AIR, WATER AND LAND RESOURCES QUALITY

(Goal 6)

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AIR QUALITY IN TILLAMOOK COUNTY

1.1 Overview

Tillamook County, known for its Acheese, trees and ocean breeze≅, has a high level of air quality. Prevailing winds come form the southwest during the winter months, and the northwest in the summer, at velocities that cleanse the air of what little air pollutants exist. Major sources of air contaminants in the County include slash burning on forest lands, motor vehicles, forest fires, and lumber mills. The Department of Environmental Quality (DEQ) has determined that the region meets all primary and secondary ambient air standards. No development is planned or anticipated that may create air quality problems in the County. The population growth anticipated is not of sufficient magnitude to affect air quality standards. No air sampling equipment has been located in the County on a permanent basis, and there are no plans to do so.*1*

Infrequently, climatic conditions cause air pollutants from the mills to be trapped under a cloud cover, causing localized nuisance conditions. Heavy tourist traffic in the summer months can cause congestion in areas such as downtown Tillamook, affecting air quality along the major arterial, U.S. Highway 101. The traffic volume is not great enough, as discussed later, to exceed DEQ standards at any point in the County. Complaints about emissions from the mills are rare, according to the Tillamook DEQ office.

Three open-burning garbage dumps have been closed and the County now operates a central sanitary landfill for solid waste disposal, thus eliminating a major previous source of air pollution in the County.

1.2 Federal Requirements

In 1974, the Environmental Protection Agency (EPA) issued air quality regulations under the 1970 version of the Clean Air Act (P.L. 91-604) for the prevention of significant deterioration of air quality. Thee regulations established a scheme for protecting the areas with air quality cleaner than the national ambient air standards. EPA=s prevention of significant deterioration regulatory scheme was further modified by 1977 amendments to the Clean Air Act (P.L. 95-595).

Under existing EPA regulations, Aclean areas≅ of the nation can be designated under one of three Aclasses≅. Specified numerical Aambient increments≅ of net air pollution increases are permitted under each class up to a level considered to be significant for that area. Class I increments permit only insignificant air quality deterioration; Class II increments permit moderate deterioration; Class III increments allow for the greatest amount of deterioration, but in no case beyond the national air quality standards.

Under the federal regulations, all areas of the state are automatically classified as Class II areas, except for mandatory Class I areas and Anon-attainment≅ areas. The area classification scheme is administered and enforced through a pre-construction and pre-modification permit program for specific types of stationary air pollution sources. No such air pollution sources could begin construction of modification unless EPA and DEQ have found that the source=s emissions will not exceed the numerical Aincrements≅ for the applicable class, and that the source would use the best available air pollution control technology. New rules for these determinations were adopted by the State in 1981.

Under this classification scheme, Tillamook County is a Class II area. According to DEQ=s Handbook for Environmental Quality Elements of Oregon Local Comprehensive Plans, the Tillamook County airshed has 100 percent of its Class II TSP and SO2 Aincrements≅ still available to it. This implies that some air quality deterioration, through industrial development, could take place without exceeding national air quality standards. Although certain areas were considered for inclusion in the federal wilderness areas system through the RARE II process, none were established. Therefore, future development in the County will not affect AClass I≅ areas.

1.3 State Requirements

The DEQ air quality program is intended to meet air quality standards of the federal and state governments. The standards include primary standards and secondary standards. Primary standards are designed to protect the public health, while secondary standards are aimed at such things as visibility, nuisance and similar impacts. The standards address Athe major pollutants of concern≅: Total suspended particulates, sulfur dioxide, carbon monoxide, photochemical oxidants and hydrocarbons. In several instances, state standards are more strict than federal standards, as illustrated in the following table.*1*

1 Source: Oregon Air Quality Report, Oregon Department of Environmental Quality,

Portland.

TABLE 1

AMBIENT AIR QUALITY STANDARDS FOR OREGON

POLLUTANT	AVERAGING TIME	FEDERAL STANDARDS Primary (Health)	Secondary (Welfare)	State of Oregon Standards
Suspended Particulate Matter	Annual Geometric Mean 24 Hours Monthly	75 ug/m^3 260 ug/$m^{3\leftarrow}$ ----------	60 ug/m^3 150 ug/$m^{3\leftarrow}$ ----------	60 ug/m^3 150 ug/$m^{3\leftarrow}$ 100 ug/$m^{3\uparrow}$
Carbon Monoxide	8 Hour$^{\leftarrow}$ 1 Hour$^{\leftarrow}$	10 mg/m^3 40 mg/m^3	10 mg/m^3 40 mg/m^3	10 mg/m^3 40 mg/m^3
Sulfur Dioxide	Annual Arithmetic Average 24 Hour 3 Hour	80 ug/$m^{3\leftarrow}$ 365 ug/$m^{3\leftarrow}$	None None 1300 ug/$m^{3\leftarrow}$	60 ug/m^3 260 ug/$m^{3\leftarrow}$ 1300 ug/$m^{3\leftarrow}$
Photochemical Oxidants	1 Hour$^{\leftarrow}$	160 ug/m^3	160 ug/m^3	160 ug/m^3
Nitrogen Dioxide	Annual Arithmetic Average$^{\leftarrow}$	100 ug/m^3	100 ug/m^3	100 ug/m^3
Hydrocarbons (Non-methane)	3 Hour$^{\leftarrow}$ (06-0900)	160 ug/m^3	160 ug/m^3	160 ug/m^3
Lead	Monthly	----------	----------	3 ug/m^3

NOTES: $^{\leftarrow}$ Not to be exceeded more than once per year.
$^{\uparrow}$ 24 hour average not more than 15% of the time.
ug/m^3 = Micrograms per cubic meter
mg/m^3 = Milligrams per cubic meter

1.4 Findings and Policies

Findings

a. Air quality is being maintained in Tillamook County as shown by the

following table giving data for the county for 1978 and 1980 as compiled by the State. The 1980 data includes emissions volumes for the open-burning garbage dumps which were eliminated in that year. Elimination of the volumes from the dumps from the 1980 totals would result in reductions of 6.4% for total suspended particulates, .63% for sulfur oxides, .77% for nitrogen oxides, 1.65% for carbon monoxide and 3.64% for organics.

EMISSIONS (Tons/Year)		
	1978	**1980**
Total Suspended Particulates	649.0	656.7
Sulfur Oxides	408.0	415.9
Nitrogen Oxides	1,996.0	2,044.5
Carbon Monoxide	13,500.0	13,516.9
Organics	N/A	2,159.5

b. The state through the Environmental Quality Commission, maintains the ultimate authority over the placement of industry with significant impacts on air quality. Each proposed facility must be evaluated on a case-by-case basis County residents support industry which is considered Aclean≅, such as the Exact Electronics plant at the Port of Tillamook Bay industrial park. The economic element of this plan places mush emphasis on the development of tourism and Anatural resource≅ based industry.

Policies

a. Tillamook County shall include in its land use standards and regulations requirements that federal and state air quality standards be met.

b. Tillamook County shall continue to encourage expansion of employment opportunity and new economic growth in industries offering a minimum of adverse impact on air quality.

2. WATER QUALITY IN TILLAMOOK COUNTY

2.1 Overview

Closely associated with comprehensive land use planning is the recognition of water as a valuable resource to Tillamook County. Both water quantity and quality are important in maintaining a wide range of beneficial uses within each river basin. The water resources section of the Goal 5 element of this plan lists beneficial uses of the waters in Tillamook County streams. These uses are to be protected by development of programs to enhance water quality.

An indication of the present generally good water quality conditions in Tillamook County streams may be found in their production of steelhead, cutthroat, coho and chinook as well as resident fish species. Nevertheless, there are some serious pollution problems in waters of the county.

The State Department of Environmental Quality has established 32 water quality monitoring stations in estuaries of the County, 6 each in Nehalem Netarts and Nestucca Bays, and 14 in Tillamook Bay. Thirty-three other monitoring stations are established in tributaries. Analysis of water quality is made of an extensive list of constituents or parameters that determine basic water quality conditions. These include:

1. Water Temperature, C
2. Stream Flow, CFS
3. Turbidity, JTU
4. Color, PT-CO Units
5. Field Conductivity, Micromho/cm
6. Conductivity at 25 C. Micromho/cm
7. Dissolved Oxygen, mg/1
8. D.O. Saturation Percent
9. BOD, 5-Day, mg/1
10. pH STD Units and Field pH
11. Total Alkalinity, as CaCo3, mg/1 (field and laboratory)
12. Residue, Total
13. Residue, Total non-filterable
14. NH3-N, Total
15. NO3-N, Total
16. Kjeldahl N
17. Ortho-PO4, as PO4
18. Total PO4, as PO4
19. Total Hardness, as CaCO2
20. Sodium, mg/1
21. Potassium, mg/1
22. Chloride, mg/1
23. Sulfate, mg/1

24. Total Coliform Organisms, MPN
25. Fecal Coliform Organisms, MPN

From the DEQ monitoring of the county=s coastal estuaries and tributary streams, three significant water quality problems come to light: Coliform bacteria concentrations are periodically high in most waters, turbidity levels increase with the heavy winter runoffs, and water temperatures often exceed desirable fishery levels during low flow periods. All other water quality parameters are good to excellent, reflecting natural conditions.

Coliform Bacteria. Even though the major domestic waste sources in the county are treated and adequately disinfected, the in-stream and estuary coliform concentrations rise disproportionally to all expectations. Numerical standards are widely violated. An evaluation of the probable causes reveals several possibilities. Foremost, practically all of the streamside agricultural lands in the county are used for livestock pastures. The watersheds of Tillamook County pastured over 16,000 dairy stock one year recently - - more cattle than people in some localities. Runoff from such lands brings the cow manure factor - - in the form of bacteria - - to the streams and bays. This relationship between cattle concentration, high rainfall, and runoff prevails throughout the county. It has been fully documented for Tillamook Bay in the recently published ATillamook Bay Drainage Basin Agricultural Non-point Source Pollution Abatement Plan≅ prepared by the Tillamook County SWCD and Tillamook Bay Water Quality Committee.

Another major contributor to stream borne coliform bacteria in the basin is the presence of large herds of resident, wild game animals. Coastal elk are universally distributed in the area, a total estimated by the Department of Fish and Wildlife at over 4,000 head. Aside from their broad ranging for food, they have a habit of wallowing in the bogs and streams during the summer heat periods. In some areas their manure accumulations reach substantial proportions, thus contributing coliform bacteria in significant quantities. In some areas beaver populations literally pave the small stream bottoms with their fecal droppings. There is no proof that these animal bacteria are of any particular public health significance in the waterways, but their presence is detected in the monitoring programs and published as violations of standards. Beaver droppings are suspected as a possible source of giardia infection in some small water supply systems.

The following table presents the range of total coliform and fecal coliform counts for Tillamook County estuaries.

TILLAMOOK ESTUARIES

RANGE OF BACTERIOLOGICAL DATA

	TOTAL COLIFORM/FECAL COLIFORM			
LOCATIONS	**MPN TC/100 ML**		**MPN FC/100 ml**	
	June-Oct	**Nov-May**	**June-Oct**	**Nov-May**
NEHALEM BAY				
Opp. USOG Station (5)	3-460	3-1,100	3-23	3-300
@Brighton opp. marina (4)	3-460	4-460	3-93	3-300
Opp. Paradise Cove Marina (3)	3-460	93-1,100	3-460	9-460
Opp. Wheeler (2)	150-460	43-1,100	39-460	23-1,100
Opp. Nehalem	25-1,100	4-1,100	3-460	3-1,100
TILLAMOOK BAY				
45 yds. N. of temporary marker (1)	4-1,100	3-1,100	0-1,100	3-1,100
50 yds. N. of temporary marker (2)	0-11,000	3-11,000	0-1,100	3-1,100
Pile near sunken jetty (3)	0-11,000	3-11,000	0-4,600	3-4,600
N. end Dick Point (4)	3-11,000	3-11,000	0-4,600	3-4,600
Memaloose Point (5)	3-1,100	3-1,100	0-460	3-1,100
Pitcher Point (6)	3-1,100	3-1,100	0-150	3-460
1.59 mi. W. of Sandstone Point (7)	3-1,100	3-1,100	0-460	3-1,100
Flashing green light #17 (8)	3-1,100	3-1,100	0-150	3-460
Flashing light #19 (9)	3-1,100	3-1,100	0-150	3-460
Hobsonville Point (10)	3-1,100	3-460	0-240	3-460
0.55 mi. W. of Sandstone Point (11)	3-11,000	3-11,000	3-2,400	3-930

S. end of Dike Point (12)	23-93	43-1,100	4-93	4-460
0.25 mi. S. of Sandstone Point (13)	------	2-93	------	3-23
400 yds. S. of temporary marker (14)	3-43	9-460	3-15	3-93
NETARTS BAY				
300 yds. W. of Hwy junction (5)	3-93	3-43	3-43	0-9
600 yds. S.W. of Station #3 (4)	3-240	-43	3-43	3-9
0.4 mi. s. of Wilson Beach (3)	3-43	-43	3-43	3-9
Opp. boat ramp (2)	3-240	3-93	3-23	3-4

Turbidity and Sedimentation: Stream turbidities are directly correlated with the intensity of rainfall. Turbid water in basin steams occurs for a short period of several days during the peak of major storms, but clears readily and remains clear between storms. As would be expected, streambank erosion in the very steep, mountainous terrain contributed much of the earthen substances. Also, there are still areas in the Tillamook Forest that have not been fully reforested following the devastating fires of the 1930-1940 period.

Oregon=s Statewide Assessment of Nonpoint Source Problems, DEQ published in August, 1978 also identified that a Asevere≅ sedimentation problem exists for streams in the County. A detailed study of sedimentation turbidity problems in Tillamook Bay and Tillamook basin has been conducted.**1*

The U.S. Department of Agriculture, in cooperation with a variety of agencies, **2* has completed a major study of erosion problems and sediment deposition in the Tillamook Bay Drainage Basin. The study results can be used as a basis for the development of a planned program for controlling erosion in the watershed.

Objectives of the study were:

a. To inventory the gross erosion rates by suitable categories under present conditions;

b. To estimate the sediment yield under existing use and management;

c. To develop and evaluate alternative measures and land use and management plans;

d. To estimate future sediment yields for various alternative land management plans;

e. To assess economic effects of soil erosion and sedimentation and evaluate economic consequences of proposed alternative solutions or plans;

f. To recommend opportunities for implementation of erosion and sediment control measures.

The study objectives were accomplished by using both commonly accepted and, where necessary, innovative and new techniques and procedures. Erosion and sediment samples were taken form 160 sample plots and 14 stream gaging stations, respectively, over a two-year period. Aerial low-level photography, taken at different time periods, was analyzed and compared to assist in evaluating streambank erosion. Analysis and evaluation of the nature and extent of erosion problem areas was aided by the use of space-age earth satellite telemetry. On-the-ground examinations and field examinations and field investigations of erosion and sediment problems were conducted. The bay was sampled at 52 surface sites and at 14 core sites. All of the known published and unpublished materials related to Tillamook were studied, compared and evaluated. Technical information was obtained from specialists and experts in several different scientific disciplines, from universities, from agencies of state and federal government, and from consultants and individuals with expertise in specialized subject matters. An erosion and sediment computer model was programmed for the basin to determine least cost alternatives of sediment reduction.

ESTIMATED SEDIMENTATION 1875 - 1975

Temperature. There are no thermal wastes that contribute measurably to stream temperature rises in the basin. Elevated temperatures result form solar heating, and such heating generally becomes significant only in those streams that are heavily drawn upon for consumptive irrigation supplies. Fortunately, there is good steam side cover along most waterways to help shade the waters.

DEQ=s non-point source problem assessment, cited in the bibliography, indicates elevated water temperatures to be a Amoderate≅ problem for most streams in the County except for the Nehalem, rated Asevere≅.

Soil Erosion

Agricultural Lands

Erosion on agricultural lands in the basin is confined to two types - - sheet and rill erosion and streambank cutting. Although the vegetative cover is generally permanent pasture and in good condition, overbank flow during periods of high water has resulted in sporadic sheet and rill erosion, such erosion normally occurring in the form of very narrow rivulets. Streambank erosion in the basin is the more serious and prevalent type of agricultural lands erosion.

There are 29,490 acres of agricultural resource area, and the study found that in an average year, 13,381 gross tons of erosion and 9,010 gross tons of sediment of agricultural lands occurs annually. Results for each of the five river basins are available in the Main Report.

Forest Lands

By comparison, there are 323,050 acres of forest land, and within an average mean year, 286,245 gross tons of erosion and 51,063 gross tons of sediment occur. These figures suggest a very serious problem, which the study concludes can be traced to Anumerous fires and increasing activity by man on the upper basin slopes≅.*1*

Detailed erosion/sediment results are available for the five basins and also for subbasins, and a summary of results is provided as follows:

1 Tillamook Bay Drainage Basin Erosion and Sediment Study, 1978, page VII-4.

FOREST LANDS

MEAN ANNUAL GROSS EROSION AND SEDIMENT RATES

Sub Basin	Area Sq. Mi.	Gross Erosion Rate-Ton/Mi2/Yr.	Gross Sediment Rate-tons/Mi.2/Yr.
Tillamook	52.45	793.68	135.30
Miami	37.95	539.97	53.70
Upper Kilchis	33.44	360.05	32.00
Lower Kilchis	23.45	578.45	98.54
S. Fork Kilchis	10.80	967.23	92.60
Lower Wilson	74.56	557.07	114.20
Upper Wilson	89.00	323.97	46.80
N. Fork Wilson	25.67	276.72	16.21
Main Trask	109.25	718.57	150.90
E. Fork Trask	29.42	985.79	246.45
S. Fork Trask	20.61	240.45	52.90
Total (Mean Annual)	**506.60**	**286,245 Tons/year**	**51,603 Tons/year**

2.2 Federal Requirements

a. The Safe Drinking Water Act

This act established primary standards with which Oregon must comply, and a set of secondary standards relating to the taste, odor and appearance of the drinking water. At the present time, the secondary regulations are not in effect, and the EPA does not have enforcement authority for these regulations. Underground water supplies are protected from contamination by this act also.

The primary standards are designed to include maximum contaminant levels, treatment techniques utilizing the best methods available within reasonable cost considerations.

The law also provides for:

(1) Research and studies regarding health, economic and technological problems of drinking water supplies. Specifically required are studies of viruses in drinking water and contamination by cancer causing chemicals;

(2) A survey on the quality and availability of rural water supplies;

(3) Aid to the States to improve drinking water programs through technical assistance training of personnel and grant support. A loan guarantee is provided to assist small water systems in meeting regulations if other means of financing cannot reasonably be found.

b. The Water Pollution control Act Amendments

In 1972 a series of amendments to the 1948 Federal Water Pollution Control Act were enacted by Congress. The Act provides for much stricter control of municipal and industrial polluters. Of importance to Tillamook County is the requirement that non-point sources of pollution be controlled.

The Act provides for planning to be done on three levels. First, at the river basin scale, Section 303 (e) requires states to develop plans for each river basin, to set a general framework within which planning for control of Oregon Department of Environmental Quality has released a water pollution prevention program. The standards set in the plan are enforced, and all dischargers must meet effluent limitations.

Section 208 provides for water quality planning at a somewhat smaller scale than the basin-wide planning under Section 303 (e). A regional planning tool, Section 208 is used to develop management programs to prevent or control both point and non-point source pollution, through adoption of best management practices. Priorities for Section 208 planning include control of erosion and sedimentation, fecal coliform bacteria from individual subsurface waste disposal systems and dairying, and urban stormwater runoff.

For non-point sources, Section 208 requires the development of a methodology to identify and control such sources. This has now been done for the Tillamook Bay drainage basin through the plan and report noted in Section 2.1 above.

The third section of the Act, Section 201, is at the project level by which municipalities may enter into cost-sharing agreements with the Federal Government to upgrade or build systems. If the need to upgrade is established, then design work can begin. The EPA gives 75% grants for all phases of the needs establishment, facilities planning and construction.

2.3 State Requirements

a. Oregon Revised Statutes

ORS 454 governs sewage treatment and disposal systems. It also regulates subsurface sewage disposal and sets fees for sewage systems permits. The financing of systems may be possible, if the project has high enough priority as defined by the Environmental Quality Commission.

ORS 468 is a pollution control statute. It gives the Environmental Commission and DEQ authority to set and enforce regulations and standards related to water quality. Oregon water quality regulations are developed by DEQ under this statute, which must conform to national standards.

The state policy on water pollution for the North Coast-Lower Columbia River Basin is set forth in the Oregon Revised Statues, Chapter 468.710 as follows:

> AWhereas the pollution of the waters of this State constitute a menace to public health and welfare, creates public nuisance, is harmful to wildlife, fish and aquatic life and impairs domestic, agricultural, industrial, recreational and other legitimate beneficial uses of the water, whereas the problem of water pollution in this State is closely related to the problem of water pollution in adjoining states; it is hereby declared to be the public policy of this State: (1) To conserve the waters of the State; (2) To protect, maintain and improve the quality thereof for public water supplies, for the propagation of wildlife, fish and aquatic life and for domestic, agricultural, industrial, municipal, recreational and other legitimate beneficial uses; (3) To provide that no waste shall be discharged into any waters of this State without first receiving the necessary treatment or other corrective action to protect the legitimate beneficial uses of such waters; (4) To provide for the prevention, abatement

and control of new or existing water pollution; and (5) To cooperate with other agencies of the State, agencies of other states and Federal Government in carrying out these objectives.≅

b. The Department of Environmental Quality (DEQ)

(1) Permits are issued by DEQ for the construction of sewage disposal systems on the site where sewage is generated. Permits can be issued for conventional subsurface systems, selected alternative systems, selected experimental systems and variations of conventional systems. Present rules require land use plan conformance prior to permit issuance.

(2) Permits are issued by DEQ for the construction and operation of new or modified sewage and industrial waste treatment facilities and related disposal of effluent. To obtain a permit, applicable federal standards and guidelines as well as portions of the state water quality management plan must be met. Initial elements of the plan include beneficial uses to be protected, water quality standards, minimum design criteria for point source controls and general policies. Plan elements for non-point sources are being developed.

The department also issues statewide general permits for effluent discharges such as the following:

(a) Adequately settled filter backwash water from water filtration plants, settling basin cleaning water, and reservoirs cleaning water.

(b) Fish hatching and rearing facilities which have no more than 100,000 pounds of fish on hand at any time;

(c) Log ponds which receive no domestic sewage or process waste water and which only discharge during wet weather months when the amount of rainfall causes the facility to overflow;

(d) Small discharges of non-contact cooling water, defrost water, heat pump transfer water, and cooling tower blowdown;

(e) Portable suction dredges;

(f) Non-discharging placer mining;

(g) Boiler blowdown.

(3) DEQ must certify that water quality standards will not be violated before any federally issued permit or license can be granted to a nonfederal permittee for actions in or adjacent to a waterway which may result in a discharge of pollutants to the waterway.

(4) Pursuant to legislative policy, DEQ has adopted an interim statement of policy on groundwater quality protection which recognizes that groundwater is a valuable natural resource which can be polluted so as to impair beneficial use. Consistent with general policies for protection of surface water, highest and best practicable treatment and control of sewage, industrial wastes and landfill leachates shall be required so as to minimize potential pollutant loading to groundwater. Where groundwater quality is being degraded by waste disposal practices, the Department will require individual sources to improve or modify waste treatment and disposal practices as necessary to reduce the pollution. The department recognizes that no statewide systematic program of groundwater monitoring presently exists and that better information is needed to permit design of an effective, efficient monitoring program for long-term quality trends.

(5) DEQ administers a program of tax relief incentives for installation of pollution control facilities.

(6) The department provides technical assistance by means of provision of information on request including administrative rules, laws pertaining to the Department, data and interpretive reports, articles concerning individual program elements and other publications. Water quality data is available on computer printouts from the EPA=s, STORET data system.

2.4 Findings and Policies

2.41 Program for Improvement in Coliform Bacteria Levels

Findings

The source of coliform bacteria can be traced to several causes, Anatural sources≅ emanating from wildlife populations, Apoint sources≅ from municipal sewage and septic tanks, and Anon-point sources≅, mainly manure from cows. Although little can be done directly about natural causes of coliform bacteria levels, water supplies impacted by these sources can be identified and necessary treatment measures instituted. The risks posed by domestic livestock wastes and sources of human coliform bacteria can be reduced or eliminated by appropriate direct measures.

Although high coliform bacteria levels are a problem and a pollution indicator in all of the County=s bays, measurements of coliform bacteria are particularly* critical to the shellfish (oyster) industry of Tillamook Bay. The National Shellfish program guidelines currently under the Food and Drug Administration (FDA), require that shellfish must be grown in waters of certain bacterial purity. Section 504 of Public Law 92-500, the 1972 Water Pollution Control Act Amendments and beneficial water uses, cited previously, gives attention to water quality protection for the growing of shellfish.

The agricultural pollution problem has been fully addressed for Tillamook Bay and correction measures recommended in ATillamook Bay Drainage Basin Agricultural Non-point Source Pollution Abatement Plan≅, January, 1981, previously noted. Highlights of the findings from the plan include the following:

a. Both the DEQ data and the FDA data show that Tillamook Bay violates the fecal coliform standards regularly during the rainy months of the year. Some violations are extremely high which inhibit safe harvesting of shellfish from the bay. The rainy months are considered to be October, November, December, January and February;

b. No dissolved oxygen violations were observed in Tillamook Bay based on 579 observations over a 10-year period. No other chemical or physical parameters for which there are bay standards are noted to be in violation. Therefore, the only pollution problem identified in Tillamook Bay is the high fecal coliform counts occurring during heavy rain-runoff conditions of the bay=s tributaries;

c. Water quality problems associated with agriculture do no occur in all locations. Many agricultural operations do not have animal waste problems although those not employing good

management practices can cause water pollution problems. When several operations in the same area are polluting, the problem is magnified;

d. Animal waste discharge into Tillamook Bay affects water quality in other ways in addition to bacterial contamination including nutrient accumulations (such as phosphates and nitrates) which accelerate aquatic algae and weed growth, organic material accumulations which deplete the oxygen and suspended solid accumulation which impairs aquatic plant photosynthesis;

e. Principal causes of animal waste discharge to streams include animal access to streams, runoff from animal confinement areas, field application of manure, seepage from silage pits and confinement areas located adjacent to water courses and insufficient manure storage capacity.

Policies

a. Tillamook County supports the voluntary compliance procedure through which agricultural producers can realistically be expected to meet state and national water quality goals. This procedure depends on the selection and implementation of Best Management Practices (BMPs) to solve water quality problems. A BMP is an agronomic, management or structural practice which, when used singly or in combination with other BMPs as a component of a farm water quality plan, will provide the minimum essential treatment needed to solve site-specific water quality problems. These BMPs were developed in the Tillamook Bay Drainage Plan for confinement areas, field applications and water course areas, taking into account floodplains, soils and proximity to water courses.

b. Tillamook County shall appoint a representative to serve on the agricultural pollution abatement program Evaluation Committee.

c. Tillamook County recognizes the responsibility of the Tillamook County Soil and Water Conservation district to implement a mandatory program phase if necessary, based on the recommendations of the Evaluation Committee.

d. Tillamook County encourages the continued expansion and improvement of sewage treatment facilities to serve communities within urban growth boundaries.

2.42 Program for Improvement in Sediment Levels

Findings

a. Agricultural Lands

Present land treatment measures related to control of sheet and rill erosion, streambank erosion, and sediment deposition on agricultural lands are relatively limited in the agricultural area. Installation of rock riprap on the channel banks has bee the principal treatment measure, with some being placed under the Emergency Watershed Protection program (Section 216 of Public Law 81-516) and the remainder placed at the expense of the local landowner. As of 1977, a total of 69,434 lineal feet of riprap has been installed. Observations indicate that it is probably the most effective means for treating streambank erosion.

Restoration of dikes in the lower flat areas of some drainages has been accomplished by rebuilding the dikes and predicting them with riprap materials. Since these areas are affected by both streamflow and tidal action, such treatment has materially reduced the erosion hazard. Repair work has been done by individual landowners or under the Emergency Watershed Protection Program. Approximately 2,397 lineal feet of this type of protection has currently been completed on the lower reaches of the Miami, Kilchis, and t Trask Rivers.

Reseeding of streambanks and other small areas of eroded farmland has been done on an intermittent basis usually following periods of high water and/or treatment has been voluntary but some has been financed under the previously mentioned emergency program. Tree removal from the channel banks has been minimal, as well as removal of debris from the channels. Those temporary remedial measures have been financed by the local landowner.

The Agricultural Pollution Abatement Plan previously referenced notes the impact of sedimentation as follows:

(1) Anadromous fish eggs may suffocate, thus preventing hatching;

(2) Spawning gravels re sealed, thus preventing fry from emerging;

(3) Aquatic insects and crustaceans, important segments in the food chain, may be damaged;

(4) Decline in fish numbers available for commercial and sport fishing may result as a consequence of (1) - (3);

(5) Oyster and clam bed damage occurs;

(6) Navigational restrictions are experienced.

If further notes that occurrences within agricultural zones which contribute to water quality problems include removal of streambank vegetation, transport of stumps and other debris from past poor timber harvesting practices and gravel bar build-up.

b. Forest Land

Twelve million dollars were expended on forest lands in the basin over a 24-year period to reforest the Tillamook Burn. It proved to be one of the most ambitious reforestation and fire protection efforts ever undertaken in this country. Reduction of soil loss was an objective of this effort, but not the primary one. If erosion control and sediment reduction had been the primary objective, another twelve million dollars would have been needed and the restoration period reduced to 2 to 5 years.

The fires had left a total of about 355,000 acres devoid of vegetation and destroyed most of the natural regeneration and early reforestation efforts. The reforestation program, under the direction of the State Forester, was started in 1949 and culminated in 1973 with the successful planting and seeding of 217,800 acres and intensified fire protection of the entire watershed. Tillamook drainage basin portion of the ≅Burn≅ was estimated to be 228,600 acres with about 194,700 acres reforested.

A resource management plan is being developed to provide for the best management of this forest for the future. The State Forest Practices Act applies to all forested lands in the basin and will provide much of the direction taken in administration of these resources. This Act was passed by the State of Oregon in 1972 to maintain forest tree species, soil, air and water resources, and fish and wildlife habitat of the forests of Oregon. The various sections of the Act provide minimum practices and set limitations upon forest land mangers to attain these ends.

Forest landowners of the basin have included in their timber harvest plans various erosion control programs to coincide with timber harvest. these include stabilization of soils on 163 miles of temporary roads, grass seeding of 3,138 acres to present sheet erosion, stabilizing 374 earth slumps and slides and surfacing of 918 miles of permanent roads to control surface erosion. The backlog of needs to control erosion and sediment resulting from the fires and past resource uses will still remain. An accelerated program is necessary if the impact of old problems is to be reduced.

c. Acreages of treatment required for specified lest-cost reductions of sediment varied greatly (see tables). For example, the areas of rock riprap are relatively small since not many areas would be amenable to this method of channel bank stabilization. On the other hand, large tracts of forest lands are amenable to the planting and fertilization of trees as shown for the maximum sediment reduction where 38,500 acres entered the least-cost solution.

LEAST COST SEDIMENT CONTROL MEASURES, AGRICULTURAL LANDS, TILLAMOOK BAY DRAINAGE BASIN, 1975

	Percent Sediment Reduction				
	0[1]	10%	20%	30%	40% Acres
Seed grass	0	0	0	0	0
Seed, mulch, fert., grass	0	0	0	0	0
Seed & mulch grass	0	0	0	0	0
Plow, seed, & fert grass	0	0	0	0	0
Backslope & revegetate	0	0	0	0	0
Remove stream debris	0	0	0	3.82	44.70
Rock pit run	0	0	0	.84	.84
Rock riprap	0	1.23	4.89	4.89	
Portable electric fence	0	.90	.84	0	0
Deferred grazing	0	0	.06	.06	.06
Access trails	0	0	0	0	0
TOTAL ACRES TREATED	0	2.13	5.79	9.61	50.49
TOTAL ACRES NOT TREATED	29,950	29,947.87	29,944.21	29,940.39	29,889.51
TOTAL ACRES	29,950	29,950	29,950	29,950	29,950

[1] This column represents the 1975 base year situation. Many control measures were in effect in 1975 and more have been installed since then. This study begins from the base year situation and looks at measures in addition to those already being applied at that time.

[2] This is the maximum sediment reduction possible, given the input data rates per acre.

Comparison of Alternative Control Programs ??ll Lands,
Tillamook Bay Drainage Basin, 1975

Levels of Reduction

Alternative Plans	10%	20%	30%	40%	50%
Economic Development:	**$**	**$**	**$**	**$**	**$**
Reduced land loss	1,080	1,900	2,590	2,590	4,010
Reduction in sediment	19,390	38,780	58,180	77,570	96,970
Increased agricultural production	--	--	--	--	--
Increased forest production	47,540	95,060	197,580	228,200	336,590
Employment Installation O & M	 1,010 1,140	 2,370 2,680	 7,030 7,950	 14,350 16,220	 41,170 46,530
TOTAL	70,160	140,790	273,330	339,790	525,270
Adverse effect Average annual cost of measures	26,330	63,350	170,950	368,590	1,046,29 0
Net beneficial effects	43,830	77,440	102,380	-28,800	-521,02

10% LEVEL OF REDUCTION

Environmental Quality:

Beneficial and adverse . . There would be 1,088 acres of improved wildlife habitat available for forage and cover. 1,058 acres would become usable as cover only in about 20 years.

There would be improved shading of about 50 miles of stream.

A slight improvement in water quality.

Less fine sediment to clog spawning gravels.

Improved visual quality of another 207.5 acres of Tillamook Burn.

Improved visual quality of about 851 acres of old clearcut.

Would reduce average annual sediment yield to Bay.

Loss of vegetative conditions necessary for wildlife habitat on 1.23 acres.

Social Well Being:

Beneficial and adverse. . The impact of floods on loss of life and property due to sediment would be slightly reduced.

Some stream banks treated would be safer for bank fishermen.

Cattle access trails would provide established entry into channel bottom and would also serve as natural drainage-ways for rapid removal of floodwater from farm operation areas.

Riprap would provide improved protection for farm operations and urban development and would prevent loss of additional pastureland.

Riprap could result in serious injuries with regard to access of personnel to channel.

30% LEVEL OF REDUCTION

Environmental Quality:

Beneficial and adverse. . There would be 4,390.93 acres of improved wildlife habitat available as forage and cover. 4,234.5 acres would become usable as cover only in about 20 years.

There would be a loss of 11.73 acres of shoreline habitat due to rock riprap and pit run rock.

Improved visual quality of the stream environment.

Improved shading to about 180 miles of stream.

A temporary (1-3 years) disruption of instream environment on 3.82 acres of streambed.

A temporary loss of 66.83 acres o shoreline habitat due to backsloping.

A significant improvement in water quality.

Improve visual quality of 960 acres of the Burn.

Improve visual quality of 3,274.5 acres of old clearcuts.

Treatment measures will reduce sediment yield to Bay.

Backsloping and revegetation would be subject to damage unless fencing is utilized.

Social Well Being:

Beneficial and adverse . . The impacts of flooding on loss of life and property due to sediment would be significantly reduced.

Volume of sediment deposited on crop lands would be reduced noticeably.

Some stream banks treated would be safer for bank fishermen.

would provide improved access to channel area for recreational purposes.

Riprap could result in serious injuries to access of personnel to channel.

40% LEVEL OF REDUCTION

Environmental Quality:

Beneficial and adverse . . There would be 5,903.22 acres of improved wildlife habitat for forage and cover. 5,015.5 acres would become usable as cover only in about 20 years.

Improved shading on about 274 miles of stream.

A loss of 33.33 acres of shoreline habitat to rock riprap and pit run rock.

A temporary loss of 43.23 acres of shoreline habitat due to backsloping.

Temporary disturbance of instream environment on 44.7 acres.

Water quality would be greatly improved.

Improved visual quality of streamside and roadside environment.

Backsloping and revegetation would be subject to damage unless fencing is utilized.

Improve visual quality of the Burn and of old clearcuts.

Treatment will reduce sediment to the Bay.

Social Well Being:

Beneficial and adverse . . The impacts of flooding on loss of life and property due to sediment would be greatly reduced.

Volume of sediment deposited on croplands would be significantly reduced.

Some stream banks treated would be safer for fishermen.

Road would be safer to drive.

Reduction of sediment would permit better crop development thus avoiding out-of-area purchase of feed for cattle.

Deferred grazing would improve existing pasture land.

Will provide better access to channel bottom for recreational purposes.

Riprap could result in serious injuries with regard to access of personnel to channel

MAXIMUM 64% LEVEL OF REDUCTION

Environmental Quality:

Beneficial and adverse . . There would be 68,007 acres of improved wildlife habitat for forage and cover. 51,454.5 acres would become usable as cover only in about 20 years.

Improved shading of about 262 miles of streams.

the basin would have less of the Tillamook Burn aspect and would have an excellent visual environment throughout.

Loss of 102.3 acres of shoreline habitat due to rock riprap and pit run rock.

Temporary disruption of 215.8 acres of instream ecosystems.

Water quality would be as near to the natural system as is possible today.

Salmon and steelhead runs would have maximum habitat available for propagation.

Social Well Being:

Beneficial and adverse . . The impacts of flooding on loss of life and property due to sediment from forest lands is reduced to insignificance.

Sediment deposition on cropland would be minor.

Some banks would be safe for fishermen.

Roads would be safer to drive. The basin would be accessible by all-weather roads.

Reduction of sediment would permit better crop development, thus avoiding out-of-area purchase of feed for cattle.

Deferred grazing would improve existing pasture land.

Will provide better access to channel bottom for recreational purposes.

Riprap could result in serious injuries with regard to access of personnel to channel.

Policies

a. The County supports sediment reduction as an appropriate objective for maintaining agricultural and forest land productivity, fish and estuarine production and water quality for all uses.

b. The County supports the Tillamook Bay Drainage Basin Agricultural Non-point Source Pollution Abatement Plan as a method for decreasing sediment-caused pollution problems in Tillamook Bay from agricultural lands.

c. The County generally supports the program outlined in the Tillamook Bay Sedimentation Study to achieve a 40% sediment reduction, provided that the program nearly achieving a positive cost-benefit ratio continues to b e supported by up-dated economic analysis.

d. The County encourages the Soil Conservation Service in cooperation with other agencies to conduct a base-line study of sedimentation in the Nehalem basin.

2.43 Program for Improvement in Water Temperature

Findings

Elevated water temperature ahs been identified as a severe problem on the Nehalem River, and a moderate problem on most other rivers in the

county. It is not possible at the present time to quantify exactly how much water temperature is raised as it traverses downstream and as it is used for various uses.

Nonpoint sources of thermal pollution are undoubtedly more to blame than heating caused by industrial or municipal use. Solar heating impacts water temperature to a certain degree in logged over areas, particularly on south-facing slopes. Removal of streamside vegetation in forest and agricultural areas can be extremely harmful. Protection of such vegetation is probably the least costly and most effective means of protecting water quality.

Removal of water for irrigation is also a cause of thermal heating of water. Solar heating is intensified by low flows but flows per se, even in summer months, are normally marginally above minimum stream flows which have been set for the streams in Tillamook County.

Policy

The County shall regulate the removal of riparian vegetation as the best means of improving or maintaining water temperature levels for beneficial uses of surface waters.

2.44 Program for Deficient Streamflows

Findings

The following table, from DEQ=s Proposed Water Management Plan and information presented in the natural resources element of this plan indicates that a potential exists on all major tributaries (except the middle fork of the Nehalem) for deficient stream flows. Low stream flows can have a detrimental impact on many beneficial water uses, in particular fish life.

INSERT NOT FOUND

The table shows average monthly stream flows (80%), minimum an optimum fish flows, and minimum perennial stream flows for selected basin streams. The 80 percent average monthly stream flow is the natural flow (before diversions) that will be equaled or exceeded eight out of every ten years. These flows are developed by the Oregon State Water Resources Board and are based upon historical flow records from the U.S. Geological Survey and the Oregon State Engineer.

Minimum and optimum fish flows were developed by the Oregon State Wildlife commission (now the Department of Fish and Wildlife). The minimum fish flows were chosen to meet the minimal requirements of salmon and steelhead because these fish receive primary management emphasis in Oregon's coastal streams. Optimum fish flows were selected to achieve the highest production of fish, based on their known habitat requirements. Actual natural flows are generally higher than optimum flows during fall, winter and spring seasons and considerably lower than optimum during the summer season.

Minimum perennial steam slows are established by the Oregon State Water Policy Review board and the Department of Water Resources after appropriate public hearings for the purpose of providing sufficient stream flow to support aquatic life. These flows are in effect a non-consumptive, public, surface water right with a priority date. Surface water right filings prior to establishment of the minimum perennial flow are not subject to the provisions of the program. The Department of Water Resources may also limit partially or entirely the uses of water. Consumptive surface water rights shown are for 1971. These rights are not subject to the 1973 minimum flow established for the North Coast Basins.

Interpretation of low stream flow criteria in the table is explained by using Miami River as an example. The natural low flow of the stream is 10 cfs and consumptive water rights are 2.2 cfs. The 2.2 cfs of surface water tights takes precedence and may, therefore, be legally diverted under any conditions. The minimum fish flow has no legal standing unless a minimum perennial flow has been established, and then only in the amount of the minimum perennial flow.

An analysis of streams presented in the natural resource element and in the preceding table shows that each stream, during low flow conditions, either has a low flow deficiency or a strong potential for low flow deficiency.

Policy

The County shall support the program of the State Water Policy Review Board and the Department of Water Resources in setting and maintaining minimum flow levels for streams in Tillamook County.

3. SOLID WASTE DISPOSAL IN TILLAMOOK COUNTY

3.1 Overview

In 1978 Tillamook County obtained a solid waste management planning grant from DEQ for the purpose of locating an acceptable regional sanitary landfill within Tillamook County. Through a series of meetings with the Tillamook County Solid Waste Advisory Committee, siting criteria were established, site feasibility was determined and seventeen proposed disposal sites were selected for analysis. An eliminating process considered such factors as DEQ requirements; RCRA requirements including surface water and wetlands criteria; soil workability and availability; public acceptance, haul distance (including energy consumption during transfer), leachate generation and treatment; waste volume and composition.

Four sites were identified for more detailed analysis which resulted in a recommendation for the conversion and expansion of the existing Tillamook open-burning dump to a sanitary landfill. A conditional use permit was granted by the Planning Commission and the commissioners then approved the site and conversion program. County funding was provided for the program, which also included the closure of the open-burning dumps in Manzanita and Pacific City, and the conversion of those sites to transfer stations for the haulage of solid waste to the central landfill facility. Completion of the program was basically attained in 1980 and the new facilities in full operation in 1981.

3.2 State and Federal Requirements

The DEQ has formulated and maintains a state solid waste plan. The plan includes a summary of all regional and county plans and a detailed description of the department=s solid waste programs and policies. DEQ is the permitting agency for a site for disposal, handling, transfer of or resource recovery from solid wastes. Recommendations from local governments are required for such sites. DEQ provides loans and grants to local governments for planning and installing approved solid waste disposal facilities.

The federal Resource Conservation and Recovery Act of 1976 prohibits open-burning dumps and encourages conservation of material and utilization of wastes for energy. DEQ is required to inventory and provide a list to the EPA of open-burning dumps to be upgraded or closed.

Hazardous waste disposal sites, not including radioactive materials, must be licensed by DEQ. None are located in Tillamook County.

3.3 Findings and Policies

Findings

Tillamook County has established and is operating a central regional sanitary landfill serving the entire County which is operated in accordance with state and federal standards. Two transfer stations have been established and together with the central landfill site provide facilities and opportunities for materials recycling and resource recovery.

Tillamook County is cooperating with the Clatsop-Tillamook Intergovernmental Council in an application to the Bonneville Power Administration for funding to examine the energy potential of the solid waste at the landfill site. The County believes that there is the potential to operate a small steam plant utilizing burnable wastes that would both generate power and extend the life of the landfill.

This project would quantify and qualify the types of materials going into the landfill and determine what type of equipment could be used to generate power and the cost of the equipment. The landfill is near the Port of Tillamook Bays Industrial Park, so an energy market survey would be undertaken to attract a small industry to the industrial park to utilize the energy resource. The benefit of BPA and the County would be to create new jobs in the area and to not increase the firm load requirements of BPA.

Policies

a. Tillamook County will continue to operate its sanitary landfill facility in accordance with state and federal standards to dispose of solid waste in the County.

b. Recycling of materials and resources will continue to be encouraged by the County as part of its solid waste disposal program.

c. Establishment of a steam electric power generating facility utilizing burnable material at the County=s sanitary landfill facility shall be pursued by the county if found to be practical and economically feasible.

4. NOISE CONTROL IN TILLAMOOK COUNTY

4.1 Overview

Although many believe noise is an irritation or annoyance, they are not aware of the direct effect excessive noise has on health. It is well documented that noise is a public health hazard, both physically and psychologically. For example, noise can cause or aggravate headache, muscle tension, fatigue and other reactions. Impairment of functions such as loss of performance,

impairment of hearing and temporary and permanent loss of hearing are caused by excessive noise exposure. Very common effects of noise are interference with communication, including direct conversations, radio,, television and telephone. Other activities noise disrupts are rest, study, and sleep. Feelings of annoyance, such as irritability, distractibility, and frustration are also caused by noise.

Physically measurable stress effects of noise such as glandular responses, cardiovascular response and hypertension are well documented. All of these adverse effects of noise on humans are cited as examples to understand why excessive noise is recognized as a threat to public health and welfare.

4.2 State and Federal Requirements

In 1971, the Legislature gave the Environmental Quality Commission power, through the Department of Environmental Quality, to adopt statewide standards for permitted noise emissions in the State of Oregon and to implement and enforce compliance with these adopted standards.

Standards have been set in four areas:

a. for new motor vehicles sold in the state,
b. for motor vehicles presently in use,
c. for industry and commerce, and
d. for new and existing airports.

All new motor vehicles sold within Oregon must meet maximum allowable decibel limits. Vehicle categories include automobiles and light trucks, motorcycles, buses, snowmobiles and medium and heavy trucks. In-use motor vehicle noise emission standards have been established for road vehicles and off-road recreational vehicles.

Noise sources from industry and commerce must meet ambient noise standards measured at the nearest noise sensitive property. Noise sensitive property is defined as residences, schools, churches, libraries and other places where people normally sleep. The definition for industry is very broad. However, some activities are exempted for reasons of flack of control technology, lack of an adequate standard or preemption by federal regulations. Industrial and commercial noise standards are based upon protection of speech communications during the daytime (7am to 10pm) and protection of sleep at night (10pm to 7am). During the day, noise is generally any sounds that disturb normal speech. Tests have shown this to be sounds above 60 decibels. During the night, noise is any sounds that disturb sleep. Tests have shown this to be sounds above 45 decibels. The standards are

written in statistical terms over a one-hour sampling period. This allows some variations in the noise level over time, but limits the statistical distribution of the measured noise throughout the one-hour sampling period. Special standards have been developed for industrial and commercial sources that produce impulsive sounds; e.g. blasts, drop forge and punch press noise.

Noise control regulations for airports and heliports were adopted by the EQC in November, 1979. New and existing airports and heliports can be required to develop noise impact boundaries and noise abatement programs when that boundary includes noise sensitive properties.

The U.S. Environmental Protection Agency has also set noise standards in some areas. In these cases, such as standards on interstate transport trucking, the federal EPA standards preempt those set by DEQ. Standards for noise at occupational locations are set by the federal Occupational Safety and Health Act. Like EPA, these standards preempt those made by DEQ.

DEQ has the power to investigate complaints, seek compliance, and, if necessary, issue fines to those people or companies that continue to be in violation of the noise pollution standards. presently, the Department is enforcing industry and commerce noise standards on a complaint basis due to the large number of noise sources and the limited amount of DEQ manpower assigned to the noise program.

4.3 Findings and Policies

Findings

The DEQ office in Tillamook enforces the state noise standards in response to complaints, as does the County Sheriff. Both agencies receive three to five complaints per week. Other sources of noise pollution in the county include rock crushing equipment, wood product mills and heavy mechanical equipment.

The Port of Tillamook Bay operates the County Airport south of the City of Tillamook. A recently completed master plan establishes noise sensitive zones around the airport (LCN levels). Since the airport is surrounded by agricultural land, no conflicts with urban uses are anticipated.

According to the county Sheriff, the biggest source of noise complaints in the County is off-road vehicles. In regulated ORV areas such as Sand Lake, dune buggies and other vehicles are required to have Astreet legal≅ or standard mufflers just as are on-road vehicles. An inter-agency management plan for the Sand Lake areas has recently been completed which controls the number of ORVs on any given day. This, in conjunction with the muffler requirement and increased enforcement by the Sheriff=s Department, has reduced the noise complaints. Off-road vehicles in other areas of the County are also a problem, but are much less easily regulated due to their dispersal and mobility.

Designated off-road vehicle enforcement is also shown for the southern portion of the County primarily by the U.S. Forest Service. These personnel, along with local county o officials, ensure that motorcycles and other off-road vehicles operating in Forest Service recreational areas do not exceed noise emission limits.

The DEQ 1980 State Noise Pollution Report shows Tillamook County as one of several counties where marine enforcement is implemented through a County marine officer. Training and equipment is provided to assist enforcement of motorboat noise emission limits on the States lakes and rivers.

Policy

Tillamook County shall continue to support and cooperate with state and federal programs of noise control.

Table IX - 12 - - Least cost sediment control measures, forested lands, Tillamook Bay Drainage Basin, 1975

	Percentage Sediment Reduction					
Sediment Control Measures	**0**	**10%**	**20%**	**30% ACRES**	**40%**	**5**
Seed grass	0	0	0	0	01,083.37	10,2
Seed & Fertilize grass	0	0	0	0	0	3,3
Seed, fertilize, mulch & net grass	0	0	0	0	0	
Seed, mulch, terrace, & fertilizer grass	0	0	0	0	0	16
Plant brush on stream sides	0	29.69	22.41	89.60	100.60	10
Plant brush on land sides	0	0	0	0	0	
Plant trees	0	1,058.63	2,117.25	4,244.50	4,235.50	4,2
Seed trees	0	0	0	0	0	
Trees, grass & fertilize	0	0	0	175.00	848.00	3,2
Water bar & vegetate	0	0	0	0	0	
Gravel surface	0	0	0	0	0	
Stabilize & close roads	0	0	0	139.48	743.89	3,1
Gravel surface & hydromulch	0	0	0	0	0	
Seed mulch, fert & rock buttress	0	0	0	0	0	
Rock riprap	0	0	0	6.00	27.60	5
Back slope & plant brush	0	0	36.42	66.83	43.23	1
Check dams	0	0	0	0	0	
Debris & log jam remove	0	0	0	38.67	107.70	13
TOTAL ACRES TREATED	**0**	**1,088.32**	**2,176.08**	**4,760.08**	**7,189.89**	**24,6**
TOTAL NOT TREATED	**324,230.00**	**323,141.58**	**322,053.92**	**319,469.92**	**317,040.11**	**299,**
TOTAL ACRES	**324,230.00**	**324,230.00**	**324,230.00**	**324,230.00**	**324,230.00**	**324,**