# Native Hardshell Clam Enhancement and Restoration Planning

**For**

## Whatcom County Marine Resources Committee

**Written By**

**Geoff Menzies**
**Puget Sound Restoration Fund**

**March 18, 2005**

**DRAFT REPORT**

**(Task 2 of the Marine Resources Committee Clam Enhancement Project)**

This report was funded in part through a cooperative agreement with the National Oceanic and Atmospheric Administration.

Introduction

This report completes the second phase of the Whatcom County Marine Resources Committee project to enhance native hardshell clam populations in either Birch Bay or Drayton Harbor. It describes additional site analysis at two locations in Birch Bay, provides cost estimates for clam seed and materials, permitting requirements, steps needed to prepare a site for planting, and key permitting agency contacts.

This report supplements the January 31, 2005 report titled: "Native Hardshell Clam Enhancement Feasibility Study". This first phase of the project considered numerous criteria to help select a site for a clam enhancement project in either Birch Bay or Drayton Harbor. Consideration was given to marine water quality, tideland ownership and access, agency and community support, substrate type, historical information on clam population densities, and tribal interests. Application of these criteria led to the recommendation in the January, 2005 report to site a clam enhancement project in Drayton Harbor, adjacent to Semiahmoo Spit, near Washington State Department of Health station number 12. Due to strong community support for siting a project in Birch Bay, Task 2 of this project was expanded to take a closer look at two sites in Birch Bay for suitability based primarily on substrate type. The areas that were assessed were the Cottonwood Beach tidelands owned by Whatcom County and the gravel bar area, near the mouth of Terrell Creek. In addition to recording substrate type, clams were collected from the top six inches at numerous locations at each site to help determine suitability for a clam seeding effort. Presence of clams is one of the best indicators of site suitability, rather than reliance on substrate alone (Jennifer Whitney).

Additional Site Analysis in Birch Bay

Cottonwood Beach

Whatcom County Planning and Development Services provided a map and GPS coordinates for the four corners of this tideland area. The site was visited on the afternoon of March 3. The low tide that afternoon was approximately – 0.1 ft elevation at 5 p.m.. We began our survey on an outgoing tide at 3 p.m. and finished at 5 p.m. We walked five transects parallel to the shoreline representing five different tidal elevations, which were estimated at +6 ft, +5 ft, +4 ft, +2 ft, and +1 ft. In each transect , we collected and counted clams from the top six inches within a one square foot area at five locations along the transect. We also noted the dominant substrate present, which in all transects at this site was fine sand. The results are shown in the table below.

| *Transect* | *Distance waterward from cobble slope on shoreline* | *Tidal Elevation* | *Substrate Type* | *Total number of clams/transect (5 sqft)* | | | |
|---|---|---|---|---|---|---|---|
| | | | | Manila | Native Littleneck | Varnish | Sand |
| 1 | 50 ft | +6 ft | Sand | 1 | 0 | 12 | 0 |
| 2 | 350 ft. | +5 ft | Sand | 3 | 1 | 17 | 3 |
| 3 | 700 ft. | +4 ft | Sand | 6 | 0 | 39 | 1 |
| 4 | 900 ft. | +2 ft | Sand | 0 | 0 | 6 | 4 |
| 5 | 1200 ft. | +1 ft | Sand | 0 | 0 | 0 | 6 |

All of the Manila clams detected in this survey were very small and well below harvestable size. They were also found exclusively from 0- 2 inches from the surface. In spite of their size, given the nature of this site (high energy, fine sand substrate) it is possible that they may be several years old (Brady Blake). The native littleneck found at this site was also below harvestable size. As with the 2004 surveys conducted in this general area by the Whatcom County MRC, varnish clams are the most abundant type of clam inhabiting the area. They were most common 3-6 inches below the surface. Sand clams were also found at many sites. No butter clams were

detected in this survey. While walking this area, it is evident that the surface of the sandy tidelands has wavy patterns indicating that it is a fairly high energy area which probably experiences significant movement of sand at least in the top inch or two.

Gravel Bar at Mouth of Terrell Creek

This site was also visited on the afternoon of March 3rd at 5 p.m. coinciding with a low tide of approximately –0.1 ft elevation. We followed the meandering intertidal drainage from the mouth of the creek westward into Birch Bay. Clams were sampled at five locations, which were selected randomly from both sides of the drainage course. Tidal elevations ranged from +2 ft to +4 ft.. Harvestable size Manila clams were found at four of five locations. All of these locations had a mix of cobble, gravel, sand, and shell, which is considered desirable for most hardshell clams.

One area in particular, on the south side of the drainage channel, appeared particularly suitable due to the predominance of pea gravel and numerous Manila clam shells on the surface. This site is approximately 500 feet west of the piling breakwater at the mouth of Terrell Creek. In two, one square-foot samples examined at this site, we detected 2 and 5 harvestable size Manila Clams per square foot in the top 2 to 3 inches. We estimated the elevation at approximately +3 ft in this location. The surface in this area south of the channel was a bit more "hummocky" and disturbed, indicating that this is either an area that is dug frequently for clams or possibly subject to wave motion. The substrate in this area was a mix of pea gravel (dominant), cobble, sand, and shell.

Based on substrate type and clam survey results from this abbreviated effort at both locations of interest in Birch Bay, this area immediately south of the Terrell Creek mouth intertidal channel appears most favorable for a Manila clam-seeding project.

> *Presence of Manila clams is a good aid in site selection. Ideal substrate is gravel with much less than 25 mm diameter and sand mixed with a small amount of mud and shell. Tightly packed large cobble and hard pan, which prevents burrowing by the clam, should be avoided. Soupy mud or mud-sand combinations are very poor habit*ats. (Anderson et al).

These tidelands are privately owned but there may be some potential to partner with the adjacent upland landowner to gain access to and use this location for a clam-seeding project. There are plans to develop the upland site according to Whatcom County (Jeff Chalfant). As mentioned in the January 2005 report, the Washington State Department of Health, Office of Shellfish Programs (DOH) does not support this general location due to the potential for bacterial pollution from Terrell Creek (Don Lennartson, Shoreline Survey).

Upon completion of these visits in Birch Bay and through discussions with staff at Whatcom County Planning and Development Services it became apparent that the current Whatcom County Comprehensive Plan does not allow for aquaculture projects in Birch Bay. Aquaculture is only allowed in Rural zoning and there is no rural zoning along most of the shoreline in Birch Bay. The definition of "Aquaculture" in the Comprehensive Plan does not differentiate between commercial and non-commercial enterprises (Jeff Chalfant). Solutions to this conflict may be to:

1. Do a code scrub of Title 20 so that the definition for Aquaculture is restricted to "commercial enterprises" only or
2. Identify the project as a "restoration" project under WDFW to bypass the zoning problem.

An amendment to the Comprehensive Plan or Title 20 could be docketed in June 2004. Addressing this issue further at this time is beyond the scope of this report, but will obviously have to be addressed soon, if the MRC pursues a project in Birch Bay.

Enhancement of Manila Clams versus Native Hardshell Clams

The initial focus of this project was to enhance native hardshell clams rather than the introduced Manila clam. Based on conversations with Washington State Department of Fish and Wildlife representatives as well as the Lummi Shellfish Hatchery, it became evident during the initial phase of this project that neither WDFW nor the Lummi Hatchery has had significant success culturing seed from either butter clams or native littleneck clams. Follow-up conversations with both groups confirm that there are a myriad of challenges (broodstock collection and transfer permits, health certificates from WDFW) to successfully culturing native clam seed and realizing success with grow-out in the field (Russell Rogers). The Point Whitney Shellfish Lab has experimented with both butter clams and native littlenecks. Native littlenecks, when brought into the lab, fall prey to numerous diseases that limit production and survival of seed (Brady Blake). Butter clam seed was cultured successfully at Point Whitney but it takes two years from broodstock selection to the production of seed large enough for transplanting. They experienced only 4% survival of transplanted seed 2 years after seeding and have subsequently abandoned efforts to culture native hardshell clams, including butter clams. Their advice is that taking this direction is long term and prone to failure. There is a shellfish hatchery in Seward Alaska called the Qutekcak Shellfish Hatchery (907) 224-5181 that has successfully produced native littleneck seed for shellfish restoration but they are not currently a viable operation. It would be difficult for them to import broodstock from other states due to very restrictive import regulations (Betsy Peabody). It would be equally challenging to import native littleneck seed from their hatchery due to Washington State requirements for health certification and the problems in that area with shellfish disease (Brady Blake). Taylor Shellfish Farms Hatchery has expressed an interest in experimenting with native littleneck seed production to support an MRC project. Broodstock could be collected from their beach in Quilcene. This may eliminate the expense associated with health certification for broodstock collected at disparate locations (Betsy Peabody). Proven techniques for culturing and rearing clam seed to a size at which they survive transplanting have been achieved for Manila clams and geoducks only in the Puget Sound region (Cheney and Mumford).

Manila clams were introduced to this area over seventy years ago and WDFW expressed no concerns that enhancing this species will displace or threaten native clams. Manila clams have been successfully reared in shellfish hatcheries and brought to harvestable size in Puget Sound waters for many years, providing the same ecological functions as native hardshell clam species (Brady Blake).

Manila Clam Aquaculture and Site Preparation

The Manila clam can be successfully cultured in commercial quantities through all stages of its life cycle. Readily available seed supply, general hardiness, and fast growth characteristics have made it a favorite for aquaculture enterprises. Commercial Manila clam grounds usually contain 150 to 500, 1 ½-inch clams per square meter. Manila clams, which typically inhabit gravelly beaches, can be grown in sand when predators and wave action are controlled (Magoon and Vining). Taylor Shellfish Farms has had success planting Manila clams in sand with better than average growth rates. Their experience is that predation is much higher in sand and therefore successful establishment requires plastic netting. In sand it is important to pay particular attention to mesh size. A small mesh netting is used in the first year. It is removed and then replaced with larger mesh netting in the second year. Maintenance of netting, particularly at the Cottonwood Beach site, may be complicated by the apparent high energy wave action as evidenced by ripple patterns on the sand surface and exposure to southerly winds (Bill Taylor). The waters of Birch Bay, even near the mouth of Terrell Creek, may be too rough for practical use of netting (Brady Blake).

Manilas, butters and native littlenecks typically live in the sands and fine gravels of gravelly beaches, and depend on larger gravel and cobble to provide stability and protection. Manila clams

prefer beaches composed mostly of large pea gravel with enough silt, sand, or ground clam shell to make the beach firm and stable. They are usually found in protected coves and inlets. The Manila usually resides quite high in the intertidal zone (+3 to +6 ft. elevation), whereas the native littleneck resides up to about +2 ft and butter clams are seldom found higher than 0 ft..
Native littlenecks like a beach with a fairly high sand and shell content. Butters range from sand to gravel although the typical butter clam habitat is a porous mixture of sand, broken shell and small gravel (Magoon and Vining).

## Density of Planting Manilas and Planting Techniques

Anderson et al recommend planting Manila clam seed at a density of 256 to 340 /square yard or 300 to 400 per square meter. Density should not exceed 1000 per square meter with seed less than 1/8inch (3mm) or 600 per square meter with large seed > 10mm. Seed is planted in April or May. A plot size of 100 to 150 square yards is easily managed. Two people can plant up to 300 square yards per day during the rising tide. Seed should be planted the day it arrives from the hatchery in sub units of 20 square yards. Twine stretched across the surface and staked on either end of the plot can be used to delineate sub units. Estimate the number of clams per sub unit based on desired overall density and calculation of the number of clams based on either volume or weight. Clam seed must be kept cool and moist until planting Seed is planted on an incoming tide to avoid dessication. Windy or wavy days should be avoided to insure uniform initial distribution of seed.

Best results have been achieved when planted between the +3 ft to +6 ft range of tidal elevation. choice. If netting is used, It is placed down and staked prior to seeding. This is done by digging an 8-inch deep trench around the edge of the plot and laying the netting over the plot. Every few feet, a stake is driven through the netting in the trench, then backfilled with the natural substrate material. The plot is constructed before the seed arrives. This allows for planting of seed on the incoming tide. Clam seed will dig down immediately through the netting. Siphon holes are apparent within a couple of months. Clam survival is moderate to fair on beaches with high sand or silt content, but surprisingly good on an exposed cobble beach (Magoon and Vining). The use of netting (artificial material) is likely to require additional permitting and may not be necessary nor practical in some situations. If netting is not used, it is advisable to use larger seed (10 to 12 mm) to avoid predation from shore crabs (Brady Blake).

## Manila Clam Predators

Common bird predators include scoters, Goldeneye, crows, and seagulls. Major fish predators include starry flounder, rock sole and English sole. Perch can also eat clams. Clams are a favorite food of dungeness, red rock and shore crabs. Moon snails are major predators of Manila clams. Plastic netting protects against most predators except the moon snail because the juvenile moon snails enter the netting and grow along with the clams (Magoon and Vining). Moon snail predation can be avoided by planting between the +2 and +4 ft elevation (Anderson et al).

## Material costs

Clam seed itself represents the major material expense in this project. Manila clam seed is available from the Lummi Shellfish Hatchery: The cost for seed depends upon size and is currently as follows: $3.50/1000 (2-4mm), $5.00/1000 (4-6mm), $8.00/1000 (8-10mm). Assuming a planting density of 340 seeds per sq. yd and a 150 sq. yd. plot, the estimated seed cost will depend upon the size of seed planted and the method of culture.

*With plastic netting*

3 mm seed is recommended when accompanied by plastic netting. In this case, seed cost would be approximately $178.50 per plot. Plastic netting (Conweb OV-1581 ½ inch mesh) is available from Redden Net Company. It is available in 14-foot widths and in rolls that are 200, 500, or

3,000 feet in length. Netting cost is approximately $115.00 per plot. Cost for stakes and twine is approximately $20.00 per plot. Total cost is $313.50 per plot.

*Without plastic netting*
10-12 mm seed is recommended in the absence of plastic netting. In this case, seed cost would be approximately $408 per plot. The cost for stakes and twine would remain at approximately $20 per plot. Total material expense is $428 per plot.

Permitting

Washington State Department of Health

There is no specific permit that is required by the Washington State Department of Health for clam enhancement. Unless accompanied by a formal community-wide effort to identify and control fecal coliform pollution, it is important to plant shellfish only in areas that are currently Approved for harvest by the Washington State Department of Health, Office of Shellfish Programs. No specific permit is required from DOH for recreational harvesting. However, all harvesters would need a shellfish license from Washington State Department of Fish and Wildlife.

Washington State Department of Fish and Wildlife

**Aquatic Farm Registration.** This registration is primarily for anyone who raises aquatic products for sale. A clam enhancement project such as this one may also register as an Aquatic Farm, however the registration form should be marked "NON-COMMERCIAL". The main purpose of this registration is to allow WDFW to track commercial sales. An Aquatic Farm Registration exempts commercial shellfish growers from Hydraulic Project Approval permitting (Diane Cooper). It is less clear whether a community-based clam enhancement project with an Aquatic Farm Registration would automatically be exempt from this permitting.

**Hydraulic Project Approval:** All commercial aquaculture is exempt from getting an HPA (Brian Williams, Diane Cooper). However, an HPA permit may be required for a non-commercial clam enhancement/clam seeding venture such as this one. The method of culture determines the need for an HPA. If the project requires any type of artificial structure (for example netting, stakes, beach gravelling etc.) an HPA will be required. If no structures such as these are used then an HPA is not required. The form to apply for an HPA is called a Joint Aquatic Resource Permit Application (JARPA). It is an application form that consolidates seven permit application forms for federal, state, and local permits. There is no charge for the HPA. Most applications are processed and mailed within 30 days or less of receipt of a complete application and compliance with the State Environmental Policy Act (SEPA).

Contact
Brian Williams
Washington State Department of Fish and Wildlife
La Conner District Office
PO Box 1100
La Conner, WA 98257
**Telephone**: 360-466-4345 Ext. 250

Department of Natural Resources

**Aquatic Land Lease:** Anyone using tidelands owned by the Washington State Department of Natural Resources (DNR) is required to secure a lease or "right of entry" permit. Lease rates are

negotiated between the user and DNR. None of the sites that are currently being considered for this project are on DNR tidelands.

Contact
Jeff Shreck
Department of Natural Resources
919 N. Township St.
Sedro Woolley, WA 98284
360-732-7411

Army Corps of Engineers

**Section 10 and 404:** The section 10 permit is for construction in navigable waters and the section 404 permit is for the discharge of dredged or fill materials in wetlands or open waters. The Army Corps of Engineers (ACOE) administers these federal permits which apply to all water bodies subject to tidal action and lying below mean high tide. Anything obstructing the water surface is likely to need a permit, for example; floating structures, long lines, poles, or stakes. Beach gravelling or installing plastic netting for clam seeding may require a permit as well. The ACOE will not issue a permit while other permits are pending (Magoon and Vining). The ACOE would also require submission of a Biological Assessment along with the permit application (Brady Blake). Commercial shellfish farms typically only apply for ACOE permits when major structures such as suspended floating shellfish culture systems are employed, as with mussel farming (Diane Cooper).

No ACOE permits are required for clam seeding projects that do not use netting, addition of gravel, or seed with substrate attached. If any structures accompany the project including netting, stakes etc., a section 10 permit is required. It usually takes 4-5 months for permit review due to the need for an Endangered Species Act (ESA) consultation. For any projects in marine waters, it is extremely difficult for the ACOE to make a "no effect" determination regarding ESA. Therefore, they have to consult numerous agencies for review. ACOE permits cost $10 (Randel Perry)

CONTACT
U.S. Army Corps of Engineers
Seattle District Regulatory Branch
ATTN: Randel Perry
Post Office Box 3755
Seattle, WA 98124-3755
**Telephone:** (206) 764-6985
**Fax:** (206) 764-6602

Local Government – Whatcom County/City of Blaine

**Shoreline Permit:** The need for a shoreline permit for aquaculture operations varies depending on the local jurisdiction. For example, typical commercial ground culture methods used for growing oysters and clams, including netting and gravelling for clam seeding, are exempt from permitting in Mason, Thurston, Jefferson, and Skagit counties (Diane Cooper). The current Drayton Harbor Community Oyster Farm operates under a Conditional Shoreline Use Permit from the City of Blaine. Acquiring this permit involved proof of "right of entry" for use of DNR-owned tidelands, completion of a SEPA checklist, vicinity map, and project description. There was also a 30-day opportunity for public review and subsequent public hearing before the Blaine Planning Commission (Geoff Menzies).

If a clam seeding project were carried out in Birch Bay, there would be some limited level of review but due to the low overall project cost, Whatcom County would probably issue a "Shoreline Statement of Exemption". There would most likely be a requirement to submit a

SEPA checklist and project description (Jeff Chalfant). As mentioned above, the first step in the Birch Bay area is to resolve the existing zoning conflict between the Comprehensive Plan and aquaculture endeavors in the bay.

Regardless of the jurisdiction, once the project is better defined as to size, location, and methods of culture, the local jurisdiction needs to be informed and brought on a site visit to best determine whether a shoreline permit is required.

CONTACT

Jeff Chalfant
Natural Resources Planner
Whatcom County Planning and Development Services
5280 Northwest Drive
Bellingham, WA 98226
**Telephone**: 360-380-8100
**Fax**: 360-738-2493

Russell Nelson
Community Planner
City of Blaine
344 "H" Street
Blaine, WA 98230
**Telephone**: 360-332-8311
**Fax:** 360-332-8330

Summary

One location in Birch Bay (South of the mouth of Terrell Creek) and one location in Drayton Harbor (adjacent to Department of Health station # 12) appear favorable for Manila clam enhancement projects. See map on the following page for general location of both sites. It will be necessary for the MRC to resolve three main issues regarding the Terrell Creek site. They are:

1. Tideland ownership and access
2. Compliance with the Whatcom County Comprehensive Plan
3. Proximity to potential fecal coliform pollution from Terrell Creek and concern expressed by the Washington State Department of Health, Office of Shellfish Programs about the suitability of this site for this reason.

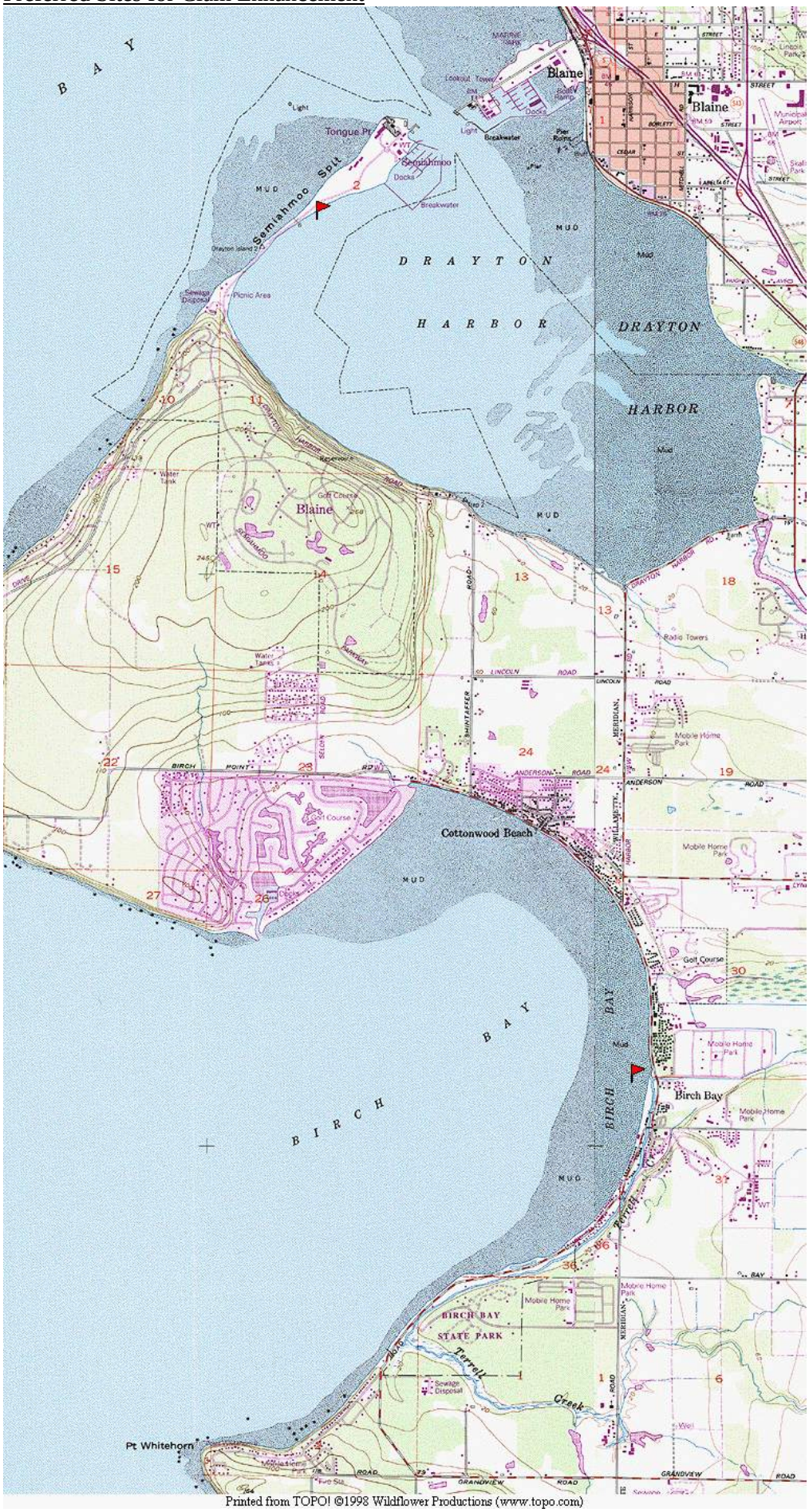
Regarding the site in Drayton Harbor south of Semiahmoo Spit that is adjacent to DOH sampling station 12, it will be necessary for the MRC to discuss this project in detail with the Lummi Nation to determine compatibility with tribal harvest interests in that area.

It is recommended that artificial netting and addition of gravel not be used in this project at either site. This will reduce permitting requirements and seems a better fit for a project associated with the mission of the MRC. This will result in a slight increase in the cost of Manila clam seed because larger seed (10-12 mm) is required to reduce damage from predators in the absence of protective netting. In addition, netting is time-consuming to install and can be difficult to maintain given the fetch, exposure, and potential for significant wave action at both of these sites.

Although the initial intent of this project was to enhance native clam species through a seeding effort, it has become apparent that Puget Sound shellfish hatcheries are not able to produce native clam seed with any proven degree of reliability. In addition, permitting requirements and expenses are increased. There are also concerns about introduction of disease depending on the source of the broodstock and potential narrowing of the gene pool in resident native clam populations that can result from reintroduction of hatchery-reared seed. This is not to say that a native clam enhancement project would not be successful. If undertaken now, and assuming that a hatchery was successful in producing seed, it would be several years before seed would be

available for planting in any of these sites. Should the MRC decide to pursue a native clam enhancement project, it should be based on in-depth discussion and planning with the Point Whitney Shellfish Lab to gain from their expertise and experience in this area.

Preferred Sites for Clam Enhancement



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