

**BURLEY WATERSHED PREVENTION/RESTORATION PROJECT**  
**FINAL REPORT**

**1.0 INTRODUCTION**

Burley Lagoon is an abundant shellfish harvest area that has been utilized as a commercial growing area since the 1930's. According to the "Annual Inventory of Commercial and Recreational Shellfish Areas in Puget Sound", (State Health, 1996) Burley Lagoon has at least 210 acres of commercial shellfish beds.

Burley Lagoon has a documented history of water quality problems associated with failing on-site sewage systems (OSS) and inadequate animal waste management practices. The following is a timeline of events that resulted in the initiation of the 1998 – 2001 Burley Watershed Prevention/Restoration Project:

- (1965) Washington State Department of Health (State Health) sanitary survey of 179 properties in the Burley Lagoon watershed (Kitsap County) identified 53 failing OSS. (State Health, 1965)
- (1978) State Health sanitary survey identified 51 failing or inadequate OSS. As a result, the first partial closure of Burley Lagoon oyster beds occurred. (BKCHD, 1986)
- (1981) State Health downgraded the commercial shellfish classification of this area from *Approved* to *Restricted* due to fecal coliform (FC) contamination. (BKCHD, 1986)
- (1985) A study by the Department of Ecology identified nonpoint pollution from failing on-site sewage systems (OSS) and inadequate livestock rearing practices as the main sources of the fecal coliform pollution. (Ecology, 1985).
- (1986) Health District responded to 1985 study by conducting a sanitary survey of 277 properties in the Burley Lagoon watershed. Twenty-three (23) failing OSS were identified and corrected (BKCHD, 1986).
- (1992) Health District initiated the Burley Watershed Remedial Action Project - a sanitary survey of 497 properties in the Burley Lagoon watershed. (BKCHD, 1994)
- (1993) State Health upgraded the commercial shellfish classification of Burley Lagoon from *Restricted* to *Conditionally Approved*.
- (1994) Health District completed the Burley Watershed Remedial Action Project. Forty-five (45) failing OSS were identified and corrected. (BKCHD, 1994)
- (1997) State Health issued an early warning to Kitsap and Pierce Counties that the commercial shellfish classification of Burley Lagoon was threatened with a downgrade due to elevated levels of FC.
- (1998) In response to the early warning, the Bremerton-Kitsap County Health District (Health District) initiated the Burley Watershed Prevention/Restoration Project.

In January 1999, the Burley Lagoon was downgraded to *Restricted* by State Health due to marine fecal coliform levels in excess of the National Shellfish Sanitation Program (NSSP) water quality criteria for *Approved* shellfish growing areas. (State Health, 1999). As a result of the commercial shellfish downgrade, Kitsap and Pierce Counties were required to implement a closure response effort pursuant to RCW 90.72, "Shellfish Protection Districts". In accordance

with this statute, a Shellfish Closure Response Committee (SCRC) was formed in January 1999, and a joint Kitsap and Pierce County Burley Lagoon watershed protection district was formed in August 1999.

In May 2001, State Health upgraded the status of the southern half of Burley Lagoon commercial shellfish beds from *Restricted* to *Approved* due to improved water quality. This classification upgrade reopened 110 acres, another 110 acres in the northern part of Burley Lagoon remain classified as *Restricted*.

The purpose of this report is to summarize the findings of the 1998 – 2001 Burley Watershed Prevention/Restoration Project. The Project was funded by a Special On-Site Sewage / Shellfish Grant Agreement with the Washington State Department of Ecology (Ecology) and the Kitsap County Surface and Storm Water Management Program (SSWM).

## **2.0 PROJECT AREA DESCRIPTION**

### **2.1 BURLEY LAGOON**

Burley Lagoon is located in southern Puget Sound at the north end of Carr Inlet near Purdy. The lagoon is approximately two miles long and seven-tenths of a mile wide at the south end (which is its widest point) and occupies an area of approximately 348 acres (State Health, May 2001). Burley Lagoon is oriented along a north-south axis. A spit encloses all but approximately 300 feet of the south end of the lagoon. Water movement in and out of the lagoon is restricted to the 300 foot opening at the east end of the spit. Due to the narrow opening, Burley Lagoon does not exchange well with the Puget Sound.

The Burley Lagoon watershed encompasses an area of approximately 16 square miles. The watershed lies within Pierce and Kitsap Counties. Land use in the watershed is a mixture of rural residential and commercial development. All residential sites in the area use OSS for the treatment and disposal of sewage. Nearly all of the commercial development is in the community of Purdy, located along the southeast shore of Burley Lagoon. Many of the commercial sites, including all of the businesses on the shoreline, are connected to the Gig Harbor sewer line.

The commercial shellfish beds in Burley Lagoon are located south of the Pierce/Kitsap County line. Two year-round streams and several small seasonal streams discharge into Burley Lagoon. Burley Creek is the largest of the streams and enters the north end of the lagoon from Kitsap County. Purdy Creek enters the lagoon near the mouth on the southeast shoreline of Pierce County.

Burley and Purdy Creeks flow through Kitsap County before discharging into Burley Lagoon. Burley Creek and its tributaries combine to make up over nine miles of stream corridor, flowing in a southerly direction from headwaters north of Mullinex Road. The mouth station of Burley Creek is located at the downstream bridge across Spruce Road to avoid tidal influence. As reported in the Draft “WRIA 15 (Kitsap County Streams) Salmonid Habitat Limiting Factors”

(Washington State Conservation Commission, 2000), the drainage supports chinook, chum, and coho salmon, steelhead, cutthroat trout and a few reported sockeye salmon.

State Health's "Sanitary Survey of Burley Lagoon" (May 7, 2001) states that there are approximately 220 acres of certified commercial shellfish beds within Burley Lagoon. The commercial shellfish beds are located in Pierce County north of Highway 302 and south of a line drawn across the north end of the lagoon at latitude 47°22.85'N. Oysters and hardshell clams are harvested commercially from the area. Shellfish are grown and harvested from intertidal beds and from floating raft structures. The only commercial harvester of shellfish in the lagoon, Western Oyster Company, estimates an annual harvest value of \$700,000 and employs ten full-time workers (Yamashita, 1997).

Recreational shellfish estimates provided by State Health (Fish and Wildlife, 1996) indicate that the Purdy sandspit, at the mouth of Burley Lagoon, is the second most visited recreational shellfish harvesting beach in Pierce County, with an annual estimate of 4,900 harvesters. Although it is difficult to estimate an economic value associated with the use of the lagoon for recreational harvesting, local merchants and the state realize revenues from purchases of supplies, state shellfish licenses, and gasoline.

Oysters, clams and mussels have been gathered from this area for thousands of years. These activities are an important element in the cultural heritage and community identity of local residents. The inability to harvest shellfish due to habitat degradation (e.g., poor water quality resulting from failing OSS, etc.) represents a loss of these values that will reduce the quality of life (economically, recreationally and culturally) for all people in the region.

## **2.2 POLLUTION IDENTIFICATION AND CORRECTION PROJECT AREA**

**Figure 1** describes the project area, which includes the drainage basins of Bear, Burley and Purdy Creeks, with an emphasis on Burley and Bear Creeks. All surface waters in the project area are classified by the State of Washington as Class AA waters (Ecology, 1992).

There are a total of 443 properties located in the project area. Two hundred thirty six (236) of these properties are adjacent to a fresh water shoreline. The other 207 properties are in upland areas and were surveyed proactively in order to prevent future FC contamination problems. Lot sizes range from 0.25 to 0.50 acres in the town of Burley, to one to twenty acres along Bethel-Burley, Madrona and Oak Roads. Due to the timeframe (1960's) in which development occurred in this area, many of the OSS in the project area are standard gravity type with the drainfield located downgradient of the building structure. OSS repairs since the 1981 shellfish downgrade are often alternative OSS due to poor soils and high water table in the Burley Creek basin.

The average annual rainfall for the past 30 years is 51.5 inches. This is based on data collected at the Washington Department of Fish and Wildlife Hatchery on Minter Creek (State Health, May 2001). Based upon rainfall information collected by Kitsap's Public Utility District #1 at a private location in Port Orchard, average rainfall for the past seven years has been 62.8 inches

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with a maximum of 81.3 inches (10/98-9/99) and a minimum of 38.5 inches (10/00-9/01). The majority of this rainfall occurs between the months of October and April, a period of time generally classified as the “wet season”.

As presented in the “Soil Survey of Kitsap County Area, Washington” (SCS, 1980), the soils along the Burley Lagoon marine shoreline in Kitsap County primarily consist of Tacoma, Harstine, Indianola and Kapowsin soils. The fresh water shoreline areas primarily consist of Harstine, Kapowsin, and Norma soils. All of these soils are rated severe for OSS because of cemented hardpan, general wetness and slow permeability.

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**Figure 1 Project Area Location Map**

### **3.0 HISTORY OF ON-SITE SEWAGE SYSTEM PERFORMANCE IN THE BURLEY LAGOON WATERSHED**

Due to poor soils, elevated average rainfall, and high seasonal water table, the Burley Creek watershed has a history of poor OSS performance:

- (1965) State Health sanitary survey of 179 properties in the Burley Lagoon watershed (Kitsap County) identified 53 failing OSS. (State Health, 1965)
- (1978) State Health sanitary survey identified 51 failing or inadequate OSS. As a result, the first partial closure of Burley Lagoon oyster beds occurred. (BKCHD, 1986)
- (1986) Health District sanitary survey of 277 properties in the Burley Lagoon watershed identified and corrected 23 failing OSS (BKCHD, 1986).
- (1994) Health District sanitary survey of 497 properties in the Burley Lagoon watershed identified and corrected 45 failing OSS (BKCHD, 1994).

### **4.0 GOALS AND OBJECTIVES**

The goals of the Burley Watershed Prevention/Restoration Project are to:

- Protect public health and the environment by identifying and correcting sources of FC contamination from failing OSS and inadequate animal waste management.
- Prevent future FC contamination through public education about OSS operation and maintenance and adequate animal waste management practices.
- In the long term, restore water quality in the watershed to a point which would allow for the upgrade of the shellfish beds to meet the *Approved* classification standard, and the removal of Burley, Bear and Purdy Creeks from the state 1998 Clean Water Act Section 303(d) List of Threatened and Impaired Waterbodies.

To meet the project goals, the following objectives were developed and implemented:

- Track, isolate and identify fecal pollution sources and areas in need of corrective action;
- Enforce correction of failing OSS under Bremerton-Kitsap County Board of Health Ordinance No. 1996-8, "Rules and Regulations Governing On-Site Sewage Systems" (Health District, 1996). Hereinafter referred to as "OSS Regulations".
- Enforce correction of animal waste management practices causing violation of state water quality standards (Ecology, 1992) under Bremerton-Kitsap County Board of Health Ordinance No. 2000-6, "Solid Waste Regulations" (Health District, 2000). Hereinafter referred to as "Solid Waste Regulations". Kitsap's Solid Waste regulations were revised in 2000, facilitating remediation of inadequate animal waste management.
- Address low-income households in the project area by making grant moneys available to qualifying property owners for OSS repairs. Assist homeowners to find grant matches.
- Educate homeowners and occupants about OSS operation and maintenance and adequate animal waste management. Help residents recognize and avoid OSS stresses/problems to get the longest possible lifespan of the system.

- Achieve a high percentage of participation by holding public meetings, taking as much time as necessary with each resident/property owner, and providing free technical assistance.
- Thoroughly assess all properties in the project area, including investigating surface water flows from properties where owners/residents deny access or do not participate.

## **5.0 PROJECT DESIGN AND METHODS**

The project design consisted of three fundamental components: PIC survey, water quality monitoring, and proactive educational activities.

### **5.1 POLLUTION IDENTIFICATION AND CORRECTION SURVEY**

All work performed was conducted according to the methods contained in the “Manual of Protocol for Conducting On-Site Sewage Systems Surveys in Kitsap County, Washington” (Health District, 1995) and “Manual of Protocol: Fecal Coliform Bacteria Pollution Identification and Correction Projects” (Health District, 1999). Both the Washington Department of Ecology and State Health have approved the Health District’s survey protocol manual. This document is available upon request.

The PIC survey consisted of an OSS record search, homeowner/resident interview, field survey, and if necessary, water samples and dye test. The purpose of the survey was to identify all potential sources of FC contamination, including failing OSS and inadequate animal waste management.

Based upon the results of each survey, each OSS was categorized as Failing; Suspect; Non-Conforming; or No Apparent Problems (see **Appendix A** for rating category criteria.) Properties found to be vacant or rated Suspect were contacted annually and surveyed when changes were noted. Failing OSS were corrected pursuant to the Bremerton-Kitsap County Board of Health’s Ordinance No. 1996-8, “Rules and Regulations Governing On-Site Sewage Systems”.

Health District inspectors also identified inadequate animal waste management practices and investigated those properties for potential FC contamination of surface waters. Surface water pollution caused by animal manure is enforced under local solid waste regulations.

The Health District developed a partnership with KCD to assist property owners/residents with inadequate animal waste management. The Health District investigates properties and refers those with potential or actual water quality violations to KCD, giving owners/residents an opportunity to work with a non-regulatory agency. The Health District suspends the correction/enforcement process as long as owners/residents satisfy KCD animal waste management requirements.

Three attempts were made to contact each property owner followed by a letter requesting participation. Properties whose owners/residents denied access to Health District inspectors or did not participate were assessed for proximity to surface waters. Properties with surface waters

near the OSS or animal waste were revisited during wet conditions. Flowing water entering and leaving the property were collected and analyzed for FC.

## **5.2 WATER QUALITY MONITORING**

The Health District conducts baseline monitoring of the fresh waters of Burley Creek basin as part of its countywide water quality monitoring effort funded by the Kitsap County Surface and Storm Water Management Program (SSWM). Monitoring is conducted according to the Health District's "Water Quality Trend Monitoring Plan, Streams and Marine Waters" (BKCHD, 2001).

Two (2) stations along Burley Creek, one (1) station on Bear Creek and one (1) station on Purdy Creek is monitored *monthly* for FC and conventional water quality parameters. The Health District does not collect Burley Lagoon marine water samples due to very shallow waters and muddy tide flats in the Kitsap County portion of the Lagoon.

In addition to trend monitoring, the Health District also conducted "impact monitoring" of six (6) additional stations along Burley, Bear and Purdy Creeks. The purpose of "impact monitoring" was to further segment the stream so that polluted segments could be identified and PIC efforts targeted to those locations.

## **5.3 PROACTIVE EDUCATIONAL ACTIVITIES**

The homeowner/resident survey included a strong educational component to proactively educate property owners about how to properly operate and maintain their OSS and to identify any non-conforming conditions that could cause premature OSS failure.

## **6.0 RESULTS AND DISCUSSION**

### **6.1 POLLUTION IDENTIFICATION AND CORRECTION - OSS SURVEY**

The pollution identification and correction OSS survey was conducted from November 1998 to December 2001. During this period, a total of **443** properties (439 residences and four businesses) were surveyed, including **236** shoreline and **207** upland properties. In addition, OSS records were located and evaluated, residents were interviewed, water samples were collected and OSS were dye-tested (when necessary) and OSS and other potential sources were rated according to the protocols set forth in the "Manual of Protocol: Fecal Coliform Bacteria Pollution Identification and Correction Projects" (Health District, 1999).

#### **6.1.1 OSS Survey Results**

**Table 1** and **Figures 2 and 3** summarize the project OSS survey results. OSS were rated according to "Criteria for Rating OSS Inspection Results" in **Appendix A:**

- A project total of **31** OSS failures (**8%**) were found. A descriptive list of the OSS failures is contained in **Appendix B1**. The 8% failure rate found in the Burley Creek basin is in

the middle of the range of failure rates (3% - 16%) found in other areas of Kitsap County surveyed by the Health District over the last twelve years.

- A project total of **15** suspect OSS (**4%**) were found.
- A project total of **89** non-conforming OSS (**24%**) were found.
- A project total of **72** OSS (**20%**) with no records were found.
- A project total of **159** OSS (**44%**) were rated as no apparent problems.

**Figure 3** illustrates a summary of visited residences in the project area. Eighty-three percent of the homes in the project area were surveyed and five percent were vacant. A total of **77** OSS have not been surveyed. Health District inspectors attempted to contact residents three times by cards left at the door or phone messages, followed by a registered letter. Properties were evaluated during wet weather conditions for their proximity to surface water and any surface waters leaving the properties were collected. **Thirty-six (36)** residents were rated as “**did not participate**” because there were no contaminated surface waters leaving the properties. **Twenty-three (23)** properties were **vacant**. **Eight (8)** property owners denied access for the field inspection and investigations show no FC problems. **Ten (10)** properties with surface waters will be investigated and **twenty-one (21)** properties will be reinspected during wet weather.

### **6.1.2 Failing OSS Grant Repair Program**

The failing OSS grant repair program was extremely helpful and saved considerable resources. Property owners were less likely to deny access, resulting in time-consuming investigations and search warrant preparation, because of the availability of grant funds to assist low-income landowners to repair failing OSS. One property owner denied inspectors access to the property. Health District staff sampled surface water flows leaving the property downgradient of the drainfield and presented the results to the property owner. He was informed that he was eligible for a 75% grant to repair the OSS. He permitted access to sample surface water and to dye test the system. The property is now served by an alternative OSS, which was partially funded by this grant.

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**Table 1 Summary of OSS Sanitary Survey Results**

**Figure 2 Summary of Results by Rating Category**

**Figure 3 Summary of Visited Residences**

### **6.1.3 Analysis of Failures**

Twenty-eight of the 31 (90%) failing OSS were located adjacent to surface waters and three (10%) were located in upland areas. Six of the 31 failures (19%) can be considered direct discharges to surface waters. One of these had a direct discharge that entered a tributary to Purdy Creek, one drainfield was covered by Burley Creek during wet weather conditions, one drainfield was uncapped and discharged to a roadside ditch, and three drainfields were cross connected into curtain drains discharging to surface waters.

The following factors have been related to OSS failure in previous surveys. Of these, age of the OSS and homeowner maintenance of the OSS have been the most prevalent causes of failure:

- Age of the OSS;
- Close proximity of the OSS to surface water bodies;
- Poor soil types and shallow depth to water table/impervious layer;
- Inadequate or lack of maintenance of the OSS;
- Number of previous repairs (failure history); and
- Grey water discharge.

Relative to these factors, the Burley project results showed that:

- Five (16%) of the 31 failing OSS were 15 years old or older;
- Twelve (39%) of the failing OSS were located less than 100 feet from a marine or fresh water body;
- One (3%) of the failing OSSs had failed, and been repaired, at least once in the past;
- Three (10%) of the failing OSS were grey water discharges; and
- Ten (32%) of the failing OSS were linked to system abuse through poor installation or damage to the drainfield area.

As shown above, proximity of the OSS to surface waters and poor installation/damage to the drainfield appear to be the two factors most in common with failing OSS in the Burley project area. As shown in **Appendix B2**, only one failure was linked to prior repairs.

### **6.1.4 Types of OSS Repairs and Maintenance Requirements**

Twenty-nine of the 31 failing OSS (94%) have been repaired: fourteen (48%) were repaired with Alternative OSS, seven repairs (24%) were pump to gravity, and one (4%) was gravity. Seven (24%) minor repairs were accomplished: one replaced a pump; one removed a fencepost from a drainfield, one repaired a damaged curtain drain, one removed a cross-connecting curtain drain, one capped the drainfield pipe and added a curtain drain, and two connected grey water discharges into the septic tank. One of the unrepaired OSS has an accepted repair plan and is awaiting installation. The last failing OSS was found in December 2001 and is in the correction process.

New state and local regulations require that all OSS be properly maintained and operated. The requirements of Bremerton-Kitsap County Board of Health Ordinance 1995-14, “Regulations for Operation and Maintenance of On-Site Sewage Treatment Systems” are in place. All alternative septic systems are required to have ongoing operation and maintenance and all standard gravity septic systems require a septic tank inspection every three years.

## **6.2 POLLUTION IDENTIFICATION AND CORRECTION - ANIMAL WASTE SURVEY RESULTS**

Kitsap Conservation District (KCD) inventoried all properties in the watershed and forwarded a list of 19 properties considered high priority due to animal waste near surface waters. Health District inspectors identified other properties with animal waste near surface waters during the survey, and investigated them for potential FC contamination of surface waters.

**Appendix B2** summarizes status of properties with animal waste near surface waters. **Eight (8)** water quality violations related to inadequate animal waste management practices were identified in the project area. One of these was located on the marine shoreline and the others drained to Burley Creek.

- **One (1)** property (marine shoreline) worked with KCD to develop and implement an animal waste management plan including exclusion structures and is under investigation.
- **Two (2)** properties with violations and one (1) additional property owner participated in the federal Environmental Quality Incentive Program (EQIP). KCD installed extensive BMP projects including heavy use exclusion areas, manure storage, and pasture renovation.
- **One (1)** property owner fenced a wetland from livestock access.
- **One (1)** property owner removes livestock in the wet weather season and is working with KCD to plan a manure storage structure.
- **Two (2)** property owners chose to remove animals
- **One (1)** is still under investigation.

Of the **eight (8)** Burley farms still under investigation, three have worked with KCD on animal waste management plans. Several new property owners in the area have taken advantage of KCD free technical assistance while planning and implementing agricultural activities.

One property owner with a manure pile in close proximity to Burley Creek denied inspectors access to sample flows to Burley Creek. Health District staff found water sample sites entering and leaving the property and gained permission to cut through heavy brush on an adjacent private property to collect samples. Several neighbors asked about this site and were told of the ongoing investigation, which to date has not identified a water quality violation. While performing a neighboring inspection, inspectors noted that the manure pile in question was carefully covered nearly two years after inspectors were denied access.

## **6.3 WATER QUALITY MONITORING RESULTS**

State Health weights water quality sample collection toward adverse pollution conditions. State Health's "Sanitary Survey of Burley Lagoon" notes that two-thirds of the current water quality dataset was collected during ebb tide, a condition which known to result in adverse water quality in the Lagoon (State Health, May 7, 2001). Despite this fact, the following results demonstrate that source correction implemented in this watershed have been successful:

- In May 2001, State Health upgraded the status of the southern half of Burley Lagoon commercial shellfish beds from *Restricted* to *Approved* due to improved water quality. This classification upgrade reopened 110 acres, another 110 acres in the northern part of Burley Lagoon remain classified as *Restricted*.
- Don Lennartson of State Health reports on Burley Lagoon water quality at ongoing Closure Response Committee (SCRC) meetings. State Health added a water quality monitoring station just north of the monitoring station (Station 339) that triggered the 1999 closure to determine the pollution contribution from the area north of the shellfish beds including Burley Creek basin in Kitsap County. Don Lennartson reported at the December 2000 SCRC meeting that he evaluated same day water quality data collected at station 339 and north of station 339. He noted that there had never been a clear indication that high counts from the north may be contaminating the closure area. Lennartson reported at the June 2001 SCRC meeting that every time station 339 is high, the station north of 339 is lower. DOH believes that an intermittent land-based FC source located west of station 339 is responsible for high FC counts.

The Health District's water quality monitoring data from the mouth of Burley Creek appears to show improvement due to FC source correction:

- **Table 2** is a summary of FC results at the mouth of Burley Creek from 1996 through October 2001. FC water quality levels at the mouth of Burley Creek are still above both parts of the state water quality standard of 50 FC/100 ml in Class AA fresh waters (Chapter 173-210 WAC).
- **Figure 4** illustrates a trend analysis of the most recent 30-sample FC GMVs at the Burley Creek mouth station. The most recent set of 30-samples includes sample events conducted from 3/30/99 through 10/30/01, roughly the same time period of the Burley project. While tests for statistical significance were not performed, Figure 2 appears to indicate that FC levels are declining at the mouth of Burley Creek.

**Table 2 Summary of Burley Creek Monitoring Results**

**Figure 4 Burley Creek Fecal Coliform 30-Sample GMVs and Trendline**

The Health District believes that FC levels will continue to decline in Burley Creek for the following reasons:

- Two (2) failing OSS are still awaiting repair.
- Additional time is needed for the full benefits of OSS repairs and BMP implementation to be realized. FC are entrained in the sediments of this silty, low-gradient creek bed, and future storm events are needed to flush them out of the system. The most recent water year (10/00 – 9/01) was unusually dry - 38.5 inches of rainfall.
- As presented in **Table 3**, the FC GMV and Part 2 exceedances are twice as high during the dry season as they are during the wet season. (Wet season is defined in OSS Regulations as November through April and dry season is May through October). This is consistent with direct discharging OSS and livestock access to the stream corridor. The Health District believes that these types of sources have now been controlled in the project area.

#### **6.4 PROACTIVE EDUCATIONAL ACTIVITIES**

Proper septic system operation and maintenance was one of the primary focuses of the Burley Watershed Prevention/Restoration Project. Health District staff provided homeowners with educational brochures and a copy of the sewage disposal permit/as-built on file at the Health District for their home. Health District staff emphasized to homeowners that proper operation and maintenance is crucial to prevent septic system failures and protect water and shellfish quality in the Burley Lagoon area.

The KCD and the Health District led preparation of a newsletter (see **Appendix C**) for the Burley SCRC as a report to cooperators, participants, and interested watershed residents about the extensive restoration activities that have taken place in this watershed. Four hundred and five copies were mailed to Kitsap County property owners and residents in summer 2001. Pierce County Water Programs paid for printing the newsletter and Kitsap County SSWM paid for the mailing.

The Health District developed and manned a “hands-on” booth on OSS operation, maintenance and landscaping during the South Kitsap Garden Tour on June 23, 2001. A team of Health District OSS maintenance contractors and regulators was available at the booth to answer questions, demonstrate septic tank retrofitting, give landscaping tips, and discuss and display successful homeowner OSS operation and maintenance. The program included free educational presentations on operating, maintaining and landscaping OSS. An OSS landscaping contest was held and prizes were distributed to the systems deemed most creative, most easily maintained, and water wise. Photos and plot plans of the winners were posted, and will be stored in a landscaping portfolio, in order to share creative, septic-friendly ways of landscaping septic components. Several Burley residents who have repaired their OSS have expressed interest in entering the landscaping contest next year. **Appendix D** is a copy of the 2002 Garden Tour brochure.

**Table 3 Summary of Burley Creek Wet versus Dry Season Monitoring Results**

## **7.0 CONCLUSIONS**

The findings of the Burley Project are:

- The first two project goals and all of the objectives listed in Section 4.0 have been met. In addition, 110 acres of commercial shellfish beds have been upgraded to *Approved* status, and Burley Creek trend monitoring data appears to show declining FC levels.
- Failing OSS appear to be a major source of FC contamination to Burley Creek. Thirty-one (31) of 366 OSS inspected were found failing for an OSS failure rate of 8%. This failure rate is in the middle of the range (3% - 16%) of failure rates found in other areas surveyed by the Health District over the last twelve years.
- Twenty-eight of the 31 (90%) failing OSS were located adjacent to surface waters and three (10%) were located in upland areas. Six of the 31 failures (19%) can be considered direct discharges to surface waters.
- Proximity of the OSS to surface waters and abuse linked to damage or poor installation appear to be the two factors most in common with failing OSS in the Burley project area. Twelve of the 31 (39%) failing OSS can be attributed to surface or ground water intrusion into the system and ten (32%) are the result of abuse. Only one failure was linked to prior repairs which indicates that past OSS repairs in the area have been successful.
- Inadequate animal waste management practices appear to be a significant source of FC contamination to Burley Creek. Eight water quality violations related to inadequate animal waste management practices were identified in the project area. One of these was located on the marine shoreline and the others drained to Burley Creek. Eight properties are still under investigation, and three are working with the KCD on animal waste management plans.
- The failing OSS grant repair program was extremely helpful and saved considerable resources for both the property owner and the Health District.
- Bob Woolrich of State Health's shellfish program was quoted in The Bremerton Sun on April 18, 2001, "I think Kitsap County has a program that we would love to see in other counties...they respond quickly to surface water problems in shellfish-growing areas. The citizenry there seems to have a heightened awareness of surface water problems."
- Puget Sound Water Quality Action Team stated "The PIC [The Health District's Pollution Identification and Correction] program has demonstrated success in addressing nonpoint pollution, and special credit should go to the cooperation, hard work and commitment of local staff that developed this innovative approach." (corresp. March, 2001).

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- Although beyond the scope of this project, the Health District was invited to present an overview of the PIC program at an International Conference on Shellfish Restoration held in Nanaimo, British Columbia the week of September 17, 2001. The presentation featured the Burley PIC project as an effective and efficient method of protecting and restoring commercial shellfish beds.
- The Conservation District is a valuable non-regulatory partner/resource that provides free technical and financial assistance to property owners.
- Consistent follow-up is essential to ensuring that all potential FC pollution sources are identified.

## **8.0 RECOMMENDATIONS**

Based upon the conclusions of the Burley Watershed Restoration/Prevention Project, the Health District recommends the following:

- The Health District encourages community residents and other project participants to realize that further declines in FC levels in Burley Creek are going to take time. FC are entrained in the sediments of this silty, low-gradient creek bed, and future storm events will be needed to flush them out of the system.
- The Health District will continue monitoring Burley Creek fresh waters as part of the baseline water quality monitoring program.
- The Health District will work with property owners to ensure that the two failing OSS remaining are corrected.
- The Health District will finish investigating the 31 properties listed in **Appendix E**.
- The Health District encourages the Department of Ecology to provide additional failing OSS repair grants as they save considerable resources for the property owner, local government, and state government.
- Other Health Districts and County Health Departments are encouraged to pursue the use of local solid waste regulations to enforce correction of animal waste management practices causing water quality violations.

## **9.0 REFERENCES**

Bremerton-Kitsap County Board of Health. Ordinance Number 1996-8, Rules and Regulations of the Governing On-site Sewage Disposal, 1996.

Bremerton-Kitsap County Board of Health. Ordinance Number 2000-6, Solid Waste Regulations, August 2, 2000.

Bremerton-Kitsap County Health District. Burley Lagoon – Minter Bay Project: Survey Results, 1986

Bremerton-Kitsap County Health District. Manual of Protocol for Conducting OSS Sanitary Surveys in Kitsap County, Washington, 1995.

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