Benthic Invertebrates and Sediments in Vegetated and Nonvegetated Habitats at Three Intertidal Areas of the Columbia River Estuary, 1992

by
George T. McCabe, Jr.
and Susan A. Hinton,

August 1993

COASTAL ZONE AND ESTUARINE STUDIES

BENTHIC INVERTEBRATES AND SEDIMENTS IN VEGETATED AND NONVEGETATED HABITATS AT THREE INTERTIDAL AREAS OF THE COLUMBIA RIVER ESTUARY, 1992

by

George T. McCabe, Jr.
and
Susan A. Hinton

Report of Research

Funded by

U.S. Army Corps of Engineers
Portland District
P.O. Box 2946
Portland, Oregon 97208
(Contract E9592012)

and

Coastal Zone and Estuarine Studies Division
Northwest Fisheries Science Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
2725 Montlake Boulevard East
Seattle, Washington 98112-2097

August 1993

CONTENTS

INTRODUCTION

The physical characteristics of the Columbia River estuary have been altered considerably by man during the last century. Major changes in the estuary were caused by such activities as jetty and pile-dike construction, diking of swamps and marshes, dam construction and operation, dredging, filling, and island construction (Sherwood et al. 1990). Deepening and maintenance of the navigation channel in the estuary have resulted in the creation of islands, including Miller Sands, Jim Crow Sands, and Rice Island.

Miller Sands, Jim Crow Sands, and Rice Island were created from material dredged from the navigation channel and are located in the same general area of the Columbia River estuary; however, the intertidal areas of these islands have undergone different degrees of wetland development, ranging from well developed (Miller Sands) to no development (Rice Island). Jim Crow Sands has intermediate wetland development. In 1992, the U.S. Army Corps of Engineers (COE) initiated a study to determine why the range in wetland development occurred at the three islands.

The COE proposed five research objectives to study the variations in wetland development at the three islands. The objectives included: 1) determination of topographic elevations, 2) mapping of plant species, 3) comparisons of wetland elevations to fluctuating water levels caused by daily tidal and seasonal river-flow changes, 4) sediment analyses for vegetated and nonvegetated intertidal sites, and 5) descriptions of benthic invertebrate communities at vegetated and nonvegetated intertidal sites. In mid-1992, the National Marine Fisheries Service (NMFS) agreed to cooperate with the COE to complete Objectives 4 and 5 at Miller Sands, Jim Crow Sands, and a remnant intertidal marsh in Grays Bay, which is adjacent to Rice Island.

METHODS

Sampling

Benthic samples were collected at Miller Sands, Jim Crow Sands, and the remnant intertidal marsh in Grays Bay in July and September 1992 (Fig. 1). At each area, two stations in intertidal vegetated habitats and two stations in adjacent nonvegetated habitats were sampled. The geographic locations of all stations were determined using the Global Positioning System (Appendix Table 1). At each station, 11 samples were collected using a PVC coring device (Fig. 2). The coring device had an inside diameter of 3.85 cm, a penetrating depth of 15 cm, and collected a 174.6-cm^3 sample. Ten of the samples collected at each station were used to determine species composition and abundance of benthic invertebrates; one sample was used by the COE to characterize the sediment. Each benthic invertebrate sample was preserved in a buffered formaldehyde solution ($\geq$ 4%) containing rose bengal, an organic stain. In the laboratory, samples were washed with water through a 0.5-mm screen. All organisms were sorted from the residue, identified to the lowest practical taxon, counted, and stored in 70% ethanol. The eleventh sample was placed in a labeled plastic bag and refrigerated for later analysis of grain size, percent silt/clay, and percent volatile solids by the COE North Pacific Division Materials Laboratory, Troutdale, Oregon.

Data Analyses

Benthic invertebrate data were analyzed by station to determine species composition and densities (both total and by species). Benthic invertebrate densities were compared between vegetated and nonvegetated habitats, between months, and between areas using three-way analysis of variance (ANOVA) (Minitab Inc. 1991). Two-way ANOVA was used

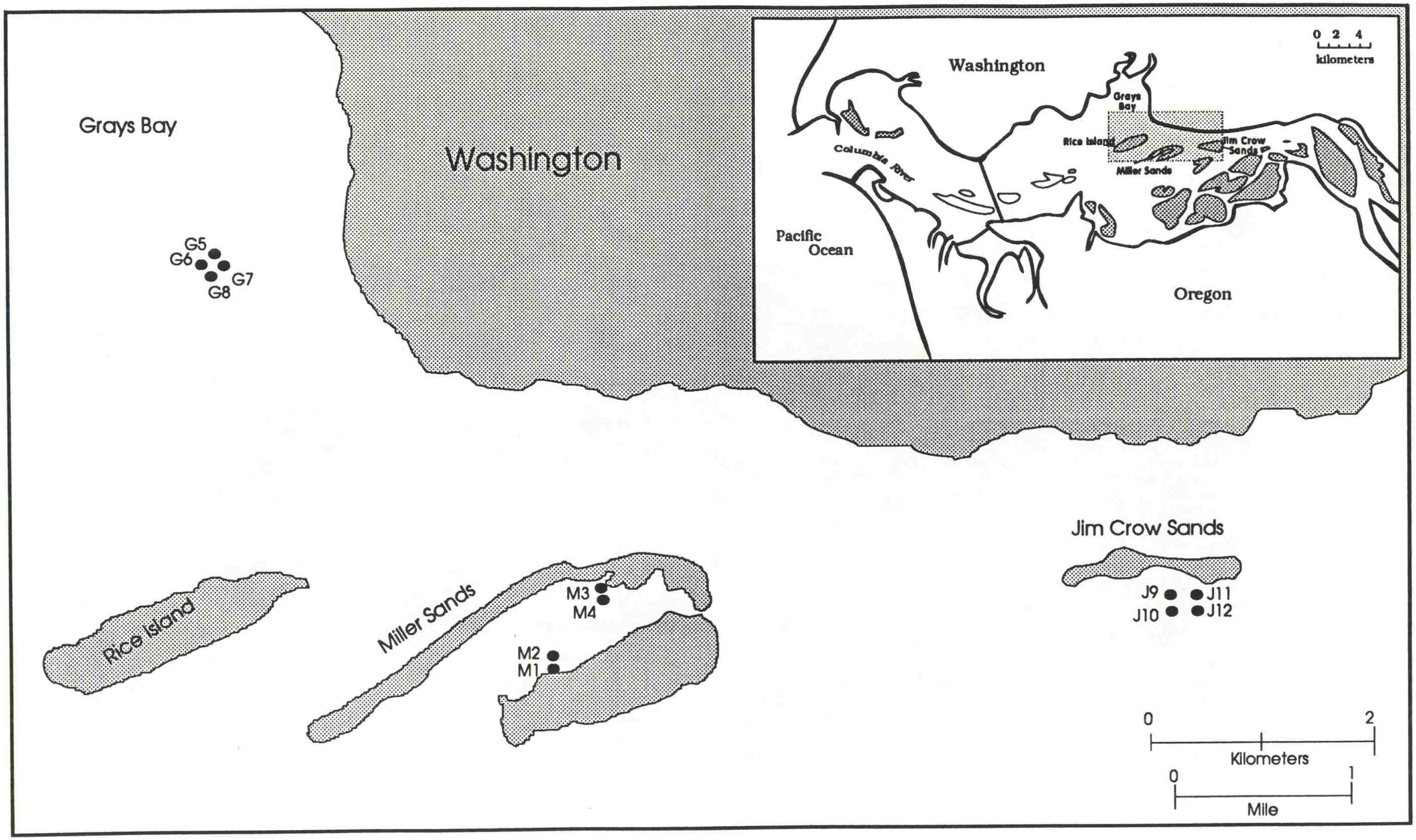

Figure 1.--Benthic invertebrate and sediment sampling stations in three wetland areas in the Columbia River estuary, July and September 1992. Odd-numbered stations were vegetated habitats and even-numbered stations were nonvegetated.

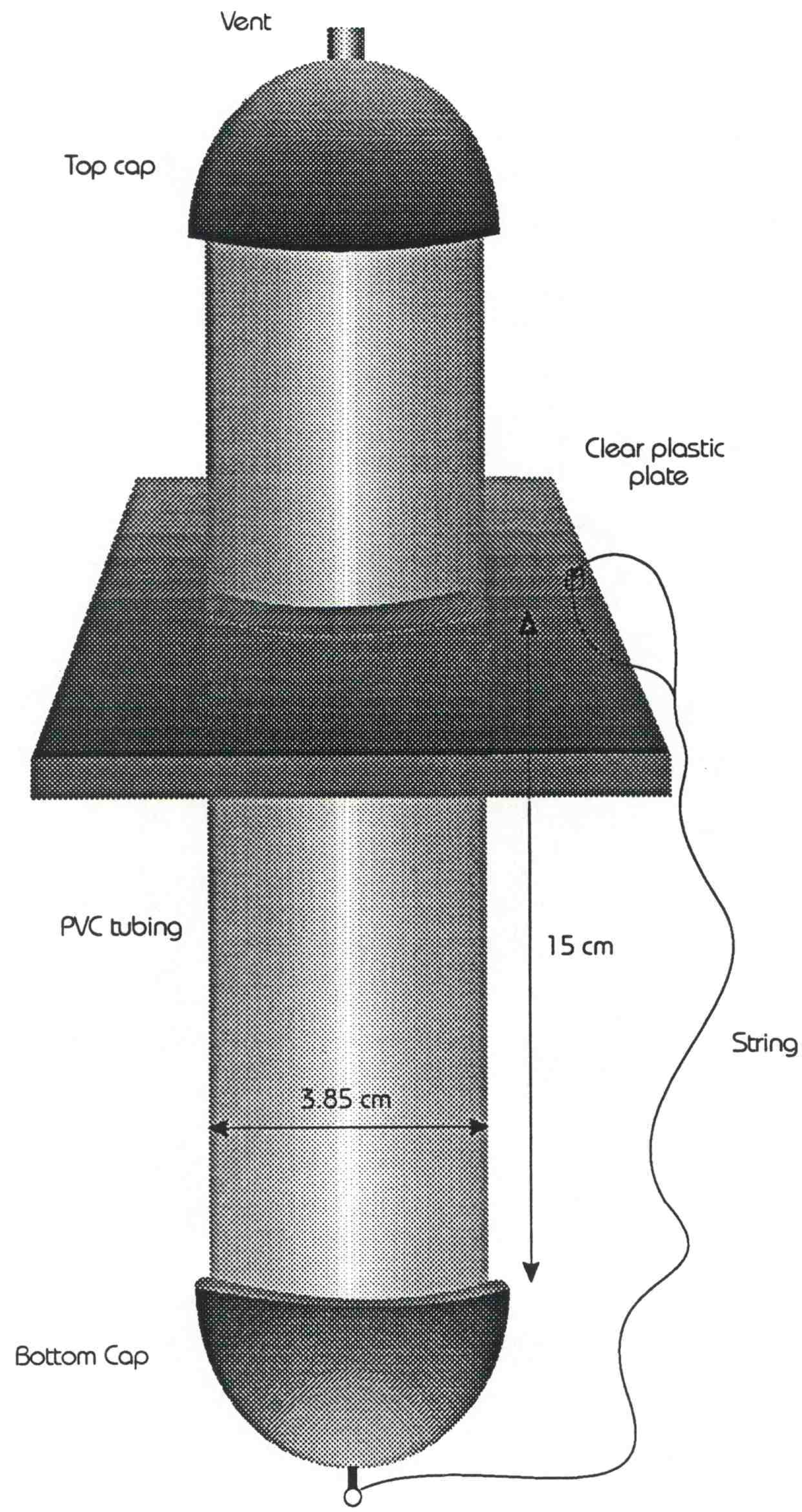

Figure 2.--PVC coring device used to collect benthic invertebrate and sediment samples in three wetland areas in the Columbia River estuary, July and September 1992.

to compare densities when three-way ANOVA could not be used due to significant interaction between factors. Data were transformed to $\log_{10}$ of (mean number of organisms/m^2) prior to running ANOVA. Densities of the amphipod Corophium salmonis were transformed to $\log_{10}$ of [(mean number of organisms + 1)/m^2] prior to analysis. One was added to the densities because of some zero values (Sokal and Rohlf 1969). Means of the 10 samples from each station provided the basic data entries for the statistical tests. When ANOVA results were significant ($P < 0.05$) for area, Fisher's protected least significant difference (FPLSD) (Petersen 1985) was used to identify significant differences between areas.

Median grain size (mm), percent silt/clay, and percent volatile solids were determined for each station. Three-way ANOVA was used to compare each of these sediment characteristics between areas, between months, and between vegetated and nonvegetated habitats. When ANOVA results were significant ($P < 0.05$) for area, FPLSD was used to identify significant differences between areas. Percent silt/clay values were transformed to $\log_{10}$ value prior to running ANOVA.

RESULTS

Benthic Invertebrates

Similar numbers of taxa or invertebrate categories were identified in samples collected at the three wetlands, with 31 in July and 36 in September (Appendix Table 2). The number of taxa or invertebrate categories collected at individual stations ranged from 6 at Station M1 (Miller Sands, vegetated) in July, to 22 at Station M3 (Miller Sands, vegetated) in September (Fig. 1; Table 1).

Table 1.--Summary of benthic invertebrate collections at Miller Sands, Jim Crow Sands, and Grays Bay, Columbia River estuary, July and September 1992. Odd-numbered stations were vegetated habitats and even-numbered stations were nonvegetated.

Station[a]	Number of taxa or categories	Number /m^2	Standard deviation
	JULY		
M1	6	15,290	6,929
M3	17	36,335	20,068
M2	9	55,749	23,985
M4	12	48,103	26,949
J9	9	73,014	58,938
J11	14	75,162	40,674
J10	9	21,904	6,495
J12	7	68,290	24,008
G5	11	35,820	18,601
G7	8	37,280	20,481
G6	9	21,389	8,234
G8	8	19,327	5,497
	SEPTEMBER		
M1	18	53,687	13,098
M3	22	59,958	10,856
M2	14	84,353	26,688
M4	19	45,183	20,117
J9	14	46,643	24,256
J11	21	155,993	43,184
J10	8	38,655	7,244
J12	16	140,789	38,384
G5	14	76,364	18,699
G7	9	44,858	31,770
G6	10	89,163	15,993
G8	13	100,845	17,441

[a] The letter in the station name denotes the area: M = Miller Sands, J = Jim Crow Sands, and G = Grays Bay.

Major benthic invertebrates collected at Miller Sands included oligochaetes; bivalves, particularly Corbicula fluminea and Pisidium spp.; ostracods; amphipods, particularly Corophium salmonis and Hyalella azteca; chironomid larvae and pupae; and invertebrate eggs (Table 2; Appendix Table 3). Major benthic invertebrates at Jim Crow Sands included the polychaete Neanthes limnicola; oligochaetes; the gastropod Lithoglyphus virens; bivalves, particularly Corbicula fluminea and Pisidium spp.; ostracods; the amphipod Hyalella azteca; chironomid larvae and pupae; and invertebrate eggs. At Grays Bay, the polychaete Neanthes limnicola; oligochaetes; the bivalve Corbicula fluminea; the amphipod Corophium salmonis; harpacticoid copepods; chironomid larvae; and invertebrate eggs were the dominant forms.

At all three wetlands, benthic invertebrate densities at individual stations were high, with all values exceeding 15,000 organisms/m^2 (Table 1). Benthic invertebrate densities at Stations G8, J11, and J12 in September exceeded 100,000 organisms/m^2. Benthic invertebrate densities (total) were significantly higher in September than in July (ANOVA, $P < 0.05$); however, there were no significant differences between the three wetlands or between vegetated and nonvegetated habitats ($P > 0.05$). Densities of C. salmonis were significantly higher in September than in July and significantly higher in nonvegetated habitats than in vegetated habitats. In addition, C. salmonis densities were significantly higher in the Grays Bay wetland than in either the Miller Sands or Jim Crow Sands wetlands (ANOVA, FPLSD; $P < 0.05$) (Table 2).

Oligochaete densities were not significantly different between months. Overall statistical comparisons of oligochaete densities by area and habitat type (vegetated vs. nonvegetated) could not be done because of significant interaction ($P < 0.05$) between these two factors. If habitat type is excluded as a factor in ANOVA (i.e., two-way ANOVA is used), then oligochaete densities at Jim Crow Sands were significantly higher than

Table 2.--Densities (mean numbers/m^2) of major benthic invertebrate taxa or categories collected in vegetated and nonvegetated habitats at Miller Sands, Jim Crow Sands, and Grays Bay, Columbia River estuary, July and September 1992. Less abundant taxa are included in totals, but are not listed individually.

Taxon/category	July		September	
	Number/m^2[a]	SD[b]	Number/m^2	SD
MILLER SANDS, vegetated				
Oligochaeta	11,940	6,786	25,813	8,270
Corbicula fluminea	1,160	936	1,288	1,262
Pisidium spp.	86	264	1,117	3,092
Ostracoda	6,271	5,853	5,755	7,499
Hyalella azteca	2,019	3,405	8,289	11,985
Chironomidae larvae	3,006	4,393	8,890	4,582
Invertebrate eggs	0	0	1,976	2,871
Total	25,813	18,167	56,822	12,142
MILLER SANDS, nonvegetated				
Oligochaeta	31,224	19,483	35,906	28,084
Corbicula fluminea	644	876	2,148	1,166
Pisidium spp.	902	1,838	2,964	3,441
Ostracoda	4,853	4,174	1,976	2,760
Corophium salmonis	215	960	2,104	2,956
Chironomidae larvae	12,112	12,224	16,664	13,646
Chironomidae pupae	258	404	1,246	1,379
Total	51,926	25,137	64,768	30,542
JIM CROW SANDS, vegetated				
Oligochaeta	56,307	48,528	60,688	42,794
Lithoglyphus virens	0	0	1,933	1,888
Corbicula fluminea	2,706	2,543	2,233	1,348
Ostracoda	8,461	5,050	1,503	1,948
Hyalella azteca	43	192	10,866	17,706
Chironomidae larvae	4,810	3,965	17,480	18,329
Chironomidae pupae	43	192	1,503	1,908
Total	74,088	49,298	101,318	65,641
JIM CROW SANDS, nonvegetated				
Neanthes limnicola	558	936	1,074	1,178
Oligochaeta	34,961	24,476	57,338	46,764
Corbicula fluminea	773	617	2,620	1,816
Pisidium spp.	0	0	2,319	3,482
Ostracoda	2,706	3,069	1,761	2,113
Chironomidae larvae	5,025	4,972	14,946	20,090
Chironomidae pupae	258	629	1,203	2,056
Invertebrate eggs	0	0	7,301	8,340
Total	45,097	29,312	89,722	58,888

Table 2.--Continued.

Taxon/category	July		September	
	Number/m^2	SD	Number/m^2	SD
GRAYS BAY, vegetated				
Oligochaeta	25,082	18,441	39,830	13,296
Corophium salmonis	215	472	15,778	15,720
Harpacticoida	8,332	8,421	136	431
Chironomidae larvae	773	1,574	1,628	2,141
Invertebrate eggs	0	0	2,667	2,234
Total	36,550	19,056	61,440	29,743
GRAYS BAY, nonvegetated				
Neanthes limnicola	4,252	2,323	1,203	705
Oligochaeta	5,712	3,181	4,510	2,046
Corbicula fluminea	1,546	1,169	1,117	1,009
Corophium salmonis	7,516	3,457	79,800	13,599
Invertebrate eggs	0	0	5,884	4,266
Total	20,358	6,895	95,004	17,354

[a] For each habitat type (vegetated or nonvegetated) within an area, a mean was calculated by averaging all replicates collected in that habitat.
[b] Standard deviation.

densities at Grays Bay; however, there were no significant differences in oligochaete densities between Miller Sands and Jim Crow Sands or between Miller Sands and Grays Bay. There were no significant differences in densities of insects (all taxa combined) between months or habitat types. Insect densities (primarily chironomids) were significantly higher at the Miller Sands and Jim Crow Sands wetlands than at the Grays Bay wetland.

Sediments

Median grain size was not significantly different between months or between vegetated and nonvegetated habitats (ANOVA; $P > 0.05$); however, it was significantly different between areas (ANOVA, FPLSD; $P < 0.05$) (Table 3). Median grain size was significantly larger at Grays Bay than at Miller Sands and Jim Crow Sands ($P < 0.05$). In addition, median grain size was significantly larger at Miller Sands than at Jim Crow Sands ($P < 0.05$). Combining data for July and September, median grain sizes averaged 0.1302 mm at Grays Bay, 0.1099 mm at Miller Sands, and 0.0722 mm at Jim Crow Sands.

Percent silt/clay was not significantly different between July and September ($P > 0.05$); however, percent silt/clay was significantly higher in vegetated habitats than in nonvegetated habitats ($P < 0.05$). Percent silt/clay was significantly higher at Jim Crow Sands than at Grays Bay, but there were no significant differences between Miller Sands and Jim Crow Sands or between Miller Sands and Grays Bay. Combining data for July and September, percent silt/clay averaged 24.6% at Jim Crow Sands, 15.5% at Miller Sands, and 10.6% at Grays Bay.

Percent volatile solids were significantly higher in September than in July ($P < 0.05$). There were no significant differences in percent volatile solids between areas

Table 3.--Sediment characteristics at Miller Sands, Jim Crow Sands, and Grays Bay, Columbia River estuary, July and September 1992. Odd-numbered stations were vegetated habitats and even-numbered stations were nonvegetated.

	JULY			SEPTEMBER		
Station[a]	Median grain size (mm)	Silt/ clay(%)	Volatile solids(%)	Median grain size (mm)	Silt/ clay(%)	Volatile solids(%)
M1	0.1088	17.3	1.2	0.1166	15.2	1.1
M3	0.1436	8.5	0.6	0.0883	15.4	1.7
M2	0.1166	11.1	0.9	0.0947	23.3	1.5
M4	0.1436	8.2	1.1	0.0670	25.3	1.7
J9	0.0718	21.7	1.0	0.0670	33.8	2.2
J11	0.0508	47.4	1.5	0.0583	38.0	1.6
J10	0.0947	6.1	1.1	0.0883	7.3	1.5
J12	0.0583	27.5	1.1	0.0883	14.6	1.6
G5	0.1539	7.0	1.0	0.1166	16.7	1.6
G7	0.1088	17.7	1.6	0.1166	18.3	1.9
G6	0.1339	6.6	1.0	0.1250	8.1	1.1
G8	0.1436	5.2	0.7	0.1436	5.0	1.2

[a] The letter in the station name denotes the area: M = Miller Sands, J = Jim Crow Sands, and G = Grays Bay.

or between vegetated and nonvegetated habitats ($P > 0.05$). Combining data for July and September, percent volatile solids averaged 1.2% at Miller Sands, 1.4% at Jim Crow Sands, and 1.3% at Grays Bay.

DISCUSSION

Results from this study strongly suggest that both vegetated and nonvegetated habitats in wetlands at Miller Sands, Jim Crow Sands, and Grays Bay have high standing crops of benthic invertebrates in July and September. Benthic invertebrate densities at individual stations frequently exceeded 35,000 organisms/m^2. Benthic invertebrate densities in the three wetlands were much higher than densities in a deeper (8-13 m), higher water-velocity area between Miller Sands and Jim Crow Sands (NMFS unpublished data). In July 1992, mean benthic invertebrate densities at individual stations in the deeper area were less than 5,400 organisms/m^2. However, in September 1992, mean benthic invertebrate densities at individual stations in the deeper area were less than 36,200 organisms/m^2, but in all three wetlands were greater than 38,000 organisms/m^2. Mean benthic invertebrate densities at Miller Sands in both vegetated and nonvegetated wetland habitats were higher in July and September 1992 than those reported for nine nonvegetated intertidal stations sampled at Miller Sands in July and September 1991 (Hinton et al. 1992). Densities in July and September 1991 averaged 20,125 organisms/m^2 and 23,481 organisms/m^2, respectively. In the present study, mean benthic invertebrate densities in all sampled habitats at Miller Sands in July and September 1992 were greater than 25,800 organisms/m^2 (Table 2). At the Grays Bay wetland, mean benthic invertebrate densities were higher than those reported for 25 stations located in nonvegetated intertidal and shallow subtidal areas adjacent to Rice Island (Hinton et al. 1992). In July and September 1991, benthic invertebrate densities at the 25 stations averaged 12,833 organisms/m^2 and 35,915 organisms/m^2, respectively. At the Grays Bay wetland in 1992, benthic invertebrate densities in the nonvegetated habitat averaged 20,358 organisms/m^2 in July and 95,004 organisms/m^2 in September.

Significantly higher benthic invertebrate densities in September than in July suggest that recruitment occurred. For example, there was a large increase in C. salmonis numbers between July and September. At Grays Bay, densities of C. salmonis in the nonvegetated habitat increased from 7,516 organisms/m^2 in July to 79,800 organisms/m^2 in September. In the vegetated habitat at Grays Bay, C. salmonis densities increased from 215 organisms/m^2 in July to 15,778 organisms/m^2 in September. Holton et al. (1984) observed that C. salmonis densities were lowest in Grays Bay at the end of July, with subsequent increases in August and September. They attributed the increases in August and September to the fall generation of juveniles. Holton et al. (1984) reported C. salmonis densities ranging from 4,122 organisms/m^2 in late July 1981 to 31,754 organisms/m^2 in February 1981.

Both vegetated and nonvegetated habitats of the wetlands are ecologically important to the estuary. In addition to supporting high densities of benthic invertebrates, vegetated habitats produce "macrodetritus," an important food resource for C. salmonis (Sherwood et al. 1990). Nonvegetated habitats of the estuary have the highest standing crops of C. salmonis, an important prey for fishes in the estuary, including juvenile salmonids (McCabe et al. 1983, 1986). Both of these habitat types are ecologically important and must be protected.

This study represents a temporally and spatially limited description of the vegetated and nonvegetated wetland habitats at Miller Sands, Jim Crow Sands, and Grays Bay. To better describe these habitats at the three areas, additional benthic sampling should be conducted. The number of sampling stations at each area should be increased and sampling should be done at least quarterly.

This report does not constitute NMFS's formal comments under the Fish and Wildlife Coordination Act or the National Environmental Policy Act.

ACKNOWLEDGMENTS

We thank Geoff Dorsey for assistance in collecting benthic samples, and Sheila Turner for sorting and identifying benthic invertebrates. The COE, Portland District provided the sediment analyses. Also, we thank Benjamin Sandford for his advice regarding statistical analyses of the data.

REFERENCES

Hinton, S. A., R. L. Emmett, and G. T. McCabe, Jr.

1992. Fishes, shrimp, benthic invertebrates, and sediment characteristics in intertidal and subtidal habitats at Rice Island and Miller Sands, Columbia River estuary, 1991. Report to U.S. Army Corps of Engineers, Contract E96910025, 44 p. plus appendices. (Available from Northwest Fisheries Science Center, 2725 Montlake Blvd. E., Seattle, WA 98112.)

Holton, R. L., D. L. Higley, M. A. Brzezinski, K. K. Jones, and S. L. Wilson.

1984. Benthic infauna of the Columbia River estuary. Final Rep. on the Benthic Infauna Work Unit of Columbia River Estuary Data Development Program. 179 p. plus appendices. (Available from Columbia River Estuary Study Taskforce, 750 Commercial St., Room 214, Astoria, OR 97103.)

McCabe, G. T., Jr., R. L. Emmett, W. D. Muir, and T. H. Blahm.

1986. Utilization of the Columbia River estuary by subyearling chinook salmon. Northwest Sci. 60(2):113-124.

McCabe, G. T., Jr., W. D. Muir, R. L. Emmett, and J. T. Durkin.

1983. Interrelationships between juvenile salmonids and nonsalmonid fish in the Columbia River estuary. U.S. Nat. Mar. Fish. Serv. Fish. Bull. 81(4):815-826.

Minitab Inc.

1991. Minitab reference manual, PC version, release 8. Quickset Inc., Rosemont, PA. 508 p.

Petersen, R. G.

1985. Design and analysis of experiments. Marcel Dekker, Inc. New York, NY. 429 p.

Sherwood, C. R., D. A. Jay, R. B. Harvey, P. Hamilton, and C. A. Simenstad.

1990. Historical changes in the Columbia River Estuary. Prog. Oceanogr. 25:299-352.

Sokal, R. R., and F. J. Rohlf.

1969. Biometry: the principles and practice of statistics in biological research. W. H. Freeman and Co., San Francisco. 776 p.

APPENDIX

Appendix Table 1.--Station locations at Miller Sands, Jim Crow Sands, and Grays Bay, Columbia River estuary, July and September 1992.

Station[a]	Vegetated (V) Nonvegetated (NV)	Latitude	Longitude
M1	V	46°14.789	123°39.545
M3	V	46°15.180	123°39.209
M2	NV	46°14.811	123°39.550
M4	NV	46°15.102	123°39.226
J9	V	46°14.922	123°35.061
J11	V	46°14.918	123°34.874
J10	NV	46°14.885	123°35.096
J12	NV	46°14.874	123°34.807
G5	V	46°16.618	123°41.777
G7	V	46°16.596	123°41.701
G6	NV	46°16.590	123°41.806
G8	NV	46°16.589	123°41.708

[a] The letter in the station name denotes the area: M = Miller Sands, J = Jim Crow Sands, and G = Grays Bay.

Appendix Table 2.--Invertebrate taxa collected at Miller Sands, Jim Crow Sands, and Grays Bay, Columbia River estuary, July and September 1992.

Taxon/category	July	September
Hydra spp.		x
Nemertea	x	x
Nematomorpha	x	
Polychaeta		
Neanthes limnicola	x	x
Oligochaeta	x	x
Hirudinea	x	x
Gastropoda	x	x
Planorbidae	x	x
Physa spp.		x
Lithoglyphus virens	x	x
Bivalvia		x
Corbicula fluminea	x	x
Pisidium spp.	x	x
Ostracoda	x	x
Amphipoda		x
Hyalella azteca	x	x
Corophium salmonis	x	x
Corophium spinicorne		x
Pontoporeia hoyi	x	x
Copepoda		
Harpacticoida	x	x
Insecta	x	x
Corixidae	x	x
Diptera	x	
Diptera larvae	x	
Diptera pupae	x	
Culicidae adult	x	
Chironomidae		
Chironomidae larvae	x	x
Chironomidae pupae	x	x
Chironomidae adult		x
Ceratopogonidae larvae	x	x
Dolichopodidae larvae	x	x
Trichoptera	x	x
Trichoptera larvae	x	x
Agraylea spp.		x
Coleoptera		x
Coleoptera larvae	x	x
Ephemeroptera larvae		x
Collembola	x	x
Arachnida	x	x

Appendix Table 2.--Continued.

Taxon/category	July	September
Hydracarina	x	x
Invertebrate eggs		x
Total number of taxa/categories	31	36

Appendix Table 3.--Summaries of benthic invertebrate surveys (by station) conducted in July and September 1992 in vegetated and nonvegetated habitats at Miller Sands, Jim Crow Sands, and Grays Bay, Columbia River estuary. Odd-numbered stations were vegetated habitats and even-numbered stations were nonvegetated.

Station: M1 Date: 16 Jul 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number /m²	Standard deviation /m²
Nematomorpha	2	10.0	171.8	543.3
Oligochaeta	121	100.0	10,393.8	6,200.2
<u>Corbicula fluminea</u>	13	80.0	1,116.7	707.2
Ostracoda	34	80.0	2,920.6	2,469.8
Chironomidae larvae	7	60.0	601.3	579.8
Chironomidae pupae	1	10.0	85.9	271.6

Number of taxa/categories: 6

Mean number/sample: 17.8 Standard deviation/sample: 8.1

Mean number/m² : 15,290.0 Standard deviation: 6,928.9

Station: M2 Date: 16 Jul 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number /m²	Standard deviation /m²
Nematomorpha	8	30.0	687.2	1,201.2
<u>Neanthes limnicola</u>	16	100.0	1,374.4	600.6
Oligochaeta	502	100.0	43,121.3	20,374.9
<u>Corbicula fluminea</u>	2	20.0	171.8	362.2
Ostracoda	36	90.0	3,092.4	2,722.4
<u>Hyalella azteca</u>	1	10.0	85.9	271.6
Chironomidae larvae	80	100.0	6,871.9	3,339.2
Chironomidae pupae	3	30.0	257.7	414.9
Hydracarina	1	10.0	85.9	271.6

Number of taxa/categories: 9

Mean number/sample: 64.9 Standard deviation/sample: 27.9

Mean number/m² : 55,748.5 Standard deviation: 23,985.0

Appendix Table 3.--Continued.

Station: M3 Date: 16 Jul 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number /m²	Standard deviation /m²
Nemertea	6	30.0	515.4	923.4
Oligochaeta	157	100.0	13,486.1	7,311.8
Gastropoda	1	10.0	85.9	271.6
Planorbidae	7	50.0	601.3	814.9
Lithoglyphus virens	3	30.0	257.7	414.9
Corbicula fluminea	14	70.0	1,202.6	1,159.5
Pisidium spp.	2	20.0	171.8	362.2
Ostracoda	112	90.0	9,620.7	6,425.5
Hyalella azteca	47	80.0	4,037.3	3,927.0
Corixidae	2	10.0	171.8	543.3
Diptera pupae	1	10.0	85.9	271.6
Diptera larvae	3	30.0	257.7	414.9
Chironomidae larvae	63	80.0	5,411.6	5,249.3
Trichoptera	1	10.0	85.9	271.6
Trichoptera larvae	2	10.0	171.8	543.3
Arachnida	1	10.0	85.9	271.6
Hydracarina	1	10.0	85.9	271.6

Number of taxa/categories: 17

Mean number/sample: 42.3 Standard deviation/sample: 23.4

Mean number/m^2 : 36,335.3 Standard deviation: 20,067.8

Appendix Table 3.--Continued.

Station: M4 Date: 16 Jul 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number /m^2	Standard deviation /m^2
Oligochaeta	225	100.0	19,327.3	8,467.3
Gastropoda	1	10.0	85.9	271.6
Planorbidae	2	20.0	171.8	362.2
Corbicula fluminea	13	70.0	1,116.7	996.0
Pisidium spp.	21	80.0	1,803.9	2,306.7
Ostracoda	77	80.0	6,614.2	4,740.5
Hyalella azteca	7	30.0	601.3	1,148.9
Corophium salmonis	5	10.0	429.5	1,358.2
Diptera pupae	1	10.0	85.9	271.6
Chironomidae larvae	202	100.0	17,351.6	15,598.0
Chironomidae pupae	3	30.0	257.7	414.9
Hydracarina	3	20.0	257.7	579.8

Number of taxa/categories: 12

Mean number/sample: 56.0 Standard deviation/sample: 31.4

Mean number/m^2 : 48,103.4 Standard deviation: 26,948.5

Appendix Table 3.--Continued.

Station: G5 Date: 16 Jul 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number /m²	Standard deviation /m²
Neanthes limnicola	9	50.0	773.1	1,309.0
Oligochaeta	285	100.0	24,481.2	17,721.3
Hirudinea	1	10.0	85.9	271.6
Corbicula fluminea	10	80.0	859.0	572.7
Ostracoda	5	40.0	429.5	607.4
Corophium salmonis	3	20.0	257.7	579.8
Harpacticoida	87	90.0	7,473.2	7,914.8
Diptera larvae	1	10.0	85.9	271.6
Chironomidae larvae	14	40.0	1,202.6	2,150.3
Trichoptera	1	10.0	85.9	271.6
Collembola	1	10.0	85.9	271.6

Number of taxa/categories: 11

Mean number/sample: 41.7 Standard deviation/sample: 21.7

Mean number/m^2 : 35,819.9 Standard deviation: 18,600.7

Station: G6 Date: 16 Jul 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number /m²	Standard deviation /m²
Nemertea	1	10.0	85.9	271.6
Neanthes limnicola	36	90.0	3,092.4	2,150.3
Oligochaeta	73	100.0	6,270.6	2,977.0
Corbicula fluminea	18	80.0	1,546.2	1,330.7
Ostracoda	4	40.0	343.6	443.6
Corophium salmonis	105	100.0	9,019.4	3,804.0
Harpacticoida	10	60.0	859.0	1,071.3
Culicidae adult	1	10.0	85.9	271.6
Chironomidae larvae	1	10.0	85.9	271.6

Number of taxa/categories: 9

Mean number/sample: 24.9 Standard deviation/sample: 9.6

Mean number/m^2 : 21,388.8 Standard deviation: 8,233.7

Appendix Table 3.--Continued.

Station: G7 Date: 16 Jul 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number /m^2	Standard deviation /m^2
Neanthes limnicola	7	50.0	601.3	707.2
Oligochaeta	299	100.0	25,683.8	20,077.6
Corbicula fluminea	8	50.0	687.2	887.2
Ostracoda	6	40.0	515.4	829.9
Corophium salmonis	2	20.0	171.8	362.2
Harpacticoida	107	100.0	9,191.2	9,243.2
Chironomidae larvae	4	40.0	343.6	443.6
Hydracarina	1	10.0	85.9	271.6

Number of taxa/categories: 8

Mean number/sample: 43.4 Standard deviation/sample: 23.8

Mean number/m^2 : 37,280.2 Standard deviation: 20,480.9

Station: G8 Date: 16 Jul 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number /m^2	Standard deviation /m^2
Nemertea	3	30.0	257.7	414.9
Neanthes limnicola	63	100.0	5,411.6	1,944.1
Oligochaeta	60	100.0	5,153.9	3,436.0
Corbicula fluminea	18	90.0	1,546.2	1,055.9
Ostracoda	1	10.0	85.9	271.6
Corophium salmonis	70	100.0	6,012.9	2,395.6
Harpacticoida	4	40.0	343.6	443.6
Chironomidae larvae	6	50.0	515.4	600.6

Number of taxa/categories: 8

Mean number/sample: 22.5 Standard deviation/sample: 6.4

Mean number/m^2 : 19,327.3 Standard deviation: 5,496.5

Appendix Table 3.--Continued.

Station: J9 Date: 16 Jul 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number /m^2	Standard deviation /m^2
Nemertea	1	10.0	85.9	271.6
Nematomorpha	1	10.0	85.9	271.6
Oligochaeta	638	100.0	54,803.6	57,344.4
Corbicula fluminea	53	100.0	4,552.6	2,219.8
Ostracoda	105	100.0	9,019.4	5,466.6
Diptera larvae	21	80.0	1,803.9	1,485.1
Chironomidae larvae	29	80.0	2,491.1	2,042.8
Dolichopodidae larvae	1	10.0	85.9	271.6
Hydracarina	1	10.0	85.9	271.6

Number of taxa/categories: 9

Mean number/sample: 85.0 Standard deviation/sample: 68.6

Mean number/m^2 : 73,014.1 Standard deviation: 58,938.1

Station: J10 Date: 16 Jul 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number /m^2	Standard deviation /m^2
Neanthes limnicola	13	70.0	1,116.7	1,075.2
Oligochaeta	189	100.0	16,234.9	5,775.8
Corbicula fluminea	12	90.0	1,030.8	543.3
Ostracoda	8	50.0	687.2	1,055.9
Corophium salmonis	13	60.0	1,116.7	1,405.6
Pontoporeia hoyi	2	20.0	171.8	362.2
Chironomidae larvae	16	70.0	1,374.4	1,228.2
Coleoptera larvae	1	10.0	85.9	271.6
Arachnida	1	10.0	85.9	271.6

Number of taxa/categories: 9

Mean number/sample: 25.5 Standard deviation/sample: 7.6

Mean number/m^2 : 21,904.2 Standard deviation: 6,494.7

Appendix Table 3.--Continued.

Station: J11 Date: 16 Jul 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number /m²	Standard deviation /m²
Nemertea	1	10.0	85.9	271.6
Oligochaeta	673	100.0	57,810.0	40,966.3
Planorbidae	1	10.0	85.9	271.6
Corbicula fluminea	10	50.0	859.0	1,071.3
Ostracoda	92	100.0	7,902.7	4,821.9
Hyalella azteca	1	10.0	85.9	271.6
Insecta	1	10.0	85.9	271.6
Diptera	1	10.0	85.9	271.6
Diptera pupae	1	10.0	85.9	271.6
Diptera larvae	2	20.0	171.8	362.2
Chironomidae larvae	83	90.0	7,129.6	4,130.5
Chironomidae pupae	1	10.0	85.9	271.6
Ceratopogonidae larvae	4	40.0	343.6	443.6
Dolichopodidae larvae	4	30.0	343.6	600.6

Number of taxa/categories: 14

Mean number/sample: 87.5 Standard deviation/sample: 47.4

Mean number/m² : 75,161.6 Standard deviation: 40,673.5

Station: J12 Date: 16 Jul 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number /m²	Standard deviation /m²
Nematomorpha	1	10.0	85.9	271.6
Oligochaeta	625	100.0	53,686.9	21,262.8
Corbicula fluminea	6	50.0	515.4	600.6
Ostracoda	55	90.0	4,724.4	3,116.9
Diptera larvae	1	10.0	85.9	271.6
Chironomidae larvae	101	100.0	8,675.8	4,589.3
Chironomidae pupae	6	40.0	515.4	829.9

Number of taxa/categories: 7

Mean number/sample: 79.5 Standard deviation/sample: 27.9

Mean number/m² : 68,289.7 Standard deviation: 24,008.2

Appendix Table 3.--Continued.

Station: M1 Date: 14 Sep 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number /m^2	Standard deviation /m^2
Nemertea	3	20.0	257.7	579.8
Oligochaeta	295	100.0	25,340.2	9,227.2
Lithoglyphus virens	1	10.0	85.9	271.6
Bivalvia	1	10.0	85.9	271.6
Corbicula fluminea	19	80.0	1,632.1	1,539.3
Pisidium spp.	16	10.0	1,374.4	4,346.2
Ostracoda	132	90.0	11,338.7	7,023.0
Corophium salmonis	6	10.0	515.4	1,629.8
Pontoporeia hoyi	1	10.0	85.9	271.6
Corixidae	1	10.0	85.9	271.6
Chironomidae adult	3	30.0	257.7	414.9
Chironomidae larvae	88	100.0	7,559.1	4,872.7
Chironomidae pupae	7	40.0	601.3	910.0
Ceratopogonidae larvae	3	20.0	257.7	579.8
Trichoptera larvae	1	10.0	85.9	271.6
Coleoptera	1	10.0	85.9	271.6
Invertebrate eggs	46	90.0	3,951.4	2,953.5
Hydracarina	1	10.0	85.9	271.6

Number of taxa/categories: 18

Mean number/sample: 62.5 Standard deviation/sample: 15.2

Mean number/m^2 : 53,686.9 Standard deviation: 13,097.8

Appendix Table 3.--Continued.

Station: M2 Date: 14 Sep 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number $/m^2$	Standard deviation $/m^2$
Neanthes limnicola	3	20.0	257.7	579.8
Oligochaeta	687	100.0	59,012.6	21,242.7
Bivalvia	5	10.0	429.5	1,358.2
Corbicula fluminea	26	100.0	2,233.4	1,228.2
Pisidium spp.	66	90.0	5,669.3	2,897.5
Ostracoda	22	70.0	1,889.8	3,131.4
Hyalella azteca	1	10.0	85.9	271.6
Corophium salmonis	45	70.0	3,865.5	3,345.3
Pontoporeia hoyi	4	30.0	343.6	600.6
Chironomidae larvae	103	100.0	8,847.6	5,567.6
Chironomidae pupae	8	60.0	687.2	789.4
Ceratopogonidae larvae	1	10.0	85.9	271.6
Trichoptera larvae	2	20.0	171.8	362.2
Invertebrate eggs	9	40.0	773.1	1,591.6

Number of taxa/categories: 14

Mean number/sample: 98.2 Standard deviation/sample: 31.1

Mean number/m^2 : 84,352.8 Standard deviation: 26,688.0

Appendix Table 3.--Continued.

Station: M3 Date: 14 Sep 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number /m²	Standard deviation /m²
Nemertea	1	10.0	85.9	271.6
Oligochaeta	306	100.0	26,285.1	7,663.8
Hirudinea	8	40.0	687.2	975.2
Planorbidae	3	30.0	257.7	414.9
Physa spp.	5	40.0	429.5	607.4
Lithoglyphus virens	4	40.0	343.6	443.6
Corbicula fluminea	11	70.0	944.9	854.2
Pisidium spp.	10	50.0	859.0	1,071.3
Ostracoda	2	20.0	171.8	362.2
Hyalella azteca	193	100.0	16,578.5	12,269.2
Corophium salmonis	7	20.0	601.3	1,622.3
Pontoporeia hoyi	2	20.0	171.8	362.2
Harpacticoida	1	10.0	85.9	271.6
Corixidae	1	10.0	85.9	271.6
Chironomidae adult	2	20.0	171.8	362.2
Chironomidae larvae	119	100.0	10,222.0	4,078.6
Chironomidae pupae	7	40.0	601.3	910.0
Dolichopodidae larvae	6	40.0	515.4	724.4
Trichoptera larvae	5	30.0	429.5	730.0
Coleoptera	3	20.0	257.7	579.8
Collembola	1	10.0	85.9	271.6
Hydracarina	1	10.0	85.9	271.6

Number of taxa/categories: 22

Mean number/sample: 69.8 Standard deviation/sample: 12.6

Mean number/m² : 59,957.5 Standard deviation: 10,856.4

Appendix Table 3.--Continued.

Station: M4 Date: 14 Sep 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number $/m^2$	Standard deviation $/m^2$
Hydra spp.	1	10.0	85.9	271.6
Oligochaeta	149	100.0	12,799.0	5,224.2
Hirudinea	1	10.0	85.9	271.6
Lithoglyphus virens	1	10.0	85.9	271.6
Corbicula fluminea	24	90.0	2,061.6	1,159.5
Pisidium spp.	3	20.0	257.7	579.8
Ostracoda	24	80.0	2,061.6	2,502.7
Gammaridae Amphipoda	1	10.0	85.9	271.6
Hyalella azteca	1	10.0	85.9	271.6
Corophium salmonis	4	30.0	343.6	600.6
Insecta	1	10.0	85.9	271.6
Corixidae	1	10.0	85.9	271.6
Chironomidae adult	2	20.0	171.8	362.2
Chironomidae larvae	285	100.0	24,481.2	15,043.9
Chironomidae pupae	21	90.0	1,803.9	1,642.3
Trichoptera larvae	4	30.0	343.6	600.6
Agraylea spp.	1	10.0	85.9	271.6
Ephemeroptera larvae	1	10.0	85.9	271.6
Hydracarina	1	10.0	85.9	271.6

Number of taxa/categories: 19

Mean number/sample: 52.6 Standard deviation/sample: 23.4

Mean number/m^2 : 45,182.9 Standard deviation: 20,117.4

Appendix Table 3.--Continued.

Station: G5 Date: 14 Sep 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number $/m^2$	Standard deviation $/m^2$
Nemertea	5	30.0	429.5	834.8
Neanthes limnicola	3	30.0	257.7	414.9
Oligochaeta	465	100.0	39,943.0	11,368.8
Corbicula fluminea	2	20.0	171.8	362.2
Ostracoda	1	10.0	85.9	271.6
Hyalella azteca	1	10.0	85.9	271.6
Corophium salmonis	333	100.0	28,604.4	9,919.2
Corophium spinicorne	4	20.0	343.6	724.4
Harpacticoida	1	10.0	85.9	271.6
Chironomidae adult	1	10.0	85.9	271.6
Chironomidae larvae	36	90.0	3,092.4	2,032.7
Chironomidae pupae	1	10.0	85.9	271.6
Dolichopodidae larvae	2	20.0	171.8	362.2
Invertebrate eggs	34	80.0	2,920.6	2,840.3

Number of taxa/categories: 14

Mean number/sample: 88.9 Standard deviation/sample: 21.8

Mean number/m^2 : 76,364.2 Standard deviation: 18,699.1

Appendix Table 3.--Continued.

Station: G6 Date: 14 Sep 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number /m^2	Standard deviation /m^2
Nemertea	9	40.0	773.1	1,177.1
Neanthes limnicola	14	80.0	1,202.6	829.9
Oligochaeta	35	90.0	3,006.5	1,681.8
Corbicula fluminea	12	70.0	1,030.8	975.2
Ostracoda	3	30.0	257.7	414.9
Corophium salmonis	869	100.0	74,646.2	11,704.2
Corophium spinicorne	1	10.0	85.9	271.6
Harpacticoida	8	50.0	687.2	887.2
Chironomidae adult	1	10.0	85.9	271.6
Invertebrate eggs	86	90.0	7,387.3	4,879.4

Number of taxa/categories: 10

Mean number/sample: 103.8 Standard deviation/sample: 18.6

Mean number/m^2 : 89,163.2 Standard deviation: 15,992.5

Station: G7 Date: 14 Sep 92 Sample size: 9

Taxon/category	Total number	Frequency of occurrence (%)	Mean number /m^2	Standard deviation /m^2
Neanthes limnicola	1	11.1	95.4	286.3
Oligochaeta	416	111.1	39,704.4	15,884.2
Gastropoda	1	11.1	95.4	286.3
Corbicula fluminea	7	55.6	668.1	715.8
Gammaridae Amphipoda	1	11.1	95.4	286.3
Corophium salmonis	16	44.4	1,527.1	3,348.3
Harpacticoida	2	11.1	190.9	572.7
Dolichopodidae larvae	1	11.1	95.4	286.3
Invertebrate eggs	25	100.0	2,386.1	1,410.0

Number of taxa/categories: 9

Mean number/sample: 52.2 Standard deviation/sample: 37.0

Mean number/m^2 : 44,858.4 Standard deviation: 31,770.4

Appendix Table 3.--Continued.

Station: G8 Date: 14 Sep 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number $/m^2$	Standard deviation $/m^2$
Nemertea	11	60.0	944.9	1,028.4
Neanthes limnicola	14	90.0	1,202.6	600.6
Oligochaeta	70	110.0	6,012.9	991.9
Gastropoda	2	20.0	171.8	362.2
Corbicula fluminea	14	70.0	1,202.6	1,086.5
Ostracoda	2	20.0	171.8	362.2
Corophium salmonis	989	100.0	84,954.1	13,941.9
Harpacticoida	15	90.0	1,288.5	834.8
Ceratopogonidae larvae	1	10.0	85.9	271.6
Trichoptera	1	10.0	85.9	271.6
Trichoptera larvae	3	10.0	257.7	814.9
Invertebrate eggs	51	90.0	4,380.8	3,095.8
Arachnida	1	10.0	85.9	271.6

Number of taxa/categories: 13

Mean number/sample: 117.4 Standard deviation/sample: 20.3

Mean number/m^2 : 100,845.4 Standard deviation: 17,441.2

Appendix Table 3.--Continued.

Station: J9 Date: 14 Sep 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number $/m^2$	Standard deviation $/m^2$
Nemertea	2	20.0	171.8	362.2
Oligochaeta	402	100.0	34,531.4	22,530.4
Planorbidae	3	30.0	257.7	414.9
Physa spp.	2	10.0	171.8	543.3
Lithoglyphus virens	36	90.0	3,092.4	1,950.4
Corbicula fluminea	32	100.0	2,748.8	1,391.0
Ostracoda	2	20.0	171.8	362.2
Harpacticoida	5	10.0	429.5	1,358.2
Chironomidae larvae	27	70.0	2,319.3	2,327.9
Chironomidae pupae	2	20.0	171.8	362.2
Ceratopogonidae larvae	6	50.0	515.4	600.6
Dolichopodidae larvae	12	80.0	1,030.8	975.2
Coleoptera larvae	1	10.0	85.9	271.6
Invertebrate eggs	11	50.0	944.9	1,591.6

Number of taxa/categories: 14

Mean number/sample: 54.3 Standard deviation/sample: 28.2

Mean number/m^2 : 46,643.2 Standard deviation: 24,255.5

Station: J10 Date: 14 Sep 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number $/m^2$	Standard deviation $/m^2$
Neanthes limnicola	24	100.0	2061.6	829.9
Oligochaeta	214	100.0	18,382.4	5,077.0
Corbicula fluminea	18	70.0	1,546.2	1,391.0
Ostracoda	5	30.0	429.5	834.8
Corophium salmonis	12	50.0	1,030.8	1,330.7
Chironomidae larvae	14	70.0	1,202.6	1,086.5
Chironomidae pupae	1	10.0	85.9	271.6
Invertebrate eggs	162	100.0	13,915.6	6,940.8

Number of taxa/categories: 8

Mean number/sample: 45.0 Standard deviation/sample: 8.4

Mean number/m^2 : 38,654.6 Standard deviation: 7,243.6

Appendix Table 3.--Continued.

Station: J11 Date: 14 Sep 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number /m²	Standard deviation /m²
Nemertea	8	40.0	687.2	1,130.9
Oligochaeta	1,011	100.0	86,843.9	42,873.9
Gastropoda	1	10.0	85.9	271.6
Planorbidae	20	80.0	1,718.0	1,460.0
Physa spp.	14	50.0	1,202.6	1,679.4
Lithoglyphus virens	9	60.0	773.1	854.2
Corbicula fluminea	20	80.0	1,718.0	1,145.3
Ostracoda	33	100.0	2,834.7	1,985.8
Gammaridae Amphipoda	3	10.0	257.7	814.9
Hyalella azteca	253	90.0	21,732.4	19,986.0
Pontoporeia hoyi	1	10.0	85.9	271.6
Insecta	2	20.0	171.8	362.2
Chironomidae adult	1	10.0	85.9	271.6
Chironomidae larvae	380	100.0	32,641.6	13,892.2
Chironomidae pupae	33	90.0	2,834.7	1,901.5
Ceratopogonidae larvae	9	60.0	773.1	854.2
Dolichopodidae larvae	3	20.0	257.7	579.8
Trichoptera larvae	8	40.0	687.2	975.2
Invertebrate eggs	3	10.0	257.7	814.9
Arachnida	1	10.0	85.9	271.6
Hydracarina	3	20.0	257.7	579.8

Number of taxa/categories: 21

Mean number/sample: 181.6 Standard deviation/sample: 50.3

Mean number/m² : 155,992.6 Standard deviation: 43,184.0

Appendix Table 3.--Continued.

Station: J12 Date: 14 Sep 92 Sample size: 10

Taxon/category	Total number	Frequency of occurrence (%)	Mean number /m^2	Standard deviation /m^2
Neanthes limnicola	1	10.0	85.9	271.6
Oligochaeta	1,121	100.0	96,292.8	34,909.8
Planorbidae	1	10.0	85.9	271.6
Lithoglyphus virens	1	10.0	85.9	271.6
Bivalvia	1	10.0	85.9	271.6
Corbicula fluminea	43	100.0	3,693.7	1,570.9
Pisidium spp.	54	80.0	4,638.5	3,693.5
Ostracoda	36	80.0	3,092.4	2,188.1
Harpacticoida	2	20.0	171.8	362.2
Chironomidae adult	6	10.0	515.4	1,629.8
Chironomidae larvae	334	100.0	28,690.3	20,763.2
Chironomidae pupae	27	90.0	2,319.3	2,464.8
Ceratopogonidae larvae	1	10.0	85.9	271.6
Dolichopodidae larvae	2	20.0	171.8	362.2
Trichoptera larvae	1	10.0	85.9	271.6
Invertebrate eggs	8	30.0	687.2	1,201.2

Number of taxa/categories: 16

Mean number/sample: 163.9 Standard deviation/sample: 44.7

Mean number/m^2 : 140,788.5 Standard deviation: 38,384.1