershed (2000, DHSPDAC). Seven of the 19 commercial dairies in the watershed were sent warning letters from the EPA for water quality violations (specifically fecal coliform pollution). The WCD estimated that 50 percent to 75 percent of commercial dairy farms had adequate manure storage by the late 1990s and that cattle at commercial dairies have limited access to streams in comparison to large animals on many hobby farms. Also at that time, six of the 19 commercial dairies had updated their Farm Resource Management Plans, which incorporate Best Management Practices (1999 Sanitary Survey of Drayton Harbor).

- The Drayton Harbor Shellfish Protection District (DHSPD) was formed by **Whatcom County** as a result of the 1995 downgrade of the Harbor. A DHSPD Advisory Committee (DHSPDAC) was formed from local volunteers to direct the activities of the DHSPD. The DHSPDAC still meets on a regular basis. Beginning in 1996, at the request of the DHSPDAC, Whatcom County pursued and received funding from the “Special On-Site Shellfish Grant Program” administered through DOE. This one-time program funded the inspection and repair of OSSs in areas where they caused contamination to commercial shellfish growing areas. By 1998, Whatcom County completed a survey of 252 OSS along the shoreline of Drayton Harbor. The failure rate was 20 percent (Halasz, 2000). By 1999, 53 of 54 identified failing systems had been repaired. By 2002 Whatcom County began funding a half-time staff person for the DHSPDAC. The County has continued to undertake water quality monitoring and studies as well as contributing to the restoration projects undertaken by the PSRF (see below).
- Throughout the years the **Port of Bellingham** has invested in both water quality monitoring as well as capital projects to reduce the potential impacts of boater waste and storm water to water quality in the Harbor.
- Beginning with initial planning efforts in 1999 and 2000, funded by Trillium, **PSRF conceived of the Drayton Harbor Community Oyster Farm (DHCOF) as a way of spurring broader community involvement and more directed pollution control efforts.** PSRF collaborated with the DHSPDAC, staff from the City of Blaine and staff from Whatcom County to restore the Harbor. In 2001 three parallel courses of action began. First, PSRF and the DHCOF planted oyster seed on 2 acres – in a Harbor classified as prohibited – with the expectation that water quality would improve in time to harvest. Secondly, in collaboration



with Whatcom County and others, water quality monitoring and improvement projects were undertaken. Thirdly, a public education and outreach campaign was established. The goal of the simultaneous efforts was to improve water quality by 2004, when the seeded oysters would be ready for harvest, and provide a vehicle for residents to access and connect with the shellfish resource. Highlights of the activities include:

- **Development of the Drayton Harbor Community Oyster Farm:**
  - Sponsorship of a Community Open House used to involve the community directly in the shellfish resource and **recruit volunteers** who would participate in this community oyster farming venture. Eventually approximately 15 volunteers would colloquially become known as the ‘Farmers of the Tide Flats,’ the primary volunteer work force of the DHCOF and the main characters of a book of the same name.
  - Special permission from the Washington State Departments of Health (DOH) and Natural Resources (DNR) to seed oysters in two acres of Drayton Harbor. Permission was necessary because the Harbor was classified as Prohibited at the time. The Farmers of the Tide Flats provided volunteer labor.
  - Collaboration with the DHSPDAC and the DHCOF to draft in a letter to Washington State Department of Health (DOH) requesting specific criteria that must be met in order to achieve a shellfish upgrade in that portion of Drayton Harbor where they had planted their oyster seed. DOH responded that three conditions must be met in order to approve harvest: (1) water quality standards must be met; (2) proof that contamination near the harbor entrance receives sufficient dilution under various stages of flood tide before getting to the shellfish beds; and (3) proof that shellfish beds are not impacted by human fecal contamination.
  - Maintenance of the oyster crop on a quarterly basis from 2001 to the present. Between 2001 and 2004, volunteer “Farmers of the Tide Flats” collectively invested 300 hours of volunteer time per year, valued at approximately \$16,000 of in-kind contribution to restoration efforts.
  - Harvesting of seeded oysters in 2004. Based upon a review of most recent water quality data, an evaluation of pollution sources, and shoreline survey information, DOH reclassified 575 acres in the central portion of Drayton Harbor from Prohibited to Conditionally Approved, allowing for the first harvest of oysters from Drayton Harbor in 10 years.
  - Reseeding of the DHCOF in 2005 and experimenting with new oyster growing techniques that could produce yearling oysters for local restaurants and retail trade.
  - Generation of approximately \$100,000 annually from 2001 through 2008. Approximately \$20,000 to \$65,000 of that funding

was used to cover the supplies, rental, and other costs of the DHCOF. The remaining funds were used to investigate and control pollution sources and support active community involvement.

- **Water quality studies, monitoring and improvements:**
  - Sewage collection line and manholes were inspected along Marine Drive in collaboration with the City of Blaine.
  - Repair of broken sewer lines, sealed pipe joints, and patched manholes along Marine Drive. Funds were provided by Whatcom County, DOE's Coastal Protection Fund and the Semiahmoo First Nation.
  - Organization of a volunteer storm water monitoring program to assess fecal coliform pollution levels from urban storm drains in association with the DHCOF with funding provided by Whatcom County.
  - Dye test studies were completed to test possible cross connections with three storm drains in the area. DOH assisted PSRF in designing a dye test with funding provided by Whatcom County. This study confirmed that there was no cross connection between sewer and storm drains (Menzies 2003). Findings from this test supported the 2004 upgrade in Drayton Harbor (WDOH, 2004).
  - Circulation study of marine water to help determine whether bacterial pollution from Blaine Marina reaches the shellfish growing areas in Drayton Harbor. DOH assisted with study design and funding was provided by Whatcom County.
  - Marine water quality sampling was conducted by contracting directly with DOH to collect additional water samples in Drayton Harbor. Samples provided more water quality data for the ambient sampling program. The goal of this program was to achieve a shellfish upgrade in a more timely fashion, which could allow the harvest of oysters produced by the DHCOF. Funding for this expanded program was shared by PSRF, DOH and Whatcom County.
  - Microbial source tracking pilot study was completed to identify specific sources of bacterial pollution affecting the Harbor under wet weather conditions. This effort was funded with proceeds from the sale of oysters from the DHCOF.
- **Public Outreach and Education:**
  - Open House and Oyster Feed - This community educational event brings together fifteen or more agencies for a four-hour open house to expose watershed residents to pollution problems in the watershed and solutions offered by those agencies. It typically attracts at least 150 residents who also benefit from the shellfish that are prepared on the barbecue by committee members and members of the DHCOF. Prior to the 2004 upgrade in Drayton Harbor, shellfish was usually donated by the industry. Once the

bay was reopened, the DHCOF supplied locally grown oysters for the event.

- Quarterly updates of water quality improvements were posted in the community section of the Bellingham Herald for three years running. These quarterly installments included graphics illustrating oyster growth and trends in water quality (see call-out box) as well as a report of key accomplishments and areas where more work needed to be done.
- In collaboration with Trillium Corporation and Semiahmoo resort a shellfish festival called Shuckin' on the Spit was held (In 2002 and 2003). This festival was a fundraiser for the DHCOF and a public outreach event. It attracted 500 people each year but was discontinued due to a change in ownership at Semiahmoo Resort. This event provided a forum for local and state agencies involved in shellfish restoration efforts to reach out to a broader public. Shellfish was donated by other Puget Sound shellfish growers and boat tours of Drayton Harbor and the DHCOF were provided by Drayton Harbor Maritime and the DHCOF.

Contributions from all of the sponsors that supported this festival were estimated to be \$20,000 per year.

- Tideflat Tours offered by PSRF, in collaboration with Whatcom County, provide educational tours of Drayton Harbor and the DHCOF. The initial round of tours focused on outreach to about forty local decision makers including: county and city land use planning commissioners, elected representatives from city and county government, City of Blaine Public Works staff, and members of both the DHSPDAC and the Whatcom County Marine Resources Committee (MRC). The objective of these tours was for decision-makers to experience a direct connection with the shellfish resource and to learn about the progress and challenges of shellfish



restoration in Drayton Harbor.

- Marine Signage was produced and installed in strategic locations in Blaine Harbor and Drayton Harbor. Funding was provided through a Horizons Foundation grant. These signs warned recreational boaters and commercial fishing vessels of the sensitive nature of Drayton Harbor and surrounding waters, requesting that they “Please – Do Not Discharge Sewage into These Waters”. Other partners for this project included the Port of Bellingham, Whatcom County, and the Blaine Seafood Processors.

Since the inception of the restoration effort in the late 1980s and early 1990s the projects described above have been estimated to represent cash and volunteers’ hours of over **2.8 million dollars**. **Table 1** provides a breakdown of restoration efforts in Drayton Harbor. The majority of the funding has been for special projects (37 percent of the total). Special Projects include all capital investments – primarily made to improve water quality, from wastewater improvements to repairs of on-site septic systems to agricultural management plans. Planning activities comprise 24 percent of the total restoration expenditures. Water quality monitoring made up 17 percent of the total. Operation of the DHCOF and Public Outreach represent 17 percent and 7 percent of total investment, respectively.

**Table 1. In-kind and Cash Investments on Restoration and the DHCOF by Category, 1990 through 2008 (dollars in thousands)**

Category	Cash	In-kind	Total	% Total
Planning	\$568	\$87	\$655	22%
Water Quality Monitoring	460	10	470	17%
Special Projects	866	170	1,035	37%
Drayton Harbor Community Oyster Farm	322	136	483	17%
Public Outreach	130	58	188	7%
Total	\$2,369	\$459	\$2,828	100%

Source: Geoff Menzies, Drayton Harbor Community Oyster Farm.

**Table 2** shows the detail of the total In-kind and Cash investments, by entity, by category over the 19-year period. The PSRF has contributed \$754 thousand (27 percent of the total) of both in-kind and cash over the 19 years primarily with the DHCOF, Special Projects, Water Quality Monitoring and Public Outreach. Whatcom County has contributed \$746 thousand (26 percent of the total) primarily in cash and primarily in Special Projects and Planning. Other entities whose contributions to funding or fundraising exceeded 10 percent of the total investment are the Whatcom Conservation District (\$432 thousand or 15 percent), Port of Bellingham (\$303 thousand or 11 percent) and Whatcom County Council of governments (\$295 thousand or 10 percent).

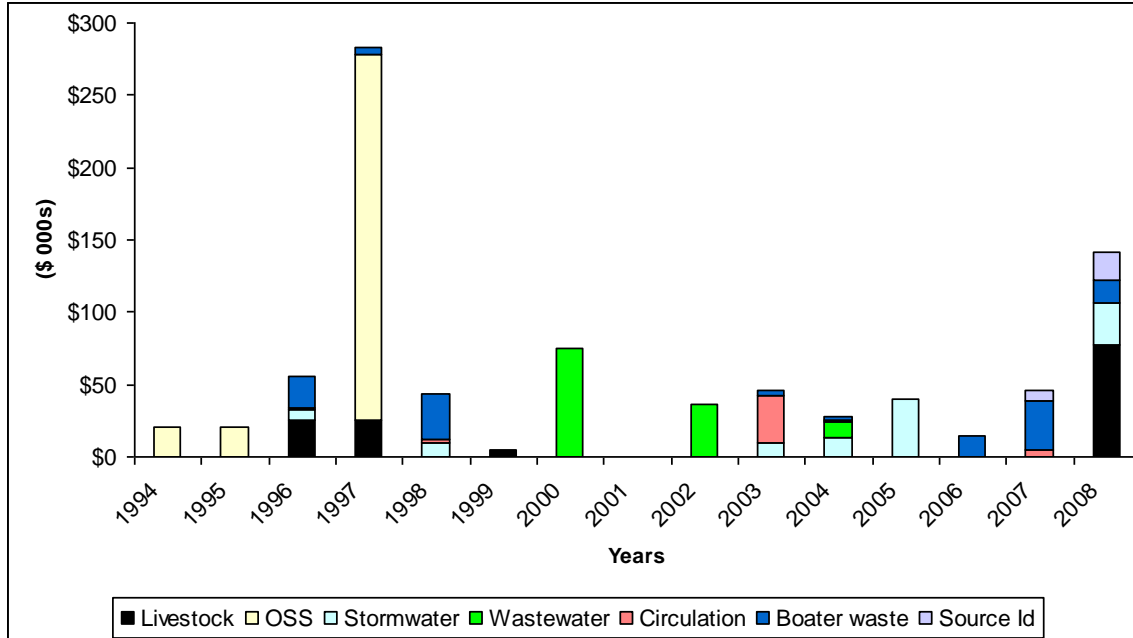
Table 2. In-kind and Cash Investments by Category and by Funding or Fund Raising Entity, 1990 through 2008 (dollars in thousands)

Entity Funding/Fund Raising and Implementing Restoration	Category of Investment								
	Planning			Water quality test/monitor			Special Projects		
	Cash	In kind	Sub Total	Cash	In kind	Sub Total	Cash	In kind	Sub Total
City of Blaine	0	0	0	0	0	0	100	0	100
DHSPDAC	0	39	39	0	0	0	0	2	2
Port of Bellingham	0	0	0	135	0	135	162	6	168
PSRF	7	0	7	77	7	83	70	22	91
PSWQA	0	0	0	0	0	0	0	0	0
Whatcom County	275	0	275	45	0	45	363	63	426
WC Conservation District	76	0	76	63	2	65	151	72	223
NW Indian College	0	0	0	38	1	39	0	0	0
WC Foundation	0	0	0	0	0	0	0	0	0
WC Council of Govt	210	40	250	25	0	25	20	0	20
WA State Dept of Health	0	8	8	0	0	0	0	5	5
Blaine Seafood Processors	0	0	0	25	0	25	0	0	0
WA State Dept of Ecology	0	0	0	50	0	50	0	0	0
WC Marine Resource Committee	0	0	0	2	0	2	0	0	0
<b>Total</b>	<b>568</b>	<b>87</b>	<b>655</b>	<b>460</b>	<b>10</b>	<b>469</b>	<b>866</b>	<b>170</b>	<b>1,035</b>
	<b>Community Oyster Farm</b>			<b>Public Outreach and Education</b>			<b>Grand Total</b>		
	Cash	In kind	Sub Total	Cash	In kind	Sub Total	Cash	In kind	Total
City of Blaine			Total	0	0	0	100	0	100
DHSPDAC	0	0	0	1	1	1	1	42	42
Port of Bellingham	0	0	0	0	0	0	297	6	303
PSRF	347	136	483	46	45	90	546	208	754
PSWQA	0	0	0	25	3	28	25	3	28
Whatcom County	0	0	0	0	0	0	683	63	746
WC Conservation District	0	0	0	58	10	68	348	84	432
NW Indian College	0	0	0	0	0	0	38	1	39
WC Foundation	0	0	0	1	0	1	1	0	1
WC Council of Govt	0	0	0	0	0	0	255	40	295
WA State Dept of Health	0	0	0	0	0	0	0	13	13
Blaine Seafood Processors	0	0	0	0	0	0	25	0	25
WA State Dept of Ecology	0	0	0	0	0	0	50	0	50
WC Marine Resource Committee	0	0	0	0	0	0	2	0	2
<b>Total</b>	<b>347</b>	<b>136</b>	<b>483</b>	<b>130</b>	<b>58</b>	<b>188</b>	<b>2,369</b>	<b>459</b>	<b>2,828</b>

Source: Geoff Menzies, Drayton Harbor Community Oyster Farm

**Figure 4** provides detail on the type of Special Projects that have been undertaken over the 19 year period. Early in the period the special projects were focused on: 1) livestock (agricultural technical assistance, planning); 2) OSS (Special On-Site Shellfish Grant Program) near the Harbor; and 3) boater waste (improved pump-out stations). From 2000 to 2007 the projects have focused on: 1) waste water (sewer investigation and repair); 2)

storm water (dye testing, retrofits, etc); 3) circulation studies; and 4) a microbial source investigation (Appendix B). Beginning in 2008, Whatcom County in partnership with the WCD started to take a more proactive role to address livestock waste on small farms and human waste from septic systems.



**Figure 4. Detail of the Type of Special Project Investments during the Period**

Despite the efforts of volunteers, the contributions of funding from federal, state, county agencies, NGOs, and foundations, the future of commercially viable oyster farming in Drayton Harbor is uncertain. The Shellfish Advisory Committee submitted an updated Recovery Plan for Drayton Harbor, which was adopted by County government in 2007 but as in the past, implementation was only partially funded. In 2008 DOE completed a watershed-wide Total Maximum Daily Load (TMDL) sampling program, which confirmed ongoing and widespread bacterial pollution in the watershed (see **Appendix C** for details). Since the 2004 upgrade, most of Drayton Harbor remained Prohibited for shellfish harvest and about 500 acres, including the DHCOF site remained Conditionally Approved for harvest based upon rainfall amount. In 2006, the rainfall amount that triggered temporary closure was increased from 0.5” in 24 hours to 0.75” in 24 hours (Appendix C describes how Conditional classifications and temporary closures have impacted the DHCOF’s ability to harvest). Based upon recent reviews of water quality data, it is likely that the portion of the Harbor currently classified as Conditional will be Prohibited each year between November and February, prime harvesting months. This pending downgrade in classification is not consistent with an economically viable shellfish farm, and represents a loss of benefit to the community. The value of that benefit is described in the next section.

## **Benefits of the Drayton Harbor Community Oyster Farm**

This section of the report recommends a framework for valuing the benefits provided by the DHCOF, both the ecosystem and the people in Drayton Harbor and surrounding Whatcom County Washington. The framework consists of the following subsections: 1) identification of the types of benefits of the DHCOF; 2) categorization of the identified benefits; 3) valuation methodologies that can be used to qualify or quantify the benefits; and 4) application of some of the valuation methodologies on two of benefits.

### ***Identifying the Types of Benefits of the Drayton Harbor Community Oyster Farm***

Benefits are defined using the terms “ecosystem goods and services” to encompass both the tangible and the intangible benefits humans obtain from ecosystems (Daily, 1997). An example of an “ecosystem good” includes food and an example of “ecosystem service” includes water filtration. The definition of ecosystem includes both natural and human-modified ecosystems as sources of goods and services (Costanza et. al. 1992 and 1997).

In addition to including benefits from the ecosystem – which focus on valuing the resource itself - there is increased attention being paid to understanding benefits that arise from *how the resource is managed* (MEA 2003). A most recent and notable demonstration of the importance of ‘how’ resources are managed is exemplified in the 2009 Nobel Prize in economics award to Elinor Ostrom. Dr. Ostrom’s work:

*...demonstrated how common property can be successfully managed by user associations....Elinor Ostrom is considered one of the leading scholars in the study of common pool resources (CPR). In particular, Ostrom's work emphasizes how humans interact with ecosystems to maintain long-term sustainable resource yields. Ms. Ostrom's work has considered how societies have developed diverse institutional arrangements for managing natural resources and avoided ecosystem collapse in many cases, even though some arrangements have failed to prevent resource exhaustion. Her current work emphasizes the multifaceted nature of human–ecosystem interaction and argues against any singular "panacea" for individual social-ecological system problems.*  
(Royal Swedish Academy of Sciences)  
<http://www.elinorostrom.com/index-filer/Research.htm>

The benefits that arise from successfully managed user associations – the ‘how’ of resource management - can most noticeably impact the cultural services that the DHCOF offers the community. For example, actively involving people in group harvests builds a sense of community and gives people an experience of a natural system that is enriching on many levels. Identifying the benefit arising from ‘how’ the resource is being managed, used and enjoyed (the resource management method and operation of the DHCOF) in addition to identifying the benefit of the ‘what’ (the goods and services) provides a complete assessment of the benefits of the DHCOF.

## ***Categorizing the Benefits of the Drayton Harbor Community Oyster Farm***

An often used method to categorize the benefits of ecosystems was developed by the United Nations Millennium Ecosystem Assessment (MEA) (MEA, 2003). The four MEA categories of benefits are: (1) provisioning; (2) regulating; (3) cultural services that directly affect people; and (4) supporting services needed to maintain the other three services ((MEA, 2007). The bulleted list below provides a description of the categories and a few examples.

- **Provisioning Services** are products obtained from ecosystems, examples include:
  - Food
  - Fiber
  - Fresh water
  - Genetic resources
- **Regulating Services** are services obtained from regulation of ecosystem processes, examples include
  - Water purification
  - Flood control
  - Climate regulation
  - Human health (regulating such things as pathogens)
- **Cultural Services** are nonmaterial benefits obtained from ecosystems, examples include
  - Spiritual and religious
  - Recreation
  - Aesthetic
  - Educational
  - Inspirational
  - Sense of Place
- **Supporting Services** are necessary for the production of all other ecosystem services, examples include
  - Soil formation
  - Nutrient cycling

With one refinement, these categories will be used to identify the benefits of the DHCOF. Benefits within each category will be described as direct or indirect. For the purposes of this study, direct benefits will be considered those benefits that arise from the primary purpose of the DHCOF – to restore clean water and shellfish harvesting in Drayton Harbor (PSRF). Indirect benefits are all the other considerable benefits that ‘spillover’ as a result of activities of the DHCOF but are not a primary objective of operating the farm. The reason to make a distinction between direct and indirect benefits is to begin to understand that it is not only the individuals and entities involved with the restoration of Drayton Harbor and the DHCOF that benefit from the operations of the farm.



Examples of direct benefits of the DHCOF include food produced when oysters are harvested and water quality improvement through the investment in local infrastructure improvements and studies. Indirect benefits to the ecosystem include improved habitat, both from the shellfish substrate but also the water quality improvements in both the freshwater and nearshore environments. Indirect benefits to the community could be the greatest benefit of the DHCOF and include, building social capital, developing and protecting the community's sense of place, and offering an opportunity to educate the community about the richness of the resource. When combined these community benefits contribute to the development of local cohesion, resiliency, and capacity—all necessary components for community action. Other types of indirect community benefits include those of public health, as recreational swimmers and beach-goers are exposed to lower levels of pathogens in the water. Each category of benefit is shown in the bulleted list that follows, including examples specific to the DHCOF.

- **Provisioning Services** (products obtained from ecosystems) DHCOF examples
  - Direct benefits
    - Oyster harvests by both the DHCOF and the Semiahmoo First Nation
  - Indirect benefit
    - Tribal and subsistence harvest that was possible as a result of water quality improvements
- **Regulating Services** (obtained from regulation of ecosystem processes) DHCOF examples
  - Direct
    - Improvements to water quality from investment in local infrastructure and management of waste water
  - Indirect
    - Water filtration in the nearshore provided by seeded oysters
    - Reduction in risk of human exposure to pathogens from an improvement in both marine and freshwater systems
- **Cultural Services** (nonmaterial benefits obtained from ecosystems and their management)
  - Indirect
    - Educational
    - Inspirational
    - Sense of Place
    - Community capacity building
    - Social capital
    - Recreation (shellfish harvest)
    - Health and fitness (harvesting oysters is hard, physical work)
- **Supporting Services** (necessary for the production of all other ecosystem services) DHCOF examples
  - Indirect
    - Nutrient cycling (shellfish are nitrogen sinks – harvesting them removes nitrogen from the marine system)
    - Habitat formation from shellfish growing areas

- Habitat improvement from improved water quality in both freshwater systems and the nearshore environment

### **Quantifying and Qualifying Benefits**

The following section presents a discussion of methodologies available to value the benefits discussed above, beginning with a brief discussion of various valuation methods and concluding with a detailed description of methods available to value two of the benefits of the DHCOF.

### **Methodologies for Valuing Benefits**

The following discussion about valuation methodologies is separated into two sub-sections: those methods that result in a quantification of benefits, and those that result in a qualified discussion of benefits. In general, benefits that accrue from Provisioning Services, Regulating Services and Supportive Services are more easily quantified using various methods. Cultural Service benefits are difficult to quantify and literature on the topic provides methods to qualify the benefits.

### **Methodologies for Quantifying Benefits**

A brief summary of pertinent valuation methodologies follows.

**Increased Production Value** – This method of valuation measures the change in production value that occurs as a result of a change in a resource. This measure provides a strict measure of economic value, because it is based on market prices. Using an increase in production value is frequently an appropriate methodology for valuing benefits categorized as Provision Services (food, fiber, fuel etc). In the DHCOF example the direct Provisioning Services benefit can be valued using this method since it is equal to the revenue generated from oyster sales. Additionally, the production value contributes indirectly to the local economy in the form of personal income earned in other sectors of the economy generated by purchases of inputs (harvest supplies, gasoline, etc.) and by the spending of their employees on goods and services.

**Avoided and/or Replacement Costs** - These two methods are related methods that estimate the economic value of environmental goods and services based on either the cost of avoiding damages due to lost services, the cost of replacing ecosystem services or the cost of providing substitute services. These methods do not provide a strict measure of economic values in the classical view of the term. Instead they assume that the costs of avoiding damages, replacing ecosystems or their services can provide useful estimates of the value of these ecosystems or services. This is based on the assumptions that if people incur costs to replace the services of ecosystems, then those services must be worth at least what people paid to replace them. For example, replacement costs can be used to value the indirect benefit, categorized as a Regulating Service, of the water quality improvements of the shellfish harvesting. Because shellfish are nitrogen sinks, harvesting them removes nitrogen from the nearshore environment. A replacement cost approach to valuing this benefit would use the costs of removing the nitrogen in some other way, e.g. an engineered solution as the value of the benefit. [See the section of this grant report that discusses the water quality improvements of shellfish harvesting for

more information]. Another example of valuing water quality improvements, this time using avoided costs, would be to assess whether there was a benefit to human health because swimmers and beachgoers were exposed to fewer pathogens in the water. The avoided costs would take the form of reduced medical expenses from pathogen-based illnesses and infections.

**Contingent valuation** is a survey-based economic technique for the valuation of goods and services, for example, enjoyment, cultural significance and/or the spiritual value that people obtain from an environmental resource. While these resources do give people utility, certain aspects of them do not have a market price as they are not directly sold-- for example, people receive benefit from walking down to the dock at Drayton Harbor to buy locally-grown oysters, but it would be difficult to value that experience – beyond the price paid for the oysters - using price-based models. Contingent valuation surveys are one technique which is used to measure these aspects. Contingent valuation is often referred to as a stated preference model, in contrast to a price-based revealed preference model. Typically the survey asks how much money people would be willing to pay (or willing to accept) to maintain the existence of (or be compensated for the loss of) an environmental feature, such as Drayton Harbor oysters. This valuation method can be used to place a value on the benefits categorized under Cultural Services. One extension of this method could be used to estimate a minimum value of the Cultural Service benefits from the DHCOF. The donations received through the PSRF to protect and restore the Harbor represent what some people were willing to pay for the benefits provided.<sup>2</sup> This valuation would not represent all the Cultural Service Benefit however. Frequently, Cultural Service benefits are not quantified because the accuracy of this valuation method has been questioned in the literature. And many of these types of benefits are based on the theory of capacity building and the development of social capital.

**Volunteer Time** can be measured in a variety of ways, five of which are (RGK Center for Philanthropy and Community Service) (RGK):

- *Average wage* – by assigning a dollar amount to the number of hours donated, for example the average wage from the Bureau of Labor Statistics
- *Replacement wage* – by estimating the amount that the organization would have to pay to replace the volunteer (this method is endorsed by the Financial Accounty Standards Board)
- *Opportunity cost* – this method uses the qualification of the person who is volunteering
- *Social benefits* – versus the wage-based value of volunteers' time this method attempts to capture the role the volunteer plays in improving the beneficiaries and in bettering society. The benefit to the beneficiaries can be valued by estimating the fees that would have to be paid for the services rendered. The

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<sup>2</sup> Generally contingent valuation methods only refer to what people *would* be willing to pay, not what people actually paid. The reason that the donations received by the PSRF for the DHCOF are a minimum value is because it is likely that many more people value the resource than donated, simply that those who did not donate were not aware of the issue.

societal benefit looks at impacts beyond the services provided and include social capital and capacity building benefits (see below). Quantifying these benefits is complicated yet notably of equal importance

- *Value to the Volunteer* – this method measure the benefit that the volunteer receives in exchange for their time and efforts. This valuation method is subjective, but nonetheless contributes to a complete understanding of the benefits. For example the RGK report notes that the performance of children of parents who volunteer in the classroom is 10 percent better than those children whose parents do not volunteer.

## Qualifying Benefits

In addition to direct and indirect environmental and human health benefits, the DHCOF provides numerous benefits to the community at large based on *how* the resource is managed. By involving locals, the County and the PSRF the DHCOF provides multiple Cultural Resource benefits referred to as ‘social capital’ or capacity building. Social capital can be thought of as the framework that supports the process of learning through interaction, and requires the formation of networking paths that are both horizontal (across agencies and sectors) and vertical (agencies to communities to individuals).

Many definitions of capacity building and social capital exist. One commonly held definition is from the Organization for Economic Cooperation and Development (OECD 2001):

*networks, together with shared norms, values and understandings which facilitate cooperation within or among groups.*

In the literature on the topic the ‘networks, norms and trust’ facilitate co-operation for mutual benefit. Two descriptions of the benefits of social capital are:

From the UN Environmental Programme, Capacity Building Division (UNEP 2009):

*...develop and enhance institutional and individual capabilities to effectively address environmental challenges ...*

*... improve environmental awareness to enhance public participation in environmental management, and mainstreaming environmental education and training to ensure positive environmentally sustainable lifestyles among current and future generations.*

From the EPA (EPA 2005):

*The concept of stewardship creates an opportunity to reframe the way environmental problems are viewed and addressed. Rather than discussing them in conventional and often overly technical terms, we can view them as opportunities for improving efficiency, engaging in problem-solving, and sustaining clean water, clean air and other natural resources.*

*These are objectives that are likely to resonate with a much broader audience and set of interests.*

Indicators of the presence of strong social capital for an individual included, among others (Department of Victorian Communities):

- The belief that one is safe, is valued by society, and that there are opportunities to express one's opinion;
- Appreciation of multiculturalism;
- Attendance at community events;
- Volunteerism;
- Membership in an organized group; and
- Membership in a decision making board or committee.

The DHCOF provides the community with all of the above indicators. The greater these indicators are, the stronger social capital is assumed to be.

The specific benefits offered by strong social capital are well-documented. The Department of Victorian Communities (DVC) attributes strong social capital to increased tolerance, decreased anti-social behavior, and increased participation in public life. Involvement in organizations and voluntary associations, such as the DHCOF, has been linked to building an individual's political aptness and engagement in civic life by developing an individual's social network and fostering the transmittal of politically relevant information (La Duke Lake and Huckfeldt 1998). Furthermore, strong social networks and civic engagement have the potential to lead to crime reduction, improvement of schools, economic development, and more effective government. This is due in part to the collaborative skills learned through participation in social networks, which can encourage future collective action and acceptance of policies which will result in collective benefits (Putnam 1995).

A study from the World Bank (Knack 2002) examined the link between social capital and government performance at the state level in the United States. Beyond increasing voting participation, health, happiness, and economic investment and growth, social capital is positively correlated with a well-functioning government. Strong social cohesiveness facilitates the generation of solutions to problems and leads to an atmosphere where groups are better organized to insist upon government accountability. Specific aspects of social capital linked most strongly to government performance are social trust, volunteering, and census response.

Volunteerism rates were based on the United States Census Bureau's May 1989 Current Population Survey, which asked whether respondents had engaged in volunteer activities over the previous 12 months. Volunteerism rates were compared to the ratings of state government performance generated by the joint *Governing* magazine and Syracuse University-facilitated Government Performance Project. Factors of performance include financial management, information technology, capital management, human resources, and the effectiveness of strategic planning. A regression model was run that showed that

government performance increased approximately one-half of a standard deviation for each standard-deviation increase in volunteering. Therefore, the study concluded that volunteerism rates, in addition to social trust and census response, are significant predictors of government performance (Knack 2002).

The general consensus of the literature is that groups that develop social networks and foster civic engagement, such as volunteer associations like the DHCOF, are vital for developing the social capital of a community. In turn, the social capital built through participation in these groups leads to significant benefits for the greater community in the form of more effective governance, healthier social norms, reduced crime, broader public engagement, and economic development.

### ***Applying the Valuation Framework to the Drayton Harbor Community Oyster Farm***

**Table 3** provides a summary of how the valuation framework discussed above could be applied to help assess the value of the DHCOF. The scope of work for this study called for memorializing the benefits of the DHCOF– as such the framework describes the types of benefits, categorizes them and provides a valuation methodology. With this framework each benefit could be quantified if data were available. It is outside the scope of this project to gather the data necessary to quantify all of the benefits of the DHCOF. Rather the types of benefits are listed and an estimate of two of the benefits is suggested; the value of harvested oysters and a minimum estimate of the direct benefits from water quality improvements is suggested.

The benefits listed in the **Table 3** were first introduced in the bulleted list in the section entitled ‘Categorizing the Benefits of the Drayton Harbor Community Oyster Farm.’

**Table 3** also includes a column for the valuation method that could be used to quantify the benefit and a column entitled Assessment of Benefit. This last column contains either the estimate of the value of the benefit or additional information to help inform about the likelihood that there is a benefit.

A summary of the information presented in **Table 3** follows:

- Provisioning Benefits
  - The benefit from harvest of oysters is estimated at \$14.0K, the average annual revenue from oyster sales for the period 2004 through 2008, plus an estimated \$10.7K economic impact to other sectors of the economy that provided supplies, etc to the DHCOF. The economic impact is estimated based on data published in WDFW’s 2008 report, the Economic Analysis of the Non-Treaty Commercial and Recreational Fisheries in Washington State. It is notable that the \$14.0K from harvesting oysters occurred from the 2-acre DHCOF. The two former aquaculture farms were 100 acres and 20 acres in size. Using the DHCOF revenue numbers as a basis the production value of 100 acres would be \$700,000 in annual production value and \$535.0K for economic impacts, for a total of \$1,235.0K
  - Tribal and subsistence shellfish harvesting made possible by water quality improvements in Drayton Harbor, estimated to be 30,000 lbs of clams

annually in the early 90s. The production value of which is estimated to be over \$48.0K, using production values from WDFW's 2008 report. Plus the additional economic impact of \$37.1K.

- **Regulating Benefits**
  - Direct benefits are estimated based on the incremental investment in projects to improve water quality, as well as studies to understand water quality issues after the DHCOF was formed. This investment is \$53K per year. Prior to the formation of the DHCOF the annual average of investment in special projects and water quality studies was \$45.0K and \$19.0K (see Table 2), respectively. After formation of the DHCOF the annual average investment increased by \$32.0K (to \$77.0k) and \$21.0K (to \$40K), respectively. Assuming the DHCOF raised awareness of water quality issues in the harbor the difference in the annual average investment (\$53.0K) may be attributed to the DHCOF. This serves as a minimum estimate.
  - Indirect benefits include water filtration in the nearshore provided by the oysters harvested, and benefits to human health, by reducing the risk of exposure to pathogens in fresh and marine waters. It is outside the scope of this project to estimate these benefits.
- **Cultural Benefits**
  - Direct benefits of the volunteers' time ranges between \$24.25K (using the \$10/hour replacement wage) to \$41.5K (using an average wage from the BLS (RGK)). The estimate is based on the number of hours donated by the Farmers of the Tidelands and others associated with the DHCOF. Volunteers for the DHCOF and the DHSPDAC logged over 38,000 hours, or an average of one person-year per year for 19 years.
  - A preponderance of value from the DHCOF is in the form of indirect benefits created as a result of the creative and collaborative way the resource is managed. Working collaboratively the volunteers build social capital and increase benefits to cultural services such as inspirational, educational and spiritual from the stewardship of the resource. Quantifying the benefit of the social capital built as a result of the DHCOF was outside the scope of this study; however the literature review suggests that building social capital can reduce crime, improve schools, contribute to economic development, and more effective government (e.g. increasing voting participation). Additionally quantifying the benefit to the volunteers is, however the benefit can easily be assumed to be substantial as indicated by the number of hours volunteered and the retention rates of the volunteers. One volunteer, working on the DHCOF from 2001 to 2008 says it keeps him young.
- **Supporting Benefits**
  - Habitat improvements for endangered salmon
  - Nutrient cycling (removing nitrogen from the nearshore)

The Cultural Services benefit to the community - resulting from *how* the DHCOF is managed - may provide as much if not more benefit than the Provisioning, Regulating and Supporting Service benefits (the *how* DHCOF is restoring the harbor)

## **Possible Futures for the Drayton Harbor Community Oyster Farm**

In spite of all the efforts to improve water quality in Drayton Harbor over the past 19 years the gains made in water quality have begun to erode. Beginning in the Fall of 2009 the harbor will have a seasonal closure (Whatcom Watch). From November to February harvesting will not be permitted. The individuals that created the DHCOF are concerned that to walk away now would reduce, if not eliminate, the focus on Drayton Harbor water quality, a fact that would allow water quality to continue to deteriorate.

Based on a recent proposal to community members who are familiar with the project, and a positive response from the community, they are launching a Community Supported Agriculture (CSA) organization for the next three years. Over fifty shareholders have collectively pledged approximately \$10,000 per year and will receive yearling oysters between March and May, when conditions are favorable for harvest. PSRF has matched the shareholder pledge amount, bringing the annual budget to \$20,000 for the next three years. This will allow a small scale oyster farm in Drayton Harbor to continue to operate, serving the local community during this critical period.

## **Recommendations for Future Work**

Two of the posited conclusions from this work are 1) the Cultural Service benefits from the DHCOF may be as great if not greater than the benefits linked more closely with the resource, namely Provision, Regulating and Supportive and 2) the indirect benefits from the DHCOF, to habitat, human health and other shellfish harvesters, may be as great or greater than the direct benefits from the DHCOF. Undertaking a detailed study that provided for a more complete valuation following the framework outlined in this study could prove useful. The value of the study would be twofold. First, it would test whether *how* a resource is managed significantly changes the total benefit. This test would help measure the relative magnitude of Cultural Service benefits to the other benefits— so that future restorat managers can make informed decisions about not just what to restore, but also how to restore it. Second, the results of a more detailed study would suggest a more comprehensive list of beneficiaries. Understanding the list of beneficiaries, and the relative magnitude of their benefits compared to others, could help suggest an equitable division of costs.



Table 3. Summary of Estimated Annual Benefits for the Drayton Harbor Community Oyster Farm				
Benefit Category	Description of Benefit		Valuation Method	Assessment of Annual Benefit
	Direct	Indirect		
<b>Provisioning</b>				
	Oyster harvest		Change in production value & economic impacts.	\$14.0K in oyster sales and \$10.7K in economic impacts for a <b>total of \$24.7K</b>
		Tribal and subsistence harvest that was possible as a result of water quality improvements	Change in production value & economic impacts	\$48.7K in equivalent oyster sales and \$37.1K in economic impacts for a <b>total of 85.8K</b> . This estimate assumes that the harvest rates from the early 1990s by the Lummi Nation (over 30,000 pounds of clams from Drayton Harbor) could be supported by the water quality improvements driven by the DHCOF.
<b>Regulating</b>				
	Improved water quality		Actual expenditures (proxy for willingness to pay)	Annual incremental increases in special projects and water quality monitoring and improvement <b>totals \$53.0K</b> . This serves as a minimum estimate.
		Water filtration in the nearshore provided by seeded oysters	Avoided or replacement costs	Estimating the water quality change from the filtration of oysters was outside the scope of the project. However, if the data was available a replacement cost method could be used to estimate the value.
		Reduction in risk accompanying human exposure to pathogens in fresh and marine waters	Avoided or replacement costs	Estimating the potential human health benefits was outside the scope of the project.
<b>Cultural</b>				
	Volunteers' Time and the value to the volunteer.	Inspirational, Recreation, Social Capital, Educational, Capacity building	Average wage and replacement value of volunteers' time and Contingent valuation for indirect benefits	Volunteer's time is estimated to range between <b>\$24.2K and \$41.5K</b> annually. Quantifying the benefit to the volunteers is subjective and was outside the scope of this study [can anything that Trina did be used here?] Quantifying the benefit of the social capital formed as a result of the DHCOF can reduce crime, improve schools, contribute to economic development, and more effective government (e.g. increasing voting participation).
<b>Supporting</b>				
		Nutrient cycling, habitat formation from shellfish beds; habitat improvement in both freshwater and nearshore	Replacement cost	Estimating the potential benefits to habitat was outside the scope of the project. However, Drayton Harbor provides habitat for salmon populations including Coho, chum, fall Chinook, steelhead, and cutthroat trouttotal Estimated Annual
<b>Quantified Annual Average Benefits</b>				<b>\$187.7k - \$205.0K</b>

## Summary

Historically, over 100 acres of the Drayton Harbor was utilized for shellfish production. If water quality in Drayton Harbor improved to a level that those 100 acres could be re-opened to unconstrained commercial operations the economic impact could be as high as \$1,235,000 annually. That estimate is based on the per-acre revenue generated by the DHCOF, resulting in an estimate of \$700,000 in annual production value and \$535,000 in economic ‘ripple’ effects throughout the region. Concluding that further investments by the County and the City of Blaine in water quality improvements could provide a considerable boost to the \$14,000 a year in oyster revenues achieved 2004-2008.

The public investment necessary to improve water quality buys more than just the economic gain from the production of shellfish. There is a variety of direct and indirect benefits available to the City of Blaine and Whatcom County from continued investment in water quality improvements associated with re-building the shellfish industry in Drayton Harbor.

The obvious benefits created by public investment in improved water quality are reductions in threats to human health and environmental habitat benefits. In the case of the DHCOF there are even more public benefits available, more subtle to identify, but perhaps of even greater value than the economic impacts of production and the human health and habitat benefits.

The creation of social capital that has occurred over the decade of volunteerism in the DHCOF is challenging to quantify however likely of greater value to the community. While clean water in the real world requires continual effort to address ongoing pollution sources and contend with changing economic and political realities, it is not the achievement alone that provides value but the effort of bringing people together all along the way to fight for a common cause – to recognize what is valuable in one’s own community and work to restore it.

The World Bank (Knack 2002) examined the link between social capital and government performance in the United States. Beyond increasing voting participation, health, happiness, and economic investment and growth, social capital is positively correlated with a well-functioning government. Strong social cohesiveness facilitates the generation of solutions to problems and leads to an atmosphere where groups are better organized to insist upon government accountability. Specific aspects of social capital linked most strongly to government performance are social trust, volunteering, and census response.

Taking just one of those aspects of social capital – census response – as an example of the value to government from strong social capital may help local officials understand the value to of building social capital. Census numbers are used in myriad of ways, including “*apportioning seats in the U.S. House of Representatives and deciding how more than \$400 billion per year is allocated for projects like new hospitals and schools.*”

*That's more than \$4 trillion over a 10-year period for things like new roads and schools, and services like job training centers”<sup>3</sup>.*

Public investment in volunteerism activities like the DHCOF buys more than shellfish production, habitat and human health benefits; it provides social capital necessary for effective government.

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<sup>3</sup> Taken from the United States Census Bureau web page, <http://2010.census.gov/2010census/why/community-benefits.php>, accessed May 21, 2010.

## References

- Bellingham Whatcom Economic Development Council (BWEDC), Community Profiles for Blaine and Lynden accessed on October 15, 2009 at [http://www.bwedc.org/anchored\\_list.asp?pagenumber=323#220](http://www.bwedc.org/anchored_list.asp?pagenumber=323#220)
- Corporation for National and Community Service, Office of Research and Policy Development. *Volunteering in America: 2007 State Trends and Rankings in Civic Life*, Washington, DC 2007.
- Costanza, R., B. Norton, and B. Haskell (eds.), 1992: *Ecosystem Health: New Goals for Environmental Management*. Island Press, Washington, DC.
- Costanza, R., R. D'Arge, R.S. de Groot, S. Farber, M. Grasso, B. Hannon, K. Limburg, S. Naeem, R.V. O'Neill, J. Paruelo, R.G. Raskin, P. Sutton, and M. van den Belt, 1997: The value of the world's ecosystem services and natural capital. *Nature*, 387(6630), 253–260.
- Daily, G.C. (ed.), *Nature's Services: Societal Dependence on Natural Systems*. Island Press, Washington, DC, 392 pp. (Daily 1997a)
- Introduction: What are ecosystem services? In: *Nature's Services: Societal Dependence on Natural Ecosystems*, G.C. Daily (ed.), Island Press, Washington, DC, 1–10. (Daily 1997b)
- Daily, G.C. and K. Ellison, 2002: *The New Economy of Nature: The Quest to Make Conservation Profitable*. Island Press, Washington, DC.
- Daily, G.C., T. Söderqvist, S. Aniyar, K. Arrow, P. Dasgupta, P.R. Ehrlich, C. Folke, A.M. Jansson, B.O. Jansson, N. Kautsky, S. Levin, J. Lubchenco, K.G. Mäler, D. Simpson, D. Starrett, D. Tilman, and B. Walker, 2000: The value of nature and the nature of value. *Science*, 289, 395–396.
- Department of Victorian Communities, 2006 (DVC), “Indicators of Community Strength: A framework and evidence,” prepared by Jeanette Pope, Research Manager, Strategic Policy and Research, Department for Victorian Communities.
- Knack, Stephen, October 2002, “Social Capital and the Quality of Government: Evidence from the States,” *American Journal of Political Science*, Vol. 46, No. 4, pp. 772-785, Midwest Political Science Association.
- Kumar, Manasi and P Kumar. Valuation of the ecosystem services: A psycho-cultural perspective. *Ecological Economics*, Volume 64, Issue 4, 1 February 2008, Pages 808-819.
- La Due Lake, Ronald and Robert Huckfeldt, 1998, “Social Capital, Social Networks, and Political Participation,” *Political Psychology*, Vol. 19, No. 3, pp. 567-584.
- Menzies, Geoff, Drayton Harbor Shellfish Protection Advisory Committee and Drayton Harbor Community Oyster Farm Director. Personal communication regarding expenditures on restoration efforts.
- OECD 2001, *The Wellbeing of Nations: The Role of Human and Social Capital, Education and Skills*, OECD Centre for Educational Research and Innovation, Paris, France.
- Putnam, Robert D. *Bowling Alone: The Collapse and Revival of American Community*, New York: Simon & Schuster, 2000. (Putnam 2000).

- “Bowling Alone: America’s declining social capital,” *Journal of Democracy* Vol. 6, No. 1, pp. 65-78, National Endowment for Democracy and the Johns Hopkins University Press.(Putnam 1995).
- RGK Center for Philanthropy and Community Service , Placing a Value on volunteer Time, Volume 2, Issue 1 Fall 2005, LBJ school of Public Affairs, University of Texas at Austin.
- Royal Swedish Academy of Science, Press release available at [http://nobelprize.org/nobel\\_prizes/economics/laureates/2009/press.html](http://nobelprize.org/nobel_prizes/economics/laureates/2009/press.html) on October 15, 2009.
- United Nations, Environmental Programme, Capacity Building Division (UNEP, 2009), accessed at [http://www.unep.org/DEPI/programmes/capacity\\_building.html](http://www.unep.org/DEPI/programmes/capacity_building.html) on June 28, 2009.
- United State Environmental Protection Agency (EPA, 2005) *Opportunities for Environmental Stewardship, Report to Stephen L. Johnson Administrator, U.S. Environmental Protection Agency.* EPA Innovation Action Council, November 2005, December 2005
- Washington State Department of Fish and Wildlife (WDFW, 2008), Economic Analysis of the Non-Treaty Commercial and Recreational Fisheries in Washington State, December 2008
- Whatcom County, Drayton Harbor, Join the Community Effort, Fact Sheet accessed on [http://whatcomshellfish.whatcomcounty.org/Drayton/DH\\_Fact\\_%20Sheet\\_FINAL\\_oyster.pdf](http://whatcomshellfish.whatcomcounty.org/Drayton/DH_Fact_%20Sheet_FINAL_oyster.pdf), October 14, 2009 at
- Whatcom County, not dated, a, Drayton Harbor Shellfish Protection District Advisory Committee and Puget Sound Restoration Fund. Drayton Harbor Fact Sheet.

## **Appendix A**

# **Detailed Description of Twenty Years of Drayton Harbor Restoration Efforts**

Prepared by Geoff Menzies



## **Appendix B**

### **Detailed Timeline of DOH approval, Investments, Planning and Restoration Activities, and Water Quality**

This is the Excel file.



## **Appendix C**

### **Fecal Coliform Pollution in Drayton Harbor through 2008**

**Appendix D**  
**The Challenges of Oyster Farming under the**  
**Conditionally Approved Classification**  
Prepared by Geoff Menzies