

APPENDIX D. SUPPORTING DATA FOR BENTHIC INVERTEBRATE PARAMETERIZATION

Table of Contents

Tables	D-i
Figures	D-ii
1 Introduction	D-1
2 LPRSA Benthic Invertebrate Functional Feeding Groups	D-2
2.1 BENTHIC INVERTEBRATE DEPs	D-4
2.2 BENTHIC INVERTEBRATE FFs	D-5
2.3 BENTHIC INVERTEBRATE DETs	D-5
2.4 BENTHIC INVERTEBRATE C/Os	D-6
3 Biomass Estimates	D-7
3.1 METHODS	D-7
3.2 BIOMASS ESTIMATES BY FUNCTIONAL FEEDING GROUP	D-9
3.3 PREDOMINANT TAXA WITHIN EACH FUNCTIONAL FEEDING GROUP	D-13
4 Parameterization for Benthic Invertebrates	D-14
4.1 WEIGHT, MOISTURE CONTENT, AND LIPID FRACTION	D-14
4.2 DIET FRACTIONS	D-20
4.2.1 Feeding plasticity	D-21
4.2.2 Benthic invertebrate diets for use in bioaccumulation model	D-24
5 References	D-28

Attachment D-1. Benthic Invertebrate Biological Traits Database

Tables

Table 1.	Summary of LPRSA species in benthic invertebrate in designated functional feeding groups	D-2
Table 2.	Biomass by feeding group within LPRSA modeling areas	D-10
Table 3.	Summary of parameters for taxa within DEP group	D-15
Table 4.	Summary of parameters for taxa within FF group	D-16
Table 5.	Summary of parameters for taxa within DET group	D-17
Table 6.	Summary of parameters for taxa within C/O group	D-18
Table 7.	Summary of parameter values for benthic invertebrates	D-19
Table 8.	Feeding preference and plasticity of select LPRSA taxa	D-22
Table 9.	Development of weighted feeding fraction for benthic invertebrate groups by modeling area	D-25

Table 10.	Diets for benthic invertebrate groups in the bioaccumulation model	D-27
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Figures

Figure 1.	Relative average biomass of feeding groups by LPRSA modeling area and by season	D-11
Figure 2.	Estimated total biomass at LPRSA sampling locations by feeding group and by season	D-12

1 Introduction

Benthic invertebrates represent a highly diverse group of taxa that play a key role in estuarine and riverine food webs (Thorp and Covich 2010). Benthic invertebrates are integral members of a fully functioning aquatic system and have a marked impact on ecosystems because they sort, rework, and oxygenate sediment (Bolam et al. 2002) and alter biogeochemical fluxes (e.g., nutrient cycling through the processing of detritus) (Covich et al. 1999). Furthermore, they provide a source of sustenance to many fish and wildlife species. Benthic invertebrates are particularly important for evaluating the bioaccumulation of contaminants in fish, because benthic invertebrates are intimately associated with sediment and act as a vector for contamination into higher-trophic-level feeders (e.g., benthic fish).

Benthic invertebrate community data collected from the Lower Passaic River Study Area (LPRSA) during fall 2009 and spring and summer 2010 were detailed by Windward Environmental LLC (Windward) (2014a, b). An in-depth discussion of the benthic community and assessment of current baseline risks in the LPRSA were presented in the final LPRSA baseline ecological risk assessment (BERA) (Windward 2019).

The purpose of this appendix is to provide the details of the assumptions used in the parameterization of the benthic invertebrate model compartments for the LPRSA bioaccumulation model. The remainder of this appendix is organized as follows:

- ◆ Section 2 – Benthic Invertebrate Feeding Groups
- ◆ Section 3 – Biomass Estimates
- ◆ Section 4 – Parameterization for Benthic Invertebrates
- ◆ Section 5 – References

2 LPRSA Benthic Invertebrate Functional Feeding Groups

For the bioaccumulation model, LPRSA benthic invertebrates were categorized into one of four groups based on dietary preference. The four benthic invertebrate functional feeding groups are:

- ◆ Deposit feeders (DEPs)
- ◆ Filter feeders (FFs)
- ◆ Detritivores (DETs)¹
- ◆ Carnivores/omnivores (C/Os)

Table 1 presents the assigned feeding groups for the benthic invertebrate species found in the LPRSA. In addition, several other life history parameters were compiled for each species; these are detailed in Attachment D-1. The four general benthic invertebrate feeding groups are described in the remainder of this section.

Table 1. Summary of LPRSA species in benthic invertebrate in designated functional feeding groups

Feeding Group/ Major Taxonomic Group ^a	Lowest Practical Taxon ^b	Common Name
Benthic Invertebrate DEPs		
Annelida	<i>Arcteonais lomondi</i> , <i>Aulodrilus</i> spp., <i>Bratislavia unidentata</i> , <i>Dero</i> spp., <i>Enchytraeidae</i> , <i>Ilyodrilus</i> spp., <i>Limnodrilus</i> spp., <i>Lumbriculidae</i> , <i>Nais</i> sp., <i>Ophidonais serpentine</i> , <i>Paranais</i> spp., <i>Potamothrix bavaricus</i> , <i>Quistadrilus multisetosus</i> , <i>Slavina appendiculata</i> , <i>Specaria josinae</i> , <i>Tubificidae</i> (w/ or w/o capilliform setae), <i>Tubificoides</i> spp., <i>Vejdovskyella intermedia</i>	oligochaete worms
	<i>Alitta succinea</i> , <i>Heteromastus filiformis</i> , <i>Mediomastus</i> sp., <i>Pectinaria gouldii</i>	polychaete worms
Bivalvia	<i>Macoma</i> spp. ^c	clams
Crustacea	<i>Apocorophium</i> spp.	amphipod crustacean
Benthic Invertebrate FFs		
Annelida	<i>Boccardia</i> sp.	polychaete worms
Bivalvia	<i>Corbicula</i> sp., <i>Crassostrea virginica</i> , <i>Mulinia lateralis</i> , <i>Mya arenaria</i> , <i>Pisidium</i> sp.	oyster, clams
Chironomidae	<i>Cladotanytarsus</i> sp., <i>Rheotanytarsus exiguus</i> , <i>Smittia</i> sp.	midges

¹ These functional feeding groups are relatively simplified compared to those often described in the literature for invertebrates. For example, specific detritivore groups such as shredders, grazer-scrapers, collector-gatherers, and piercer-herbivores are not distinguished in the bioaccumulation model.

Feeding Group/ Major Taxonomic Group ^a	Lowest Practical Taxon ^b	Common Name
Crustacea	<i>Ampelisca</i> sp., <i>Balanus</i> sp., <i>Chthamalus fragilis</i> , <i>Leptocheirus plumulosus</i> , <i>Leucon</i> spp., Mysidae, <i>Neomysis americana</i>	barnacles, mysids, shrimp
Diptera	Culicidae	true flies
Trichoptera	<i>Cheumatopsyche</i> sp., <i>Hydropsyche</i> spp, <i>Simulium</i> sp., <i>Psychoda</i> sp.	caddisflies
Benthic Invertebrate DETs		
Annelida	Naididae	oligochaete worms
	<i>Hobsonia</i> spp., <i>Laeonereis culveri</i> , <i>Leitoscoloplos fragilis</i> , <i>Manayunkia</i> sp., <i>Marenzelleria viridis</i> , Nereididae, <i>Polydora</i> sp., Spionidae, <i>Streblospio benedicti</i>	polychaete worms
Bivalvia	Sphaeriidae	clams
Chironomidae ^c	Chironomini, <i>Chironomus</i> sp., <i>Cladopelma</i> sp., <i>Cricotopus</i> spp., <i>Dicrotendipes</i> spp., <i>Glyptotendipes</i> sp., <i>Harnischia</i> sp., <i>Limnophyes</i> sp., <i>Microtendipes pedellus</i> , <i>Nanocladius</i> sp., <i>Orthocladius</i> sp., <i>Paracladopelma</i> sp., <i>Parakiefferiella</i> sp., <i>Paralauterborniella nigrohalteralis</i> , <i>Paratanytarsus</i> sp., <i>Paratendipes</i> sp., <i>Phaenopsectra</i> sp., <i>Polypedilum</i> spp., <i>Pseudosmittia</i> sp., <i>Saetheria tylus</i> , <i>Stempellinella</i> sp., <i>Stenochironomus</i> sp., <i>Stictochironomus</i> sp., <i>Synorthocladius</i> sp., <i>Tanytarsini</i> , <i>Tanytarsus</i> sp., <i>Telmatogeton</i> sp., <i>Thienemanniella</i> sp., <i>Tvetenia discoloripes</i>	midges
Coleoptera	<i>Ancyronyx variegatus</i> , <i>Dubiraphia</i> sp., <i>Macronychus glabratus</i> , <i>Stenelmis</i> sp.	beetles
Crustacea	Amphipoda, <i>Caecidotea</i> sp., <i>Chiridotea</i> spp., Corophiidae, <i>Cyathura polita</i> , <i>Edotia</i> spp., Gammaridae, <i>Gammarus</i> spp., <i>Grandidierella onnieroides</i> , <i>Hyalella</i> sp., Idoteidae, <i>Lirceus</i> sp., <i>Marinogammarus stoerensis</i> , <i>Melita nitida</i> , Ostracoda, <i>Palaemonetes pugio</i>	amphipods, isopods, ostracods,
Diptera	<i>Antocha</i> sp., Diptera, <i>Erioptera</i> sp., Psychodidae, <i>Tipula</i> sp.	true flies, crane flies, mosquitoes
Ephemeroptera	Baetidae, <i>Baetis flavistriga</i> , <i>Paraleptophlebia</i> sp., <i>Stenacron</i> sp.	mayflies
Gastropoda	<i>Ferrissia</i> sp., <i>Fossaria</i> sp., Gastropoda, <i>Haminoea solitaria</i> , Hydrobiidae, <i>Ilyanassa obsoleta</i> , <i>Laevapex fuscus</i> , Lymnaeidae, <i>Micromenetus</i> spp., <i>Physa</i> sp., Planorbidae, <i>Promenetus exacuus</i> , <i>Rictaxis punctostriatus</i> , <i>Valvata</i> sp.	limpets, snails
Lepidoptera	Lepidoptera, <i>Petrophila</i> sp.	moths, butterflies
Trichoptera	<i>Hydroptila</i> sp., Hydroptilidae, <i>Leucotrichia pictipes</i>	caddisflies
Benthic Invertebrate C/Os		
Actiniaria	Actiniaria	anemones
Annelida	<i>Alitta succinea</i> , <i>Glycera dibranchiata</i> , <i>Glycinde solitaria</i> , <i>Hypereteone</i> spp.	polychaete worms
	<i>Alboglossiphonia heteroclita</i> , <i>Desserobdella phalera</i> , <i>Erpobdella</i> sp., Erpobdellidae, <i>Helobdella</i> spp., Hirudinea	leeches
Arachnida	Acari, <i>Hygrobatas</i> sp., <i>Koenikea</i> sp., <i>Mideopsis</i> sp., <i>Neumania</i> sp., <i>Oxus</i> sp., <i>Lebertia</i> sp.	water mites

Feeding Group/ Major Taxonomic Group ^a	Lowest Practical Taxon ^b	Common Name
Chironomidae ^d	<i>Ablabesmyiaspp.</i> , <i>Cryptochironomus sp.</i> , <i>Procladius sp.</i> , <i>Tanytus sp.</i> , <i>Thienemannimyia sp.</i> , <i>Cardiocladius sp.</i> , <i>Clinotanytus sp.</i>	midges
Crustacea ^e	Brachyura, <i>Callinectes sapidus</i> , <i>Crangon septemspinosa</i> , Portunidae, <i>Rhithropanopeus harrisi</i> , <i>Synidotea sp.</i> , <i>Orconectes limosus</i> , <i>Perioculodes sp.</i>	shrimp, crabs, isopods
Diptera	<i>Hemerodromia sp.</i> , Dolichopodidae, Ceratopogoninae, <i>Bezzia/Palpomyia sp.</i>	true flies
Gastropoda	<i>Polinices sp.</i>	snails
Odonata	<i>Argia sp.</i> , Coenagrionidae, <i>Stylurus sp.</i>	dragonflies/damselflies
Nematoda	Nematoda	roundworms
Nemertea	Nemertea, <i>Micrura sp.</i> , <i>Prostoma sp.</i>	ribbon worms
Neuroptera	Neuroptera	net-winged insects
Trichoptera	<i>Hydropsyche sp.</i> , Hydropsychidae, <i>Oecetis sp.</i>	caddisflies
Turbellaria	Turbellaria	flatworms

Note: Current taxonomic nomenclature may have changed for species identified in Table 1 since the time of sample collection and analysis. For example, *Rictaxis punctostriatus* has been renamed *Japonacteon punctostriatus*. Names of species in Table 1 and Attachment D-1 reflect naming conventions at the time of collection in 2009 and 2010.

- ^a This column represents a high-level grouping of taxa that was used to describe the LPRSA benthic community; major groups include phyla, classes, orders, and one family (Chironomidae). Highly diverse taxa such as Arthropoda are described in terms of lower taxonomic groupings such as orders of insects, crustaceans, and arachnids.
- ^b This column represents the lowest level of taxonomic identification for individual invertebrates by expert taxonomists during benthic community sample analyses. In some cases, the lowest level of taxonomic identification for an individual was the same as its major taxonomic grouping (e.g., Nemertea and Nematoda).
- ^c *Macoma balthica* was initially considered a DET because they feed on the surface of sediment, where detritus accumulates; however, the species was ultimately moved to the DEP category to be consistent with their definition in the literature.
- ^d Chironomidae is a highly diverse and abundant group, so it is described independently of other dipterans.
- ^e Large crustacean individuals were not observed in LPRSA samples and are not considered part of the C/O feeding group in the model. The blue crab compartment of the model represents large adult crustaceans.

C/O – carnivore/omnivore

DET – detritivore

DEP – deposit feeder

FF – filter feeder

LPRSA – Lower Passaic River Study Area

2.1 BENTHIC INVERTEBRATE DEPS

DEPs include those organisms that intentionally ingest sediment in order to digest organic materials (e.g., buried detritus and bacteria) that are sorbed to sediment particles. Examples of DEPs found in the LPRSA are provided in Table 1. Individual taxa identified in the literature as DEPs that selectively consume rich detrital material at the sediment surface were classified as DETs for the purpose of bioaccumulation modeling and include the following: *Laeonereis culveri*, *Marenzelleria viridis*, and all other spionid polychaetes. Therefore, non-selectively feeding and/or head-down

deposit-feeding species were included in the DEP group for the purpose of bioaccumulation modeling.

2.2 BENTHIC INVERTEBRATE FFs

FFs passively collect suspended material (e.g., through the use of polychaete mucus nets) or actively pump particulates past filtering appendages (e.g., through the use of siphons in bivalves or setae in small crustaceans). Their exposures are likely to reflect concentrations sorbed to suspended particulates or in plankton, which may be in equilibrium with concentrations in the water column. Examples of FFs found in the LPRSA are provided in Table 1.

2.3 BENTHIC INVERTEBRATE DETs

DETs comprise a variety of organisms, including clams, gastropods, polychaetes, amphipods, and insects (Table 1). The feeding strategies of species within this group are diverse, and some species are omnivorous; however, the expected vector for contaminant uptake among DETs is similar (e.g., unconsolidated fluff, anthropogenic inputs like sewage, and animal and plant/algal detritus). Taxa with the following feeding strategies were defined as DETs:

- ◆ **Selectively feeding deposit feeders** – These species sort particles from the sediment surface. For example, some polychaete worms were classified as DETs, given that they are expected to consume surficial detritus that has recently settled out (including near-bottom particulates).
- ◆ **Grazer-scrapers, shredders, and piercer-herbivores** – These organisms consume periphyton, biofilms, and/or leaf litter, all of which are materials expected to have contaminant concentrations similar to those of recently deposited particulate matter (i.e., in equilibrium with concentrations in the water column rather than those in sediment or animal tissues, which compose the diets of DEPs and C/Os, respectively). Although piercer-herbivores (e.g., beetles) are expected to preferentially consume living plant matter, very little submerged or emergent vegetation is present in the LPRSA; for that reason, it is assumed that piercer-herbivores in the LPRSA consume freshly deposited leaf litter, as do shredders. Piercer-herbivores are not abundant or represented by many taxa in the LPRSA and so have little influence on the parameterization of the bioaccumulation model.

- ◆ **Small-bodied omnivores and collector-gatherers** – Small-bodied omnivores tend to be < 1 cm in length and graze on detritus, but they will also consume aquatic plant or animal matter (i.e., carrion), as available. It is assumed that the majority of material consumed by these taxa is detritus. Collector-gatherers selectively consume fine organic particulates and fluff, so the distinction between their diet and that of small-bodied omnivores is expected to be negligible.

2.4 BENTHIC INVERTEBRATE C/OS

C/Os are organisms that eat primarily other benthic organisms but that may also obtain a fraction of their diet from detritus, sediment, or other materials. Examples of organisms in this group include turbellarians, nematodes, leeches, larger insects, decapods (e.g., crabs), and some large polychaetes (Table 1). The following groups were defined as C/Os based on their feeding preferences and strategies:

- ◆ **Benthic omnivores** – Organisms that are active, motile predators or scavengers that primarily feed on animal material (but also consume algae and/or biofilms) are considered benthic omnivores.
- ◆ **Predators and predator/parasites** – These organisms include taxa that are considered to be obligate predators, obligate parasites, or species that can consume smaller invertebrates in addition to parasitizing larger invertebrates (and potentially vertebrates). Leeches (e.g., *Helobdella elongata*) are one example. Species with parasitic larvae were not included in this group; rather those species were included in the group that corresponds to their post-larval, sediment-dwelling life stages.²

² It is assumed that individuals observed in LPRSA sediments were not parasitizing larger species in the water column at the time of collection but were free-living in sediments.

3 Biomass Estimates

The biomass of benthic invertebrates in the LPRSA was estimated using available invertebrate abundance data from the LPRSA, which were collected in fall 2009 (Windward 2014a) and spring and summer 2010 (Windward 2014b). Also, benthic invertebrate biomass data were compiled from regional studies conducted between 2009 and 2013 (CBBMP 2014) and other literature. These data were used to estimate the relative contributions of the four functional feeding groups within the LPRSA in order to assign relative dietary portions of benthic invertebrate prey to higher-trophic-level organisms (i.e., blue crab and fish) in the bioaccumulation model. The methods and results of the estimation of biomass in the LPRSA are described further in the following subsections.

3.1 METHODS

Although the biomass of benthic invertebrates was not directly measured at locations in the LPRSA, a quantitative estimate of biomass was calculated from the available data. Specifically, abundance and taxonomic data collected from the LPRSA in fall 2009 and spring and summer 2010 were used to estimate LPRSA biomass based on abundance, biomass, and taxonomic data from other water bodies. Abundance data were reported in the respective data reports: the fall 2009 data in Appendix J of the 2009 data report (Windward 2014a) and the spring and summer 2010 data in Appendix I of the 2010 data report (Windward 2014b).

The following steps were taken to convert abundance data from the LPRSA into biomass data:

1. **Calculate abundance per m²** – Taxonomists' counts of individual invertebrates from LPRSA sediment samples were adjusted to normalize the data from all LPRSA sampling locations, so that all abundance data were comparable among samples.
 - ◆ If less than 100% of a sample was used by taxonomists to enumerate individuals and identify taxa, then the abundance was corrected by dividing the abundance by the fraction of sample analyzed to extrapolate to 100% of that sample. This assumed that invertebrates were homogeneously distributed within samples. For example, subsampling in fall 2009 ranged from 14.3 to 100% of the total sample, resulting in adjustments ranging from a seven-fold increase (at 14.3%) to no change (at 100%).
 - ◆ Abundance was extrapolated from the actual area sampled, which varied among the sieves used during surveys of the LPRSA (Windward 2014b, a), to a per m² basis. Specifically, a 0.1-m² sieve was used in the "estuarine zone," and a 0.05-m² sieve was used in the "freshwater zone" (upstream of river mile [RM] 8.5). To adjust the abundance value to a per-m² basis,

corrected abundance values were multiplied by 10 or 20 for estuarine or freshwater zone samples, respectively. This assumed that invertebrates were homogeneously distributed over 1-m² areas.

2. **Calculate taxon-specific biomass conversion factors** – Taxon-specific ash-free dry weight (AFDW) biomass conversion factors were calculated using 2009 to 2013 data collected in Chesapeake Bay (Maryland and Virginia datasets), Chesapeake Bay (CBBMP 2014),³ and elsewhere (as reported in the literature). CBBMP (2014) reported abundance and AFDW biomass in separate data files, so abundance and biomass had to be paired according to taxon, sampling year, and location identification (ID). Taxa-specific biomass conversion factors were calculated by dividing the AFDW biomass for a taxon at a sampling location by the number of individuals in that taxon at the same location. This process was repeated for every location ID in both the Virginia and Maryland datasets and for each of the sampling years considered. The geometric mean quotient of biomass and abundance for each taxon was then calculated and used as the final conversion factor for that taxon. Conversion factors based on the literature (i.e., Whiles and Goldowitz 2005; Barbone et al. 2007; Bloom et al. 1972; Douce 1976; Sapkarev 1967; Whiles and Wallace 1995; Lugthart and Wallace 1992; Stone and Wallace 1998; Gogina et al. 2016; Shupryt and Stelzer 2009; Cortelezzi et al. 2007; Nalepa et al. 2010) were calculated by dividing the reported AFDW biomass for a taxon by the reported abundance.
3. **Assign conversion factors for all LPRSA taxa** – Conversion factors for Chesapeake Bay taxa (and those from literature sources) were paired to LPRSA taxa to the extent possible. Surrogate values were used in some instances (e.g., by assigning a taxonomically similar species' conversion factor), when a direct match was not available.⁴
4. **Calculate AFDW biomass per m² for all LPRSA taxa** – Abundance per-m² data from the LPRSA (for each taxon at each sampling location) were then multiplied by the biomass conversion factor for each taxon, resulting in an estimate of the AFDW biomass (per m²) for each taxon.

³ The CBBMP dataset is updated annually. The 2009 to 2013 datasets represented the most recent information at the time that the database of biomass conversion factors was developed (Attachment D-1).

⁴ Surrogate values were only applied up to the order or subclass level; for example, *Hyaella* sp. were assigned a more generic "Amphipoda" value. Similarly, conversion factors for multiple lower-level taxa were sometimes averaged to obtain a surrogate for a higher-level LPRSA taxon (e.g., see Naididae "Biomass References (and Rationale)" in Attachment D-1). In some cases an LPRSA taxon was at too high of a taxonomic level to reasonably assign a surrogate conversion factor (e.g., Ostracoda). See Attachment D-1 for additional information.

5. **Convert AFDW biomass to wet weight biomass** – The estimated AFDW biomass was converted to an estimated wet weight (ww) biomass using taxa-specific⁵ AFDW-to-ww conversion factors from the literature (Ricciardi and Bourget 1998; Smit et al. 1993). Attachment D-1 provides these values, which represent the amount of moisture and organic material (e.g., lipids) lost during the intense drying process. Only dry weight (dw)-to-ww conversions (derived using a less intense drying method) were available for some taxonomic groups (Sapkarev 1967; Newton 2013), but they were still used to convert AFDW biomass estimates to ww biomass.⁶

The biomass data from LPRSA locations were then summarized according to the four functional feeding groups defined in Section 2: DEPs, FFs, DETs, and C/Os. The estimates of biomass for each taxon and group were then averaged across seasons.

3.2 BIOMASS ESTIMATES BY FUNCTIONAL FEEDING GROUP

Mean biomass estimates by functional feeding group were determined for each LPRSA modeling area and for each of the three seasonal LPRSA sampling events (fall 2009, spring 2010, and summer 2010). Table 2 presents the average and range of percentages of biomass contributed by each feeding group within LPRSA areas (across seasons). Differences across seasons and areas are expected, given the different habitat conditions. The sampling methods used during these community survey efforts targeted the collection of infaunal and relatively immobile benthic invertebrates in the LPRSA, as opposed to the relatively larger and more mobile epibenthic invertebrates that might otherwise be included in the C/O category that were collected during the 2009 and 2010 fish/crab community sampling events (e.g., mud crabs, adult blue crabs, grass shrimp) (Windward 2010, 2011). The results in Table 2 show that C/Os consistently represent a small portion of the overall biomass in the LPRSA, indicating that C/Os may be under-represented in this dataset.

⁵ Although conversion factors were taxa specific, the level of taxonomy to which the factors were applied was generally high (e.g., class) because of the limitations of the available data. For example, a single conversion factor was applied to all polychaetes.

⁶ The use of a dw-to-ww rather than an AFDW-to-ww conversion factor is expected to have underestimated the final biomass value for some taxa. The average conversion from AFDW to ww was 0.14 (as the denominator); the dw-to-ww conversions for hirudineans were only slightly greater than that average (0.169 to 0.2). Therefore, the underestimated ww biomass is acceptable. The general dw-to-ww conversion rate applied to water mites was greater than the rates for other taxa (0.4), although water mites contributed a negligible amount of biomass at any sampling location. Therefore, the use of the dw-to-ww conversion factor for water mites had a very small effect on the parameterization of the bioaccumulation model.

Table 2. Biomass by feeding group within LPRSA modeling areas

LPRSA Modeling Area	Average Percent of Total Biomass ^a (%)				Average Total Estimated Biomass (g ww/m ²)				
	DEP	FF	DET	C/O	DEP	FF	DET	C/O	All Groups
Seasonal average									
RM 0–RM 6	53	22	23	1	225	76	94	5.9	401
RM 6–RM 14.7	25	27	33	14	72	96	88	41	297
RM 14.7–Dundee Dam	36	42	12	10	63	109	14	4.1	190
Site-wide	40	29	24	6	360	281	195	51	887
Seasonal range									
RM 0–RM 6	33–73	3–44	21–26	1–2	105–383	15–141	66–121	3.9–8.0	318–527
RM 6–RM 14.7	17–34	12–53	15–43	7–20	50–95	25–217	60–114	20–60	206–407
RM 14.7–Dundee Dam	16–66	28–66	3–25	1–27	3.8–112	7.7–290	3.6–32	2.1–6.5	24–437
Site-wide	36–44	19–38	16–33	5–8	227–566	125–521	159–214	31–71	633–1,371

Note: Values provided in this table are the average and range of seasonal data; percentages of estimated biomass for each season are provided in Figure 1.

^a Percentages of biomass have been rounded to the nearest integer; some rows do not add to 100%.

C/O – carnivore/omnivore

FF – filter feeder

DEP – deposit feeder

LPRSA – Lower Passaic River Study Area

DET – detritivore

RM – river mile

ww – wet weight

While DEPs, DETs, and FFs contribute similar amounts of biomass on average, marked differences appear seasonally (Figure 1). For example, from RM 0 to RM 6, the percentage of biomass contributed by DEPs and FFs changed between fall 2009 and summer 2010 by approximately 40%. Similar shifts occurred for DETs and FFs from RM 6 to RM 14.7. Interestingly, DETs, DEPs, and FFs all change seasonally from RM 14.7 to Dundee Dam, even though habitat conditions (e.g., salinity) in that area are relatively stable throughout the year; the large fluctuations are partly a reflection of the small number of sampling locations from RM 14.7 to Dundee Dam (i.e., $n = 7$ in for fall 2009, and $n = 2$ each for spring and summer 2010). Figure 2 presents the breakdown of biomass by feeding group but, unlike Figure 1, shows absolute estimates of total biomass. Figure 2 shows that there are clear disparities among areas in the amount of biomass that is available to the food web, with the middle modeling area (RM 6 to RM 14.7) having consistently less total biomass than the other two modeling areas. Based on the fall 2009 data, there is a clear switch in the dominance from DEPs at the RM 0 to RM 6 area to FFs in the RM 14.7 to Dundee Dam area (Figure 2); this change reflects the influence of relatively large bivalves (e.g., *M. balthica* or *Corbicula* sp.) over the total biomass in either area. This trend is less apparent in the spring and summer 2010 datasets.



Note: Panes are organized by season and modeling area, as indicated by column and row labels.

Figure 1. Relative average biomass of feeding groups by LPRSA modeling area and by season



3.3 PREDOMINANT TAXA WITHIN EACH FUNCTIONAL FEEDING GROUP

The predominant taxa in each feeding group (based on site-wide estimated biomass) were as follows:

- ◆ **Benthic invertebrate DEPs** – The greatest contribution to DEP biomass (53%) was from the relatively large *M. balthica* clam. Highly abundant but small oligochaetes (e.g., *Limnodrilus* spp.), large oligochaetes (i.e., Lumbriculidae), and somewhat less abundant but large polychaetes (e.g., *Heteromastus filiformis*) also contributed to DEP biomass.
- ◆ **Benthic invertebrate FFs** – This feeding group was dominated by *Corbicula* sp., which accounted for 79% of site-wide FF biomass. The barnacle *Balanus* sp. contributed 12% of the FF biomass, although it was the only FF observed below RM 6. *Pisidium* sp. contributed 6%, site-wide.
- ◆ **Benthic invertebrate DETs** – DET biomass was distributed among several groups, including polychaete worms (e.g., *Laeonereis culveri*, *Leitoscoloplos fragilis*, *Hobsonia florida*, and *M. viridis*), sphaeriid bivalves, crustaceans (e.g., *Cyathura polita* [isopod] and *Gammarus* sp. [amphipods]), gastropods (e.g., *Ilyanassa obsoleta* and Hydrobiidae [mud snails]), and insects (e.g., *Chironomus* sp. [midges]). *M. viridis* accounted for the largest portion of site-wide DET biomass (21%), followed by *L. fragilis*, *Chironomus* sp., and Hydrobiidae (12% each).
- ◆ **Benthic invertebrate C/Os** – The greatest contributions to biomass by C/Os were from Turbellaria (flatworms), chironomids (e.g., *Procladius* sp. and *Cryptochironomus* sp.), decapods (e.g., *Rhithropanopeus harrisi* [mud crab] and *Crangon septemspinosa* [sand shrimp]), and *Helobdella elongata* (leech). *Procladius* sp. and Turbellaria accounted for 43 and 35% of site-wide C/O biomass, respectively.

This information, along with the estimates of benthic invertebrate biomass, was used in the parameterization of diets for higher-trophic-level species that feed on benthic invertebrates.

4 Parameterization for Benthic Invertebrates

This section presents the parameter values for benthic invertebrate weights, moisture content, and lipid fractions (Section 4.1), as well as benthic invertebrate diets (Section 4.2).

4.1 WEIGHT, MOISTURE CONTENT, AND LIPID FRACTION

The bioaccumulation model requires specific input parameters for calibration. Body weight, moisture, and lipid data for the species that make up the majority of the biomass in each feeding group are presented in Tables 3 through 6 and summarized in Table 7.⁷ Body weights were determined using regional biomass and abundance data from Chesapeake Bay (CBBMP 2014) or from the literature. The calculation of the moisture and lipid contents of benthic invertebrates was conducted in a similar manner using values from the literature (which are compiled and cited in Attachment D-1). The averages of these values (weighted by the percentage of the total biomass of each feeding group contributed by each taxa) within each feeding group were used as input parameters in the bioaccumulation model.

⁷ Species included in this “majority” are all those species within a guild that contribute 1% or greater to the total biomass for that guild within any of the three modeling areas.

Table 3. Summary of parameters for taxa within DEP group

Taxon ^a	Major Taxon	Percent of Biomass By Modeling Area (%) ^b			Body Weight (mg ww) ^c	Percent Moisture (%) ^d	Lipids (%) ^e
		RM 0–RM 6	RM 6–RM 14.7	RM 14.7–Dam			
<i>Arcteonais lomondi</i>	Annelida		6		1.11	80	2.12
<i>Heteromastus filiformis</i>	Annelida	2			3.31	80	1.57
<i>Ilyodrilus templetoni</i>	Annelida		10		0.947	80	2.12
<i>Limnodrilus hoffmeisteri</i>	Annelida	1	49	3	0.165	80	2.12
<i>Limnodrilus udekemianus</i>	Annelida		10	1	1.83	80	2.12
Lumbriculidae	Annelida		8	95	404	80	2.12
<i>Macoma balthica</i>	Bivalvia	97	1		151	91	1.34
<i>Quistadrilus multisetosus</i>	Annelida		9		0.124	80	2.12
<i>Slavina appendiculata</i>	Annelida		5		1.11	80	2.12
RM 0–RM 6:							
Weighted average value ^f					150	91	1.4
Range of values					0.17–150	80–91	1.3–2.1
RM 6–RM 14.7:							
Weighted average value ^f					36	80	2.1
Range of values					0.12–400	80–91	1.3–2.1
RM 14.7–Dundee Dam:							
Weighted average value ^f					380	80	2.1
Range of values					0.17–400	80	2.1

^a Taxa included in Table 3 are those species that account for ≥ 1% of the total biomass of the DEP feeding group within any modeling area.

^b Percent biomass was calculated on a per-feeding group and per-modeling area basis. Percentages were calculated as the sum of average biomass contributions by the given taxon across all sampling locations within the modeling area divided by the total biomass of that feeding group within the same area. Total biomass in this case only included the biomass values for taxa included in Table 3.

^c Body weights were determined using regional biomass and abundance data from Chesapeake Bay (CBBMP 2014) or from the literature. AFDW data were converted to ww using conversion factors from the literature. Attachment D-1 provides additional information and citation.

^d Percent moisture was determined using AFDW- or dw-to-ww conversion factors from the literature. Specifically, percent moisture is equal to 100% (AFDW- or dw-to-ww ratio × 100%).

^e Lipid contents of benthic invertebrates were taken from the literature; converted from AFDW to ww, as appropriate (using AFDW- or dw-to-ww conversion factors); and averaged at the level of the major taxon (with the exception of insect taxa, which were averaged together).

^f The percent biomass contributed by each taxa to the total biomass of the feeding group within a modeling area was used to weight the averages within modeling areas.

AFDW – ash-free dry weight

RM – river mile

DEP – deposit feeder

ww – wet weight

dw – dry weight

Table 4. Summary of parameters for taxa within FF group

Taxon ^a	Major Taxon	Percent of Biomass By Modeling Area (%) ^b			Body Weight (mg ww) ^c	Percent Moisture (%) ^d	Lipids (%) ^e
		RM 0–RM 6	RM 6–RM 14.7	RM 14.7– Dam			
<i>Balanus</i> sp.	Crustacea	100	1		11	81	2.34
<i>Corbicula</i> sp.	Bivalvia		90	99	60.8	91	1.34
<i>Pisidium</i> sp.	Bivalvia		9	1	6.43	91	1.34
RM 0–RM 6:							
Weighted average value ^f					11	81	2.3
Range of values					-	-	-
RM 6–RM 14.7:							
Weighted average value ^f					56	91	1.3
Range of values					6.4–61	81–91	1.3–2.3
RM 14.7–Dundee Dam:							
Weighted average value ^f					60	91	1.3
Range of values					6.4–61	-	-

- ^a Taxa included in Table 4 are those species that account for $\geq 1\%$ of the total biomass of the FF group within any modeling area.
- ^b Percent biomass was calculated on a per-feeding group and per-modeling area basis. Percentages were calculated as the sum of average biomass contributions by the given taxon across all sampling locations within the modeling area divided by the total biomass of that feeding group within the same area.
- ^c Body weights were determined using regional biomass and abundance data from Chesapeake Bay (CBBMP 2014) or from the literature. AFDW data were converted to ww using conversion factors from the literature.
- ^d Percent moisture was determined using AFDW- or dw-to-ww conversion factors from the literature. Specifically, percent moisture is equal to 100% (AFDW- or dw-to-ww ratio $\times$ 100%).
- ^e Lipid contents of benthic invertebrates were taken from the literature; converted from AFDW to ww, as appropriate (using AFDW- or dw-to-ww conversion factors); and averaged at the level of the major taxon (with the exception of insect taxa, which were averaged together).
- ^f The percent biomass was contributed by each taxa to the total biomass of the feeding group within a modeling area was used to weight the averages within modeling areas.

AFDW – ash-free dry weight
dw – dry weight
FF – filter feeder

RM – river mile
ww – wet weight

Table 5. Summary of parameters for taxa within DET group

Taxon ^a	Major Taxon	Percent of Biomass By Modeling Area (%) ^b			Body Weight (mg ww) ^c	Percent Moisture (%) ^d	Lipids (%) ^e
		RM 0–RM 6	RM 6–RM 14.7	RM 14.7–Dam			
<i>Caecidotea</i> sp.	Crustacea		4	2	2.76	79	0.587
<i>Chiridotea almyra</i>	Crustacea		2		3.15	79	0.587
<i>Chironomus</i> sp.	Chironomidae		27	16	3.06	85	0.60
<i>Cyathura polita</i>	Crustacea	9	1		8.24	79	0.587
<i>Gammarus</i> sp.	Crustacea	1	13	1	0.313	79	3.84
<i>Hobsonia florida</i>	Annelida	3	2		1.59	80	1.57
Hydrobiidae	Gastropoda	5	22	15	5.44	92	0.795
<i>Ilyanassa obsoleta</i>	Gastropoda	10			326	92	0.795
<i>Laeonereis culveri</i>	Annelida	11			24.0	80	1.57
<i>Leitoscoloplos fragilis</i>	Annelida	30			11.6	80	1.57
Lymnaeidae	Gastropoda			14	nd	92	0.795
<i>Marenzelleria viridis</i>	Annelida	32	19		13.3	80	1.57
<i>Micromenetus dialatus</i>	Gastropoda			21	3.53	92	0.795
Sphaeriidae	Bivalvia		10	30	11.5	91	1.34
RM 0–RM 6:							
Weighted average value ^f					43	82	1.4
Range of values					0.31–330	79–92	0.59–3.8
RM 6–RM 14.7:							
Weighted average value ^f					6.0	85	1.3
Range of values					0.31–13	79–92	0.59–3.8
RM 14.7–Dam:							
Weighted average value ^f					5.6	90	0.97
Range of values					0.31–12	79–92	0.59–3.8

^a Taxa included in Table 5 are those species that account for ≥ 1% of the total biomass of the DET feeding group within any modeling area.

^b Percent biomass was calculated on a per-feeding group and per-modeling area basis. Percentages were calculated as the sum of average biomass contributions by the given taxon across all sampling locations within the modeling area divided by the total biomass of that feeding group within the same area.

^c Body weights were determined using regional biomass and abundance data from Chesapeake Bay (CBBMP 2014) or from the literature. AFDW data were converted to ww using conversion factors from the literature.

^d Percent moisture was determined using AFDW- or dw-to-ww conversion factors from the literature. Specifically, percent moisture is equal to 100% (AFDW- or dw-to-ww ratio × 100%).

^e Lipid contents of benthic invertebrates were taken from the literature; converted from AFDW to ww, as appropriate (using AFDW- or dw-to-ww conversion factors); and averaged at the level of the major taxon (with the exception of insect taxa, which were averaged together).

^f The percent biomass contributed by each taxa to the total biomass of the feeding group within a modeling area was used to weight the averages within modeling areas.

AFDW – ash-free dry weight

DET – detritivore

dw – dry weight

nd – not determined

RM – river mile

ww – wet weight

Table 6. Summary of parameters for taxa within C/O group

Taxon ^a	Major Taxon	Percent of Biomass By Modeling Area (%) ^b			Body Weight (mg ww) ^c	Percent Moisture (%) ^d	Lipids (%) ^e
		RM 0–RM 6	RM 6–RM 14.7	RM 14.7–Dam			
<i>Crangon septemspinosa</i>	Crustacea	18			11.0	73	1.69
<i>Cryptochironomus</i> sp.	Chironomidae		1	6	0.300	85	0.60
<i>Helobdella elongata</i>	Annelida		2	5	1.81	83	2.01
Portunidae	Crustacea	10			220	73	1.69
<i>Procladius</i> sp.	Chironomidae		52	57	2.16	85	0.60
<i>Rhithropanopeus harrisii</i>	Crustacea	67			12.5	73	1.69
<i>Synidotea</i> sp.	Crustacea	4			3.32	79	0.59
<i>Tanypus</i> sp.	Chironomidae	1	1		4.03	85	0.60
Turbellaria	Turbellaria		43	32	2.69	75	2.37
RM 0 to RM 6:							
Weighted average value ^f					33	73	1.6
Range of values					3.3–220	73–85	0.59–1.7
RM 6 to RM 14.7:							
Weighted average value ^f					2.4	81	1.4
Range of values					0.30–4.0	76–85	0.60–2.4
RM 14.7 to Dundee Dam:							
Weighted average value ^f					2.2	82	1.2
Range of values					0.30–2.7	76–85	0.60–2.4

- ^a Taxa included in Table 6 are those species that account for ≥ 1% of the total biomass of the C/O feeding group within any modeling area.
- ^b Percent biomass was calculated on a per-feeding group and per-modeling area basis. Percentages were calculated as the sum of average biomass contributions by the given taxon across all sampling locations within the modeling area divided by the total biomass of that feeding group within the same area.
- ^c Body weights were determined using regional biomass and abundance data from Chesapeake Bay (CBBMP 2014) or from the literature. AFDW data were converted to ww using conversion factors from the literature.
- ^d Percent moisture was determined using AFDW- or dw-to-ww conversion factors from the literature. Specifically, percent moisture is equal to 100% (AFDW- or dw-to-ww ratio × 100%).
- ^e Lipid contents of benthic invertebrates were taken from the literature; converted from AFDW to ww, as appropriate (using AFDW- or dw-to-ww conversion factors); and averaged at the level of the major taxon (with the exception of insect taxa, which were averaged together).
- ^f The percent biomass contributed by each taxa to the total biomass of the feeding group within a modeling area was used to weight the averages within modeling areas.

AFDW – ash-free dry weight
C/O – carnivore/omnivore
dw – dry weight

RM – river mile
ww – wet weight

Table 7. Summary of parameter values for benthic invertebrates

Statistic	DEPs			FFs			DETs			C/Os		
	Body Weight (mg ww)	Percent Moisture (%)	Lipids (%)	Body Weight (mg ww)	Percent Moisture (%)	Lipids (%)	Body Weight (mg ww)	Percent Moisture (%)	Lipids (%)	Body Weight (mg ww)	Percent Moisture (%)	Lipids (%)
RM 0 to RM 6:												
Average	150	91	1.4	11	81	2.3	43	82	1.4	33	73	1.6
Range	0.17–150	80–91	1.3–2.1	-	-	-	0.31–330	79–92	0.59–3.8	3.3–220	73–79	0.59–1.7
RM 6 to RM 14.7:												
Average	36	80	2.1	56	91	1.3	6.0	85	1.3	2.4	81	1.4
Range	0.12–400	80–91	1.3–2.1	6.4–61	81–91	1.3–2.3	0.31–13	79–92	0.59–3.8	0.30–4.0	76–85	0.60–2.4
RM 14.7 to Dundee Dam:												
Average	380	80	2.1	60	91	1.3	5.6	90	0.97	2.2	82	1.2
Range	0.17–400	-	-	6.4–61	-	-	0.31–11	79–92	0.59–3.8	0.30–2.7	76–85	0.60–2.4

Note: Values have been rounded to two significant figures.

C/Os – carnivore/omnivores

DETs – detritivores

RM – river mile

ww – wet weight

DEP – deposit feeders

FFs – filter feeders

As described, the weighted average values presented Table 7 are used for parameterization of the bioaccumulation model. Several important notes regarding the range in values used for parameterization are summarized herein:

- ◆ **Differences in parameter values across modeling areas** – Differences in weights across modeling areas are the result of differences in the community composition observed during sampling. These differences are to be expected, given the differences in habitat and salinity that result in the presence of different species in different areas of the LPRSA. For example, the body weight for C/Os is much higher in the RM 0 to RM 6 modeling area than in the other two areas (Table 6), because of the presence of a larger C/O species (Portunidae) in the RM 0 to RM 6 modeling area (and not in the other two areas).
- ◆ **Comparison of body weights across feeding guilds** – On average, body weights are generally highest for the lower-trophic-level organisms (DEPs) and lowest for the higher-trophic-level organisms (C/Os). Ecologically, there are many examples of carnivores that are smaller than their prey. For the LPRSA, smaller C/O species are often omnivorous crustaceans, which feed on a variety of materials including carrion of larger species, diatoms, and detritus. Some larger C/O species included engulfer predators (meaning they consume entire prey items, as opposed to consuming only part). In either case, C/O species are exposed to contamination in invertebrate tissues regardless of the size of their prey. Thus, the lower average weight of C/Os (as compared with the weights of other invertebrates feeding groups) is not a concern for the model.

4.2 DIET FRACTIONS

As described in Section 2, LPRSA benthic invertebrates were categorized into four feeding groups based on their primary feeding method. For each of these feeding groups, the primary diet item, as it relates to the bioaccumulation model, is as follows:

- ◆ **DEPs** – diet consists of 100% bedded sediment
- ◆ **DETs** – diet consists of 100% near-bottom particulates (i.e., fluff)
- ◆ **FFs** – diet consists of a mix of phytoplankton and zooplankton
- ◆ **C/Os** – diet consists of a mix of other invertebrates (invertebrate portions assigned based on their relative estimated biomasses in the LPRSA)

Although these categories are useful in understanding the benthic invertebrate community, invertebrates (like most organisms) generally utilize several feeding strategies to account for factors such as habitat conditions and available food items, an adaptation often referred to as feeding plasticity. Feeding plasticity and the development of diets for LPRSA invertebrates are discussed below.

4.2.1 Feeding plasticity

Although each invertebrate species in the LPRSA was categorized by feeding group, it is common for invertebrates to utilize alternate feeding strategies (i.e., exhibit feeding plasticity). For example, *M. balthica* and the polychaete *Marenzelleria viridis* exhibit changes in their modes of obtaining food in response to overlying water quality (Lin and Hines 1994; Dauer et al. 1981). When particulates are available, they filter feed (either using an extended siphon or by waving mucilaginous palps), but when particulates decrease in the water column, these species can switch to surface deposit feeding (by turning their respective feeding appendages toward the sediment surface).

In order to characterize the LPRSA invertebrate community in terms of feeding plasticity, a literature search was conducted to parameterize benthic invertebrate species in terms of their feeding preferences. For each species, a percent was assigned to each of the four feeding strategies to account for feeding plasticity, both intentional feeding and unintentional ingestion of sediment or other materials. For simplicity, this analysis was conducted only for those species that account for 1% or more of the total sitewide estimated biomass within each functional feeding group for any of the modeling areas. This reduced list of invertebrate taxa accounted for 95% of the total estimated biomass in the LPRSA (and between 93 and 97% of the total site-wide biomass for each of the feeding groups), indicating that this simplification did not have a major impact on the results of the feeding plasticity evaluation (or the parameterization of the model). The feeding preferences of included species are presented in Table 8.

Table 8. Feeding preference and plasticity of select LPRSA taxa

Taxon ^a	Functional Feeding Group	Fraction of Feeding by Strategy ^b				Notes on Feeding Strategies ^c	Primary Reference
		As DEP	As FF	As DET	As C/O		
<i>Arcteonais lomondi</i>	DEP	0.60	0	0.40	0	"During summer, algae accounted for up to 57–75% by volume of ingested matter in <i>A. lomondi</i> ...depending on lake whereas in winter the corresponding range was 10–22%." Given the ranges during summer and winter feeding, a 60-40 diet of sediment and detritus was considered reasonable. Also, <i>A. lomondi</i> appear to feed in and among aquatic plant communities, suggesting that direct feeding on plants and algae is preferred over feeding on sediments; regardless, the 60% sediment versus 40% detritus diet provides rationale for the assignment of <i>A. lomondi</i> to the DEP group.	(Moore 1981)
<i>Heteromastus filiformis</i>	DEP	0.95	0	0.05	0	"...nonselective deposit feeder. Its food is derived from sediment in the anaerobic layer below the surface. It is a "conveyor-belt feeder," living vertically in the sediment, feeding indiscriminately on smaller sediment particles 4–12 in. below the sediment surface."	(PWS RCAC 2004)
<i>Ilyodrilus templetoni</i>	DEP	0.75	0	0.2	0.05 ^d	"Consumes detritus and organic components of substrate; often consumes largely filamentous algae, diatoms, or miscellaneous plant and animal detritus."	(Vieira et al. 2006)
<i>Limnodrilus hoffmeisteri</i>	DEP	0.95	0	0.05	0	"Scraper/grazer;" "Feed on bacteria in sediment."	(Vieira et al. 2006)
<i>Limnodrilus udekemianus</i>	DEP	0.95	0	0.05	0	"Scraper/grazer;" "Feed on bacteria in sediment" (based on <i>L. hoffmeisteri</i>).	(Vieira et al. 2006)
Lumbriculidae	DEP	0.75	0	0.2	0.05 ^d	"Consumes detritus and organic components of substrate; often consumes largely filamentous algae, diatoms, or miscellaneous plant and animal detritus;" "Ingest sediment, extract nutrition from organic matter, esp. bacteria;" "Detritivore;" "Including algae" (based on Lumbriculidae, <i>Lumbriculus</i> sp. and <i>L. variegatus</i>).	(Vieira et al. 2006)
<i>Macoma balthica</i>	DEP	0.2	0.35	0.45	0	"Feeding behavior is predictable. It extends the separate inhalent siphon 2-3 cm radially from the siphon hole. The siphon is then withdrawn radially, bottom material being sucked up indiscriminately meanwhile. This activity leaves a characteristic 'stellate' pattern on the bottom. A crowded individual will reduce its feeding radius. This behavioral pattern, the restriction of the species' distribution to muddy bottoms, and the hohow tubular cross section of the inhalent siphon indicate that this species is probably exclusively adapted to deposit feeding,"; "For subtidal species, the availability of substrate and suspended food determine whether a given species will be a suspension feeder, a fine-deposit feeder, or a sand-grain feeder..."; "In intertidal wave-swept beaches, one would expect selection to be for permanent suspension feeding (Wade 1967, 1969). However, in protected intertidal areas, where some detritus can accumulate, deposit feeding would probably be selected. But, since currents will still be present with the coming of the tide, suspension feeding can also be used, and the presence of predatory fish may thus lead to selection for suspension feeding when the tide is in and for deposit feeding when the bottom is uncovered." Based on the likely presence of fluff through the LPRSA and the relative lack of intertidal habitat, it is expected that feeding on fluff and water column particulates (etc.) is the dominant feeding mode, which is reflected in the feeding breakdown. However, this species will be classified as DEP to be consistent with categorization in the literature.	(Levinton 1971; Aller and Yingst 1985)
<i>Quistadrilus multisetosus</i>	DEP	0.95	0	0.05	0	No feeding data are available for this species; its diet is assumed to be similar to those of other oligochaetes (e.g., <i>Limnodrilus</i> spp.).	See <i>Limnodrilus</i> spp., above
<i>Slavina appendiculata</i>	DEP	0.95	0	0.05	0	Based on other naidid worms, most likely a predominately deposit feeder. Information is not currently available for this species specifically.	(Vieira et al. 2006)
<i>Balanus</i> sp.	FF	0.05	0.95	0	0	"...filter feed on plankton and edible detritus;" "When water covers a barnacle, the trap door opens, and the barnacle's feathery legs emerge to sweep the water for plankton and detritus. When the tide is out, barnacles close their trap doors to conserve moisture..."	(MBA 2017)
<i>Corbicula</i> sp.	FF	0.15	0.65	0.2	0	"Collector-filterer;" "Parasite;" "Deposit and suspension feeders; consume plankton, algae, bacteria, and microdetritus;" "Consumes fine organic detritus dislodged from the substrate and in suspension. Larvae are parasitic on fish" (based on <i>C. fluminea</i> , and <i>Corbicula</i> sp.).	(Vieira et al. 2006)
<i>Pisidium</i> sp.	FF	0.1	0.8	0.1	0	"Deposit and suspension feeders; consume plankton, algae, bacteria, and microdetritus;" "Consumes fine organic detritus dislodged from the substrate and in suspension. Larvae are parasitic on fish."	(Vieira et al. 2006)
<i>Caecidotea</i> sp.	DET	0.1	0	0.9	0	"Scavengers; feed on dead and injured aquatic animals, and both green and decaying leaves, grass, and aquatic vegetation" (based on various <i>Caecidotea</i> spp.).	(Vieira et al. 2006)
<i>Chiridotea almyra</i>	DET	0.1	0	0.65	0.25	" <i>Chiridotea caeca</i> competes with other predators...for benthic prey within the surf zone;" "...the isopod grazes upon organic detritus..." from within or after emerging from shallow (1 cm) burrows along sandy beaches (based on <i>C. caeca</i>); "...feeding behavior of the isopod <i>C. caeca</i> can be correlated to the TOC in sediment." (based on <i>C. caeca</i>).	(McDermott 2005; Hauck et al. 2008)
<i>Chironomus</i> sp.	DET	0.05	0	0.95	0	"Collector-gatherer," "Detritivore," "Shredder," "Few collector-filterer, Herbivore" (based on various <i>Chironomus</i> spp.).	(Vieira et al. 2006)
<i>Cyathura polita</i>	DET	0.1	0	0.9	0	Detritivore (based on <i>C. carinata</i>)	(Martins et al. 1997)
<i>Gammarus</i> sp.	DET	0.05	0	0.85	0.1 ^d	"Generally omnivorous, scavengers, or detritus feeders; chews food mass without tearing into smaller pieces first. Feeds on all kinds of animal and plant matter, seldomly attacks living animals. Scavenges on freshly killed animals, the film of microscopic plants, animals, and organic debris; aufwuchs" (based on various <i>Gammarus</i> spp.).	(Vieira et al. 2006)
<i>Hobsonia florida</i>	DET	0.25	0	0.75	0	"...a surface deposit feeder, picking up particles with tentacles; family eats detritus, unicellular algae, larval invertebrates (Fauchald and Jumars 1979). Worms begin feeding as newly settled juveniles of 2-3 setigers, by muscular pumping of lips, before tentacles develop...When feeding, adult stretches out of tube, spreads tentacles over substratum, keeps branchiae up in water...Food ingestion dependent on particles' surface texture, size; sorting for specific gravity done in gut (Taghon et al. 1978)"	(Rudy et al. 1988)
Hydrobiidae	DET	0.05	0	0.95	0	"Consume mostly the thin film of algae that covers most submerged surfaces; also occasionally feed on dead plant and animal materials."	(Vieira et al. 2006)
<i>Ilyanassa obsoleta</i>	DET	0.05	0	0.95	0	Detritivore; selectively feeds on <i>Ulva</i> sp detritus.	(Kelaher et al. 2003)
<i>Laeonereis culveri</i>	DET	0.35	0	0.55	0.1 ^d	Gut contents observed in terms of frequency of item presence: highest frequencies of macrophyte detritus, foraminiferans, and diatoms. It is assumed that detritus, foraminiferans, and diatoms are most abundant at the sediment surface and associated with unconsolidated sediments.	(Checon et al. 2016; Magalhaes and Barros 2011)
<i>Leitoscoloplos fragilis</i>	DET	0.5	0	0.5	0	"...potential food items (organic POC/PON, diatoms, bacteria)"; "In these coarse-grained sediments benthic diatoms are the major food resource for <i>L. fragilis</i> "	(Bianchi 1988)

Taxon ^a	Functional Feeding Group	Fraction of Feeding by Strategy ^b				Notes on Feeding Strategies ^c	Primary Reference
		As DEP	As FF	As DET	As C/O		
Lymnaeidae	DET	0.05	0	0.95	0	"Consume mostly the thin film of algae that covers most submerged surfaces; also occasionally feed on dead plant and animal materials"; "Omnivorous scavengers; consume algae that covers most submerged surfaces, dead plant and animal materials"; "Consume long strands of filamentous algae; scrape algae and diatoms from rocks or macrophytes" (based on various Lymnaeids).	(Vieira et al. 2006)
<i>Marenzelleria viridis</i>	DET	0.25	0.2	0.55	0	" <i>Marenzelleria viridis</i> is a deep-burrowing surface deposit feeder that uses a pair of tentaculate palps to search for food (George 1966) as well as occasional irregular lashing of both palps in the water column for suspension feeding (Dauer et al. 1981)."	(Jovanovic et al. 2014)
<i>Micromenetus dialatus</i>	DET	0.05	0	0.95	0	No feeding data is available for this species; its diet is assumed to be similar to other planorbid snails: "Consume mostly the thin film of algae that covers most submerged surfaces; also occasionally feed on dead plant and animal materials;" "Prefers consuming detritus, but will also eat periphyton and bacteria" (based on various other planorbid snails).	(Vieira et al. 2006)
Sphaeriidae	DET	0.3	0.5	0.2	0	"Deposit and suspension feeders; consume plankton, algae, bacteria, and microdetritus;" "Consumes fine organic detritus dislodged from the substrate and in suspension. Larvae are parasitic on fish" (based on Sphaeriidae, <i>Sphaerium</i> sp. and <i>S. striatinum</i>).	(Vieira et al. 2006)
<i>Crangon septemspinosa</i>	C/O	0.05	0	0.85	0.1	"In nature, 85% of the material in the stomach is organic debris; sand, crustacean parts, copepods, plant material and polychaetes make up the remainder." Given that a large part of their diet is composed of animal tissues, and based on the size of this species, it has been categorized as C/O, although the majority of its diet comes from detritus.	(Wilcox and Jeffries 1974)
<i>Cryptochironomus</i> sp.	C/O	0.05	0	0	0.95	"Predator;" "Engulfer of Protozoa, Microcrustacea, Chironomidae, Piercer of Oligochaeta" (based on <i>C. blarina</i> , <i>C. sorex</i> , and <i>Cryptochironomus</i> sp.).	(Vieira et al. 2006)
<i>Helobdella elongata</i>	C/O	0.05	0	0	0.95	"Predator," "Parasite," "Feeds on aquatic insects and parasitic on fish," "Often are temporary parasites on fish, frogs, turtles, and humans," "Feeds on snails" (based on <i>H. californica</i> , <i>H. elongata</i> , <i>H. stagnalis</i> , and <i>Helobdella</i> sp.).	(Vieira et al. 2006)
Portunidae	C/O	0.1	0	0.05	0.85	"...benthophagic, with preference for infaunal and slow moving prey, as attested by the notable amount of sediment in their stomachs; the most frequent food items were molluscs, crustaceans and fish" (based on <i>Charybdis longicollis</i>); "Crustaceans form the predominant food item"; "The other dietary items includes fishes, detritus, mud and sand and miscellaneous" (based on <i>Scylla olivacea</i>); "omnivorous, feeding on a wide range of benthic invertebrates, scavenging on dead pelagic animal remains, and ingesting significant amounts of plant material" (based on <i>Portunus pelagicus</i>).	(Stasolla et al. 2015; Viswanathan and Raffi 2015; Hajisamae et al. 2015)
<i>Procladius</i> sp.	C/O	0.1	0	0.45	0.45	"Collector-gatherer;" "Engulfer of Protozoa, Microcrustacea, Ephemeroptera, Ceratopogonidae, Gastrotricha."	(Vieira et al. 2006)
<i>Rhithropanopeus harrisii</i>	C/O	0.05	0	0.15	0.8	"In Baltic coastal waters this species feeds on detritus, and also on animal and plant matter"; "Remains of Chlorophyta, Amphipoda, Ostracoda, Polychaeta, Gastropoda and Bivalvia were found in the stomachs of the specimens analysed"; "The generalist consumer nature of <i>R. harrisii</i> and preference for structured habitat was supported by an active habitat and food choice, revealing no preference for prey species (polychaetes versus amphipod), but selection of brown algae over bare mud."	(Hegele-Drywa and Normant 2009; Aarnio et al. 2015)
<i>Synidotea</i> sp.	C/O	0.05	0	0.2	0.75	Consume live animal tissue, carrion, and plant matter as available (based on laboratory study with <i>S. laticauda</i>); preference in the field is unclear	(Boyd 2008)
<i>Tanypus</i> sp.	C/O	0.05	0	0.25	0.7	Engulfer and piercer (parasite); some species feed on algae; may also be parasitic (i.e., feeding on fluids only) or herbivorous	(Cranston 2010; Vieira et al. 2006)
Turbellaria	C/O	0.05	0	0.05	0.9	"...on the whole, turbellarians feed on a variety of food items"; "the majority of turbellarians appear to be predators"; "Turbellarians are known to eat ciliates, hydroids, nematodes, turbellarians, copepods, amphipods, annelids, and also dead animals"; "...there is no strong evidence that turbellarians feed on bacteria"; "From the data now available we conclude that bacteria and detritus play a minor role (if any at all) in turbellarian diet, that some turbellarians prefer diatoms, and that the majority of them are mainly predators or scavengers."	(Martens and Schockaert 1986)

^a A species was selected for inclusion in this table if it contributed ≥ 1% to the total site-wide biomass or to the biomass within its feeding group. These criteria were used for the sake of simplicity and because parameters based on the values in this table were biomass weighted; therefore, species contributing < 1% to biomass would have a minimal effect on the resulting parameterization. The species included in this table account for 95% of the total estimated biomass in the LPRSA.

^b Fractions were determined based on information in the available literature. The notes on feeding strategies provide the key information used when assigning fractions for dietary strategies. See Section 2 for a description of the feeding strategies associated with each feeding group. **Bold values** indicate the dominant feeding mode(s) for the taxon.

^c **Bold text** provides rationale for the assignment of a taxon’s functional feeding group or the plasticity of a taxon’s diet.

^d DETs and DEPs, although they cannot feed as C/Os in the bioaccumulation model, are likely to feed on a variety of food items potentially including living animal tissues; this is reflected in this table, although the diet of DETs and DEPs will ultimately be adjusted for the bioaccumulation model to exclude a C/O feeding mode. Similarly, DEPs will not be able to eat DETs in the model.

C/O – carnivore/omnivore
DEP – deposit feeder

DET – detritivore
FF – filter feeder

LPRSA – Lower Passaic River Study Area

POC – particulate organic carbon
PON – particulate organic nitrogen

4.2.2 Benthic invertebrate diets for use in bioaccumulation model

In order to parameterize the diets of the four feeding groups by modeling area, weighted-average feeding values were calculated by multiplying the biomass percentage for each species (for each modeling area) by the feeding fractions presented in Table 9. These values were then summed within areas and feeding groups to calculate the diets used in the bioaccumulation model for invertebrates. The resulting values are presented in Table 10. Also, the proportion of invertebrates consumed by those invertebrates feeding as C/Os were determined (Table 10). The fractions of invertebrates (within feeding groups) consumed by C/Os are proportionate to the relative biomass of each feeding group within each modeling area.⁸ Due to modeling constraints, invertebrates were not allowed to feed at their own trophic level or higher. The trophic levels for the invertebrate feeding groups were ordered as follows: DEP < FF < DET < C/O, so that DEPs occupy the lowest trophic position, and C/Os occupy the highest position. Some DETs have the potential to feed on carrion (e.g., of fish or other invertebrates), so it is reasonable that they occupy a higher position than FFs, which feed primarily on plankton. Moreover, no FF species are expected to feed as C/Os.

⁸ Relative biomass estimates are based on the average biomass for each feeding group (as a proportion of the total biomass across feeding groups), within each modeling area, and across seasonal surveys (fall 2009 and spring/summer 2010).

Table 9. Development of weighted feeding fraction for benthic invertebrate groups by modeling area

Species	Feeding Fraction ^a				RM 0–RM 6					RM 6–RM 14.7					RM 14.7–Dundee Dam				
	As DEP	As FF	As DET	As C/O	Percent of Group ^b	Weighted Percent				Percent of Group ^b	Weighted Percent				Percent of Group ^b	Weighted Percent			
						DEP	FF	DET	C/O		DEP	FF	DET	C/O		DEP	FF	DET	C/O
DEPs																			
<i>Arcteonais lomondi</i>	0.6	0	0.4	0	0%	-	-	-	-	5%	3%	-	2%	-	5%	3%	-	2%	-
<i>Heteromastus filiformis</i>	0.95	0	0.05	0	2%	1.9%	-	0%	-	0%	-	-	-	-	0%	-	-	-	-
<i>Limnodrilus hoffmeisteri</i>	0.95	0	0.05	0	2%	2%	-	0%	-	51%	49%	-	3%	-	20%	19%	-	1%	-
<i>Limnodrilus udekemianus</i>	0.95	0	0.05	0	0.04%	0%	-	0%	-	10%	10%	-	1%	-	10%	10%	-	1%	-
<i>Ilyodrilus templetoni</i>	0.75	0	0.2	0.05	0%	-	-	-	-	9%	7%	-	1.8%	0%	1%	1%	-	0%	0%
<i>Lumbricidae</i>	0.75	0	0.2	0.05	0%	-	-	-	-	8%	6%	-	1.6%	0%	60%	45%	-	12%	3%
<i>Macoma balthica</i>	0.2	0.35	0.45	0	96%	19%	34%	43%	-	2%	0%	1%	1%	-	0%	-	-	-	-
<i>Quistadrilus multisetosus</i>	0.95	0	0.05	0	0.0003%	0%	-	0%	-	10%	9%	-	0%	-	1%	1%	-	0%	-
<i>Slavina appendiculata</i>	0.95	0	0.05	0	0%	-	-	-	-	4%	4%	-	0%	-	4%	3%	-	0%	-
Weighted average sum					-	23%	34%	43%	0%	-	88%	1%	10%	1%	-	73%	0%	22%	5%
FFs																			
<i>Balanus sp.</i>	0.05	0.95	0	0	100%	5%	95%	-	-	0%	0%	0%	-	-	0%	-	-	-	-
<i>Corbicula sp.</i>	0.15	0.65	0.2	0	0%	-	-	-	-	83%	13%	54%	17%	-	91%	14%	59%	18%	-
<i>Pisidium sp.</i>	0.1	0.8	0.1	0	0%	-	-	-	-	16%	2%	13%	2%	-	9%	1%	7%	1%	-
Weighted average sum					-	5%	95%	-	-	-	14%	68%	18%	-	-	15%	66%	19%	-
DETs																			
<i>Caecidotea sp.</i>	0.1	0	0.9	0	0%	-	-	-	-	3%	0%	-	2%	-	16%	2%	-	15%	-
<i>Chiridotea almyra</i>	0.1	0	0.65	0.25	0.02%	0%	-	0%	0%	1%	0%	-	1%	0%	0%	-	-	-	-
<i>Chironomus sp.</i>	0.05	0	0.95	0	0.04%	0%	-	0%	-	23%	1%	-	22%	-	22%	1%	-	21%	-
<i>Cyathura polita</i>	0.1	0	0.9	0	9%	1%	-	9%	-	2%	0%	-	1%	-	0%	-	-	-	-
<i>Gammarus sp.</i>	0.05	0	0.85	0.1	0.6%	0%	-	1%	0%	11%	1%	-	9%	1%	7%	0%	-	6%	1%
<i>Hobsonia florida</i>	0.25	0	0.75	0	2%	1%	-	2%	-	2%	0%	-	1%	-	0%	-	-	-	-
<i>Hydrobiidae</i>	0.05	0	0.95	0	6%	0%	-	6%	-	23%	1%	-	22%	-	9%	0%	-	9%	-
<i>Ilyanassa obsoleta</i>	0.05	0	0.95	0	9%	0%	-	9%	-	0%	-	-	-	-	0%	-	-	-	-
<i>Laeonereis culveri</i>	0.35	0	0.55	0.1	8%	3%	-	4%	1%	0.0%	0%	-	0%	0%	0%	-	-	-	-
<i>Leitoscoloplos fragilis</i>	0.5	0	0.5	0	26%	13%	-	13%	-	0.0%	0%	-	0%	-	0%	-	-	-	-
<i>Lymnaeidae</i>	0.05	0	0.95	0	0%	-	-	-	-	0%	-	-	-	-	6%	0%	-	6%	-

Species	Feeding Fraction ^a				RM 0–RM 6					RM 6–RM 14.7					RM 14.7–Dundee Dam				
	As DEP	As FF	As DET	As C/O	Percent of Group ^b	Weighted Percent				Percent of Group ^b	Weighted Percent				Percent of Group ^b	Weighted Percent			
						DEP	FF	DET	C/O		DEP	FF	DET	C/O		DEP	FF	DET	C/O
<i>Marenzelleria viridis</i>	0.25	0.2	0.55	0	38%	10%	8%	21%	-	24%	6%	5%	13%	-	0%	-	-	-	-
<i>Micromenetes dialatus</i>	0.05	0	0.95	0	0%	-	-	-	-	0.4%	0%	-	0%	-	9%	0%	-	8%	-
<i>Sphaeriidae</i>	0.3	0.5	0.2	0	0%	-	-	-	-	12%	4%	6%	2%	-	31%	9%	15%	6%	-
Weighted average sum					-	28%	8%	64%	1%	-	13%	11%	74%	1%	-	14%	15%	70%	1%
C/Os																			
<i>Crangon septemspinosa</i>	0.05	0	0.85	0.1	17%	1%	-	15%	2%	0%	-	-	-	-	0%	-	-	-	-
<i>Cryptochironomus sp.</i>	0.05	0	0	0.95	0.05%	0%	-	-	0%	1.7%	0%	-	-	2%	4.6%	0%	-	-	4%
<i>Helobdella elongata</i>	0.05	0	0	0.95	0%	-	-	-	-	1.8%	0%	-	-	2%	6.7%	0%	-	-	6%
<i>Portunidae</i>	0.1	0	0.05	0.85	7%	1%	-	0%	6%	0%	-	-	-	-	0%	-	-	-	-
<i>Procladius sp.</i>	0.1	0	0.45	0.45	0.2%	0%	-	0%	0%	62%	6%	-	28%	28%	60%	6%	-	27%	27%
<i>Rhithropanopeus harrisii</i>	0.05	0	0.15	0.8	72%	4%	-	11%	57%	0.5%	0%	-	0%	0%	0%	-	-	-	-
<i>Synidotea sp.</i>	0.05	0	0.2	0.75	3%	0%	-	1%	2%	0%	-	-	-	-	0%	-	-	-	-
<i>Tanypus sp.</i>	0.05	0	0.25	0.7	0.6%	0%	-	0%	0%	3%	0%	-	1%	2%	0.05%	0%	-	0%	0%
<i>Turbellaria</i>	0.05	0	0.05	0.9	0%	-	-	-	-	31%	2%	-	2%	28%	28%	1%	-	1%	25%
Weighted average sum					-	5%	-	27%	68%	-	8%	-	30%	62%	-	8%	-	29%	63%

Note: Weighted percentages are reported to the closest whole number; thus in some cases, sums may not appear to add up to the reported weighted average sum value.

^a Feeding fractions were developed as described in Table 8.

^b Percent of group is the average percent biomass across the three seasons during which benthic invertebrate community data were collected (fall 2009, spring 2010, and summer 2010). Data rules for developing biomass percentages were different for Tables 3 through 6 (as compared with those presented for Table 9), resulting in some differences in the reported percentages. These differences resulted from changes that occurred during the course of model development and are within the range of variability for biomass at locations throughout the LPRSA.

C/Os – carnivore/omnivores

DEPs – deposit feeders

DETs – detritivores

FFs – filter feeders

LPRSA – Lower Passaic River Study Area

RM – river mile

Table 10. Diets for benthic invertebrate groups in the bioaccumulation model

Modeling Area	Feeding Group	Feeding Strategy (%) ^a				Proportion of Invertebrates ^b			Associated Diet in Bioaccumulation Model (%) ^c						
		As DEPs	As FFs	As DETs	As C/Os	DEP	FF	DET	Sediment	Particulate or Fluff	PHY	ZOO	DEP	FF	DET
RM 0 to RM 6	DEP	23	34	43	0	na	na	na	23	43	17	17	-	-	-
	FF	5	95	0	0	na	na	na	5	0	47.5	47.5	0	-	-
	DET	28	8	64	1	70	30	0 ^d	28	64	3.5	3.5	1	0	-
	C/O	5	0	27	68	54	23	24	5	27	0	0	37	15	16
RM 6 to RM 14.7	DEP	89	1	10	0 ^d	na	na	na	89	10	0.5	0.5	-	-	-
	FF	14	68	18	0	na	na	na	14	18	34	34	0	-	-
	DET	13	11	74	1	52	48	0 ^d	13	74	5.5	5.5	1	1	-
	C/O	8	0	30	62	29	32	39	8	30	0	0	18	20	24
RM 14.7 to Dundee Dam	DEP	84	0	16	0 ^d	na	na	na	84	16	0	0	-	-	-
	FF	15	66	19	0	na	na	na	15	19	33	33	0	-	-
	DET	14	15	70	1	45	55	0 ^d	14	70	8	8	0	0	-
	C/O	8	0	29	63	39	46	15	8	29	0	0	25	29	9

- ^a Percent feeding strategies represent how each group is feeding (differences by modeling area are based on the abundance of individual species within each feeding group in that area). Feeding strategies are based on the biomass-weighted sums presented in Table 9, with values rounded as needed to ensure that each diet adds up to 100%.
- ^b The proportion of invertebrates is the relative biomass of invertebrates in a given model area, which represents the proportion consumed by invertebrates when feeding as C/Os (assuming diet composition is proportionate to available food). The proportions of biomass by feeding guild are weighted average values, as presented in Table 9.
- ^c Values were converted from feeding strategy to the bioaccumulation model diet based on the following simplified assumptions:
- Diet for invertebrates feeding as DEPs was assumed to be 100% sediment.
 - Diet for invertebrates feeding as FFs was assumed to be 50% each of phytoplankton and zooplankton.
 - Diet for invertebrates feeding as DETs was assumed to be 100% particulates/fluff.
 - Diet for invertebrates feeding as C/Os was assumed to be a mix of invertebrates (proportions based on invertebrate abundance in a given area).
- ^d Because of the mechanistic limitations of the bioaccumulation model, modeled species/groups can only consume species/groups that are of lower trophic levels (i.e., they cannot eat other members of their own group/species or those higher on the food chain). The trophic levels of the benthic invertebrate feeding groups are ordered as follows: DEP < FF < DET < C/O. Thus, this value was reduced to 0%, and the proportions of the lower trophic boxes were adjusted proportionally.

C/O – carnivore/omnivore
DEP – deposit feeder

DET – detritivore
FF – filter feeder

na – not applicable
PHY – phytoplankton

RM – river mile
ZOO – zooplankton

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**ATTACHMENT D-1. DATABASE OF BENTHIC
INVERTEBRATE TAXONOMY, TRAITS, AND
ESTIMATES OF BIOMASS/PERCENT MOISTURE**

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Attachment D-1
Database of Benthic Invertebrate Taxonomy, Traits, and Estimates of Biomass/Percent Moisture

Taxonomy (a)				Ecology		Biomass/Percent Moisture				Reference		
Lowest Practical Taxon	Phylum, Subphylum, or Class	Order or Subclass	Family or Suborder	Feeding Group	Notes on Ecology	Dry Biomass (kg dw/ind)	Wet-to-Dry Conversion Factor	Wet Biomass (mg ww/ind)	Moisture Content (%)	Ecology References (and rationale)	Biomass References (and rationale)	Infaunal presence/ absence (b)
<i>Ablabesmyia mallochi</i>	Insecta	Diptera	Chironomidae	C/O	Obligate predator (per Roback [1985] in reference to genus); collector-gatherer (as per Vieira et al. [2006] in reference to genus); generally small bodied (2-15 mm)	6.30E-07	0.129	4.88	87%	Simpson and Bode (1980); Boesel (1972); Fagnani and Harman (1987); Roback (1985); Vieira et al. (2006); Thorp and Covich (2010) (based on Chironomidae)	CBBMP (2014) (<i>Ablabesmyia parajanta</i> surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Ablabesmyia</i> sp.	Insecta	Diptera	Chironomidae	C/O	Collector-gatherer and invertebrate-piercer	6.30E-07	0.129	4.88	87%	Simpson and Bode (1980); Boesel (1972); Fagnani and Harman (1987); Roback (1985); Vieira et al. (2006); Thorp and Covich (2010) (based on Chironomidae)	CBBMP (2014) (<i>Ablabesmyia parajanta</i> surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
Acari	Arachnida	Acari	na	C/O	Invertebrate parasite (mostly); very small bodied, likely shallow if infaunal	3.69E-09	0.4	0.00923	60%	Vieira et al. (2006) (from water mite families); Thorp and Covich (2010); Pilarczyk et al. (2007) (based on Acari species)	Douce (1976) (average of all Acari species); ww conversion based on Newton (2013), conversion is for dw to ww rather than AFDW to ww	X
Actiniaria	Cnidaria	Actiniaria	na	C/O	Tentaculate zooplankton predator; may burrow as deep as 30 to 35 cm; several are sessile and attach to hard surfaces epibenthically	7.37E-07	0.143	5.15	86%	Brusca and Brusca (2003); Kristensen and Kostka (2004)	CBBMP (2014) (based on Anthozoa); ww conversion based on Ricciardi and Bourget (1998) (for Actiniaria)	X
<i>Alboglossiphonia heteroclita</i>	Annelida	Hirudinea	Glossiphoniidae	C/O	Invertebrate parasite; small bodied	5.07E-07	0.175	2.9	83%	Vieira et al. (2006) (based on glossophonids); Calow and Riley (1982) (based on glossiphoniids)	CBBMP (2014) (based on Hirudinea); ww conversion from Sapkarev (1967) (from <i>Helobdella</i> spp., maximum density), based on dw rather than AFDW; high level of uncertainty due to the degree of taxonomic difference	X
<i>Argia</i> sp.	Insecta	Odonata	Coenagrionidae	C/O	Engulfer; large-bodied damselfly species	1.08E-07	0.129	0.835	87%	Vieira et al. (2006); Thorp and Covich (2010)	CBBMP (2014) (based on Coenagrionidae); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	(c)
<i>Bezzia/Palpomyia</i> sp.	Insecta	Diptera	Ceratopogonidae	C/O	Engulfer; burrow into soft sediment or algal growths; generally small bodied (2-15 mm)	5.94E-08	0.129	0.46	87%	Connelly (2013); Vieira et al (2006); Pilarczyk et al. (2007); Bouchard (2004) (based on Ceratopogonidae)	Whiles and Goldowitz (2005) (based on Diptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Brachyura</i>	Crustacea	Decapoda	Pleocyemata	C/O	Group is diverse, although most are carnivorous scavengers and predators living primarily epibenthically although possibly burrowing to evade predators	7.94E-07	0.165	4.81	84%	Llanso (2002)	CBBMP (2014) (based on Brachyuran zoea; potential underestimate); ww conversion based on Ricciardi and Bourget (1998) (based on Decapoda)	X
<i>Callinectes sapidus</i>	Crustacea	Decapoda	Portunidae	C/O	Feeds opportunistically, but primarily on animal matter	3.59E-06	0.165	21.8	84%	Laughlin (1982); Barshaw and Able (1990); Millikin and Williams (1984); SMS (2004)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Decapoda)	X
<i>Cardiocladius</i> sp.	Insecta	Diptera	Chironomidae	C/O	Larval invertebrate-engulfer; up to 11 mm long as larvae	9.84E-08	0.129	0.763	87%	Oliver and Bode (1985); Cranston (2010)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	(c)
Ceratopogoninae	Insecta	Diptera	Ceratopogonidae	C/O	Engulfer; burrow into soft sediment or algal growths; generally small bodied (2-15 mm)	2.71E-07	0.129	2.1	87%	Vieira et al. (2006); Pilarczyk et al. (2007); Bouchard (2004)	CBBMP (2014) (based on Ceratoponidae); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Clinotanypus</i> sp.	Insecta	Diptera	Chironomidae	C/O	Engulfer; up to 15 mm long as larvae; prefer soft sediment and variable water quality; also consumes detritus	9.84E-08	0.129	0.763	87%	Vieira et al. (2006); Cranston (2010)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
Coenagrionidae	Insecta	Odonata	Coenagrionidae	C/O	Sits and waits for prey, but can move to search for food	1.08E-07	0.129	0.835	87%	Vieira et al. (2006) (size based on multiple species); Pilarczyk et al. (2007)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Crangon septemspinosa</i>	Crustacea	Decapoda	Crangonidae	C/O	In nature, 85% of the material in the stomach is organic debris; sand, crustacean parts, copepods, plant material and polychaetes make up the remainder. Given that a large part of their diet is composed of animal tissues and based on the size of this species, it has been categorized as C/O.	1.82E-06	0.165	11	73%	Wilcox and Jeffries (1974)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Decapoda)	X
Crayfish (unspecified)	Crustacea	Decapoda	unclear without more specific identification	C/O	Allochthonous, autochthonous, living, dead animal and plant tissues; "crayfish" could refer to several families of decapods within the Astacoidea or Parastacoidea superfamilies	#N/A	nd	nd	nd	Thorp and Covich (2010); Vieira et al. (2006) (based on multiple species)	nd -- not present in infaunal samples; collected during fish surveys (epibenthic)	(d)
<i>Cryptochironomus</i> sp.	Insecta	Diptera	Chironomidae	C/O	Small invertebrate-engulfer and oligochaete-piercer; larvae up to 15 mm long; "Predator", "Engulfer of Protozoa, Microcrustacea, Chironomidae, Piercer of Oligochaeta" (based on <i>C. blarina</i> , <i>C. sorex</i> , and <i>Cryptochironomus</i> sp.)	3.87E-08	0.129	0.300	87%	Vieira et al. (2006) (based on various <i>Cryptochironomus</i> spp.); Curry (1958); Pilarczyk et al. (2007); Cranston (2010)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Desserobdella phalera</i>	Annelida	Hirudinea	Glossiphoniidae	C/O	Fish parasite	5.07E-07	0.175	2.90	83%	Jones and Woo (1990); Vieira et al. (2006) (based on <i>H. stagnalis</i> and other Hirudineans)	CBBMP (2014) (based on Hirudinea); ww conversion from Sapkarev (1967) (from <i>Helobdella</i> spp., maximum density), based on dw rather than AFDW; high level of uncertainty due to the degree of taxonomic difference	X
Dolichopodidae	Insecta	Diptera	Dolichopodidae	C/O	Generally in leaf litter as larvae	5.94E-08	0.129	0.46	87%	Vieira et al. (2006); d'Assis Fonseca ECM (1978); Brooks (2005); Corpus (1986); Pilarczyk et al. (2007); Bouchard (2004); Thorp and Covich (2010)	Whiles and Goldowitz (2005) (based on Diptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Eriocheir sinensis</i>	Crustacea	Decapoda	Varunidae	C/O	Epibenthic omnivore, carnivore/detrivore	nd	nd	nd	nd	ISSG (2014b); Veilleux and de Lafontaine (2007)	nd -- not present in infaunal samples; collected during fish surveys (epibenthic)	(d)

Database of Benthic Invertebrate Taxonomy, Traits, and Estimates of Biomass/Percent Moisture

Taxonomy (a)				Ecology		Biomass/Percent Moisture				Reference		
Lowest Practical Taxon	Phylum, Subphylum, or Class	Order or Subclass	Family or Suborder	Feeding Group	Notes on Ecology	Dry Biomass (kg dw/ind)	Wet-to-Dry Conversion Factor	Wet Biomass (mg ww/ind)	Moisture Content (%)	Ecology References (and rationale)	Biomass References (and rationale)	Infaunal presence/ absence (b)
<i>Erpobdella</i> sp.	Annelida	Hirudinea	Erpobdellidae	C/O	Invertebrate, fish, and amphibian parasite	5.07E-07	0.2	2.54	80%	Vieira et al. (2006); WLU (2014); Pilarczyk et al. (2007) (based on Erpobdellidae and other Hirudineans)	CBBMP (2014) (based on Hirudinea); ww conversion from Sapkarev (1967) (approximated from Figure 9 showing ww and dw biomass of <i>E. punctata</i> ; used maximum observed values), based on dw rather than AFDW	X
Erpobdellidae	Annelida	Hirudinea	Erpobdellidae	C/O	Invertebrate, fish, and amphibian parasite	5.07E-07	0.2	2.54	80%	Vieira et al. (2006) (size based on <i>E. punctata</i> and other Hirudineans); WLU (2014); Pilarczyk et al. (2007)	CBBMP (2014) (based on Hirudinea); ww conversion from Sapkarev (1967) (approximated from Figure 9 showing ww and dw biomass of <i>E. punctata</i> ; used maximum observed values), based on dw rather than AFDW	X
<i>Glycera dibranchiata</i>	Annelida	Polychaeta	Glyceridae	C/O	Burrowing is extensive, and feeding occurs while burrowing; burrows appear to be permanent; appear to be large-bodied (several cm in length)	2.40E-06	0.16	15	84%	DFO (2009); Klawe and Dickie (1957)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X
<i>Glycinde solitaria</i>	Annelida	Polychaeta	Goniadidae	C/O	Burrow to a depth of 8 cm under controlled conditions	2.41E-07	0.16	1.5	84%	Pearson and Rosenberg (1978); Llanso (2002); Levin et al. (2009); Silberstein (1987)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X
<i>Helobdella elongata</i>	Annelida	Hirudinea	Glossiphoniidae	C/O	"Predator", "Parasite", "Feeds on aquatic insects and parasitic on fish", "Often are temporary parasites on fish, frogs, turtles, and humans", "Feeds on snails" (based on <i>H. californica</i> , <i>H. elongata</i> , <i>H. stagnalis</i> , and <i>Helobdella</i> sp.)	5.07E-07	0.169	3.00	83%	Clifford (1991); WLU (2014); Pilarczyk et al. (2007) (based on <i>H. stagnalis</i>); Vieira et al. (2006) (based on various <i>Helobdella</i> spp. and other hirudineans)	CBBMP (2014) (based on Hirudinea); ww conversion from Sapkarev (1967) (for this species, maximum density), based on dw rather than AFDW	X
<i>Helobdella fusca</i>	Annelida	Hirudinea	Glossiphoniidae	C/O	"Predator", "Parasite", "Feeds on aquatic insects and parasitic on fish", "Often are temporary parasites on fish, frogs, turtles, and humans", "Feeds on snails" (based on <i>H. californica</i> , <i>H. elongata</i> , <i>H. stagnalis</i> , and <i>Helobdella</i> sp.)	5.07E-07	0.175	2.9	83%	Clifford (1991); WLU (2014); Pilarczyk et al. (2007) (based on <i>H. stagnalis</i>); Vieira et al. (2006) (based on various <i>Helobdella</i> spp. and other hirudineans)	CBBMP (2014) (based on Hirudinea); ww conversion from Sapkarev (1967) (average of <i>H. elongata</i> and <i>H. stagnalis</i> , maximum density), based on dw rather than AFDW	X
<i>Helobdella papillata</i>	Annelida	Hirudinea	Glossiphoniidae	C/O	"Predator", "Parasite", "Feeds on aquatic insects and parasitic on fish", "Often are temporary parasites on fish, frogs, turtles, and humans", "Feeds on snails" (based on <i>H. californica</i> , <i>H. elongata</i> , <i>H. stagnalis</i> , and <i>Helobdella</i> sp.)	5.07E-07	0.175	2.9	83%	Clifford (1991); WLU (2014); Pilarczyk et al. (2007) (based on <i>H. stagnalis</i>); Vieira et al. (2006) (based on various <i>Helobdella</i> spp. and other hirudineans)	CBBMP (2014) (based on Hirudinea); ww conversion from Sapkarev (1967) (average of <i>H. elongata</i> and <i>H. stagnalis</i> , maximum density), based on dw rather than AFDW	X
<i>Helobdella</i> sp.	Annelida	Hirudinea	Glossiphoniidae	C/O	"Predator", "Parasite", "Feeds on aquatic insects and parasitic on fish", "Often are temporary parasites on fish, frogs, turtles, and humans", "Feeds on snails" (based on <i>H. californica</i> , <i>H. elongata</i> , <i>H. stagnalis</i> , and <i>Helobdella</i> sp.)	5.07E-07	0.175	2.9	83%	Clifford (1991); WLU (2014); Pilarczyk et al. (2007) (based on <i>H. stagnalis</i>); Vieira et al. (2006) (based on various <i>Helobdella</i> spp. and other hirudineans)	CBBMP (2014) (based on Hirudinea); ww conversion from Sapkarev (1967) (average of <i>H. elongata</i> and <i>H. stagnalis</i> , maximum density), based on dw rather than AFDW	X
<i>Helobdella stagnalis</i>	Annelida	Hirudinea	Glossiphoniidae	C/O	"Predator", "Parasite", "Feeds on aquatic insects and parasitic on fish", "Often are temporary parasites on fish, frogs, turtles, and humans", "Feeds on snails" (based on <i>H. californica</i> , <i>H. elongata</i> , <i>H. stagnalis</i> , and <i>Helobdella</i> sp.)	5.07E-07	0.181	2.81	82%	Clifford (1991); WLU (2014); Pilarczyk et al. (2007); Vieira et al. (2006) (based on various <i>Helobdella</i> spp. and other hirudineans)	CBBMP (2014) (based on Hirudinea); ww conversion from Sapkarev (1967) (for this species, maximum density), based on dw rather than AFDW	X
<i>Hemerodromia</i> sp.	Insecta	Diptera	Empididae	C/O	Engulfer	5.94E-08	0.129	0.46	87%	Vieira et al. (2006) (size based on family); Thorp and Covich (2010); Pilarczyk et al. (2007); Bouchard (2004)	Whiles and Goldowitz (2005) (based on Diptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
Hirudinea	Annelida	Hirudinea	na	C/O	Leech on snails, insects, or fish	5.07E-07	0.187	2.71	81%	Vieira et al. (2006) (based on multiple Hirudineans)	CBBMP (2014) (data available for taxon); ww conversion from Sapkarev (1967) (average of <i>Erpobdella punctata</i> and <i>Helobdella</i> spp., maximum density), based on dw rather than AFDW	X
<i>Hydropsyche</i> sp.	Insecta	Trichoptera	Hydropsychidae	C/O	Various (collector-gatherer, predator)	3.69E-07	0.129	2.86	87%	Vieira et al. (2006); Pilarczyk et al. (2007) (based on <i>Hydropsyche</i> spp.); Charbonneau and Hare (1998) (based on a trichopteran)	Whiles and Goldowitz (2005) (based on Trichoptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
Hydropsychidae	Insecta	Trichoptera	Hydropsychidae	C/O	Various (collector-gatherer, predator)	3.69E-07	0.129	2.86	87%	Vieira et al. (2006); Charbonneau and Hare (1998) (based on a trichopteran)	Whiles and Goldowitz (2005) (based on Trichoptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Hygrobates</i> sp.	Arachnida	Trombidiformes	Hygrobatidae	C/O	Dipteran larvae parasite	3.69E-09	0.4	0.00923	60%	Vieira et al. (2006) (from water mite families); Thorp and Covich (2010); Pilarczyk et al. (2007) (based on Acari species)	Douce (1976) (average of all Acari species); ww conversion based on Newton (2013), conversion is for dw to ww rather than AFDW to ww	X
<i>Hypereteone foliosa</i>	Annelida	Polychaeta	Phyllodocidae	C/O	Predator; typically found burrowed less than 10 cm, but may be found very deep (~25 cm)	1.35E-06	0.16	8.46	84%	Holton (1984); Hines and Comtois (1985) (from <i>H. heteropoda</i>)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X
<i>Hypereteone heteropoda</i>	Annelida	Polychaeta	Phyllodocidae	C/O	Predator; typically found burrowed less than 10 cm, but may be found very deep (~25 cm)	1.91E-07	0.16	1.2	84%	Hines and Comtois (1985); Levin et al. (2009); Zajac and Whitlatch (1982)a,b	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X
<i>Koenikea</i> sp.	Arachnida	Trombidiformes	Unionicolidae	C/O	Invertebrate parasite	3.69E-09	0.4	0.00923	60%	Vieira et al. (2006) (from water mite families); Thorp and Covich (2010); Pilarczyk et al. (2007) (based on Acari species)	Douce (1976) (average of all Acari species); ww conversion based on Newton (2013), conversion is for dw to ww rather than AFDW to ww	X

Database of Benthic Invertebrate Taxonomy, Traits, and Estimates of Biomass/Percent Moisture

Taxonomy (a)				Ecology		Biomass/Percent Moisture				Reference		
Lowest Practical Taxon	Phylum, Subphylum, or Class	Order or Subclass	Family or Suborder	Feeding Group	Notes on Ecology	Dry Biomass (kg dw/ind)	Wet-to-Dry Conversion Factor	Wet Biomass (mg ww/ind)	Moisture Content (%)	Ecology References (and rationale)	Biomass References (and rationale)	Infaunal presence/ absence (b)
<i>Lebertia</i> sp.	Arachnida	Trombidiformes	Lebertiidae	C/O	Dipteran parasite; also eat small invertebrates	3.69E-09	0.4	0.00923	60%	Vieira et al. (2006) (from water mite families); Thorp and Covich (2010); Pilarczyk et al. (2007) (based on Acari species)	Douce (1976) (average of all Acari species); ww conversion based on Newton (2013), conversion is for dw to ww rather than AFDW to ww	X
<i>Micrura</i> sp.	Nemertea	Heteronemertea	Lineidae	C/O	Most nemerteans are active predators or scavengers	5.84E-07	0.2	2.92	80%	Thorp and Covich (2010); Brusca and Brusca (2003); Coe (1951); Wright (2014)	CBBMP (2014) (based on Nemertea); ww conversion based on Ricciardi and Bourget (1998) (based on Nemertea)	X
<i>Mideopsis</i> sp.	Arachnida	Trombidiformes	Mideopsidae	C/O	Dipteran larva parasite	3.69E-09	0.4	0.00923	60%	Vieira et al. (2006) (from water mite families); Thorp and Covich (2010); Pilarczyk et al. (2007) (based on Acari species)	Douce (1976) (average of all Acari species); ww conversion based on Newton (2013), conversion is for dw to ww rather than AFDW to ww	X
Mud crab (unspecified)	Crustacea	Decapoda	unclear without more specific identification	C/O	"Mud crab" is a general term that is not related to any particular taxon; associated with mud (i.e., possibly burrowing)	nd	nd	nd	nd	Thorp and Covich (2010)	nd -- taxon uncertain beyond Decapoda	(d)
Nematoda	Nematoda	Nematoda	na	C/O	Likely very shallow sediment-dweller, parasite inside other benthic invertebrates, etc.	7.00E-10	0.2	0.0035	80%	Thorp and Covich (2010); Pilarczyk et al. (2007); Ferris et al (1972); Bongers and Ferris (1999)	Whiles and Goldowitz (2005) (based on Nematoda); ww conversion based on Ricciardi and Bourget (1998) (used Nemertea median value)	X
Nemertea	Nemertea	Nemertea	na	C/O	Diverse taxon	5.84E-07	0.2	2.92	80%	Roe (1976); Thorp and Covich (2010); Vieira et al. (2006); Coe (1951); Wright (2014)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Nemertea)	X
<i>Neumania</i> sp.	Arachnida	Trombidiformes	Unionicolidae	C/O	Dipteran larva parasite	3.69E-09	0.4	0.00923	60%	Vieira et al. (2006) (from water mite families); Thorp and Covich (2010); Pilarczyk et al. (2007) (based on Acari species)	Douce (1976) (average of all Acari species); ww conversion based on Newton (2013), conversion is for dw to ww rather than AFDW to ww	X
Neuroptera	Insecta	Neuroptera	na	C/O	Consume benthic invertebrates	nd	nd	nd	nd	MDFRC (2014); Thorp and Covich (2010)	nd -- data unavailable	X
<i>Oecetis</i> sp.	Insecta	Trichoptera	Leptoceridae	C/O	Engulfer, primarily	4.26E-08	0.129	0.33	87%	Vieira et al. (2006); Pilarczyk et al. (2007); Charbonneau and Hare (1998) (based on a trichopteran)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Orconectes limosus</i>	Crustacea	Decapoda	Cambaridae	C/O	Scavengers	nd	nd	nd	nd	Vieira et al. (2006); Pilarczyk et al. (2007) (based on <i>Orconectes</i> spp.)	nd -- not present in infaunal samples; collected during fish surveys (epibenthic)	(d)
<i>Oxus</i> sp.	Arachnida	Trombidiformes	Oxidae	C/O	Dipteran larval parasite	3.69E-09	0.4	0.00923	60%	Vieira et al. (2006) (from water mite families); Thorp and Covich (2010); Pilarczyk et al. (2007) (based on Acari species)	Douce (1976) (average of all Acari species); ww conversion based on Newton (2013), conversion is for dw to ww rather than AFDW to ww	X
<i>Parachironomus</i> sp.	Insecta	Diptera	Chironomidae	C/O	Larvae up to 12 mm long; several species may be ectoparasitic, herbivorous, or detritivorous	5.00E-08	0.129	0.388	87%	Beck (1977); Pilarczyk et al. (2007); Cranston (2010)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Periculodes</i> sp.	Crustacea	Amphipoda	Oedicerotidae	C/O	Feed primarily on crustaceans and detritus	3.33E-07	0.16	2.08	84%	Navarro-Barranco et al. (2013)	CBBMP (2014) (based on Amphipoda); ww conversion based on Ricciardi and Bourget (1998) (based on Amphipoda)	X
<i>Polinices</i> sp.	Gastropoda	Gastropoda	Naticidae	C/O	Carnivorous gastropod assumed to feed on carrion or sedentary invertebrates such as worms	2.83E-06	0.138	20.5	86%	Soster and McCall (1990) mentions gastropods indicative of more stable areas; Brusca and Brusca (2003)	CBBMP (2014) (<i>Polinices duplicatus</i> surrogate); ww conversion based on Ricciardi and Bourget (1998) (based on shelled Opisthobranchia)	X
Portunidae	Crustacea	Decapoda	Portunidae	C/O	"...benthophagic, with preference for infaunal and slow moving prey, as attested by the notable amount of sediment in their stomachs; the most frequent food items were molluscs, crustaceans and fish" (based on <i>Charybdis longicollis</i>); "Crustaceans form the predominant food item", "The other dietary items includes fishes, detritus, mud and sand and miscellaneous" (based on <i>Scylla olivacea</i>); "omnivorous, feeding on a wide range of benthic invertebrates, scavenging on dead pelagic animal remains, and ingesting significant amounts of plant material" (based on <i>Portunus pelagicus</i>)	3.63E-05	0.165	220	73%	Freire and Gonzalez-Gurriaran (1995); Barshaw and Able (1990) (based on <i>Ovalipes ocellatus</i> and <i>Callinectes sapidus</i>); Stasolla et al. (2016) (based on <i>C. longicollis</i>); Viswanathan and Raffi (2015) (based on <i>S. olivacea</i>); Hajisamae et al. (2015) (based on <i>P. pelagicus</i>)	nd -- data unavailable	X
<i>Procladius</i> sp.	Insecta	Diptera	Chironomidae	C/O	"Collector-gatherer", "Engulfer of Protozoa, Microcrustacea, Ephemeroptera, Ceratopogonidae, Gastrotricha"; ~2 cm burrows	2.78E-07	0.129	2.16	87%	Soster and McCall (1990); Vieira et al. (2006); USEPA (2012); Cranston (2010); Charbonneau and Hare (1998)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Prostoma</i> sp.	Nemertea	Hoploneurtea	Tetrastemmatidae	C/O	Small invertebrate predator; consumes some detritus; Hoplonemertea use pointed stylets to stab prey items	5.84E-07	0.2	2.92	80%	Vieira et al. (2006); EOL (2014c) (based on Nemertea); Wright (2014)	CBBMP (2014) (based on Nemertea); ww conversion based on Ricciardi and Bourget (1998) (based on Nemertea)	X
<i>Rhithropanopeus harrisii</i>	Crustacea	Decapoda	Panopeidae	C/O	"In Baltic coastal waters this species feeds on detritus, and also on animal and plant matter"; "Remains of Chlorophyta, Amphipoda, Ostracoda, Polychaeta, Gastropoda and Bivalvia were found in the stomachs of the specimens analysed"; "The generalist consumer nature of <i>R. harrisii</i> and preference for structured habitat was supported by an active habitat and food choice, revealing no preference for prey species (polychaetes versus amphipod), but selection of brown algae over bare mud"	2.05E-06	0.165	12.5	84%	Hegele-Drywa and Normant (2009); Fowler et al. (2013); McDonald (1982) (based on <i>Panopeus herbstii</i> and <i>Eurypanopeus depressus</i> surrogates); Aarnio et al 2015	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Decapoda)	X
<i>Stylurus</i> sp.	Insecta	Odonata	Gomphidae	C/O	Large-bodied dragonfly species	2.77E-06	nd	nd	nd	Vieira et al. (2006); Pilarczyk et al. (2007)	nd -- data unavailable	X

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Taxonomy (a)				Ecology		Biomass/Percent Moisture				Reference		Infaunal presence/absence (b)
Lowest Practical Taxon	Phylum, Subphylum, or Class	Order or Subclass	Family or Suborder	Feeding Group	Notes on Ecology	Dry Biomass (kg dw/ind)	Wet-to-Dry Conversion Factor	Wet Biomass (mg ww/ind)	Moisture Content (%)	Ecology References (and rationale)	Biomass References (and rationale)	
<i>Synidotea laticauda</i>	Crustacea	Isopoda	Idoteidae	C/O	Consume live animal tissue, carrion, and plant matter as available; "Single-choice feeding trials identified predation on nine fauna and flora species and established <i>S. laticauda</i> as an omnivore capable of exploiting multiple food resources..."	4.71E-07	0.142	3.32	86%	Macdonald et al. (2010) (based on Idoteidae); Boyd (2008); Griffith and Telford (1985) (based on <i>Chiridotea caeca</i>); Bushek and Boyd (2006) (based on <i>S. laevidorsalis</i>); Naylor (1955) (based on <i>Idotea emarginata</i>)	CBBMP (2014) (<i>Synidotea</i> spp. surrogate); ww conversion based on Ricciardi and Bourget (1998) (based on Isopoda)	X
<i>Synidotea</i> sp.	Crustacea	Isopoda	Idoteidae	C/O	Consume live animal tissue, carrion, and plant matter as available; "Single-choice feeding trials identified predation on nine fauna and flora species and established <i>S. laticauda</i> as an omnivore capable of exploiting multiple food resources..." (based on <i>S. laticauda</i>)	4.71E-07	0.142	3.32	86%	Macdonald et al. (2010) (based on Idoteidae); Boyd (2008) (based on <i>S. laticauda</i>); Griffith and Telford (1985) (based on <i>Chiridotea caeca</i>); Bushek and Boyd (2006) (based on <i>S. laevidorsalis</i>); Naylor (1955) (based on <i>Idotea emarginata</i>)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Isopoda)	X
<i>Tanypus</i> sp.	Insecta	Diptera	Chironomidae	C/O	Engulfer and piercer; some species feed on algae; Larvae up to 10-12 mm; tolerant of high nutrients and salinity; may also be parasitic (i.e., feeding on fluids only) or herbivorous (Cranston 2010)	5.19E-07	0.129	4.03	87%	Vieira et al. (2006), Cranston (2010); Llanso (2002); Vieira et al. (2006)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Thienemannimyia</i> sp.	Insecta	Diptera	Chironomidae	C/O	Larvae up to 10 mm long; associated with sandy or muddy bottoms	5.00E-08	0.129	0.388	87%	Vieira et al. (2006); Beck (1977); Pilarczyk et al. (2007); Cranston (2010)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
Turbellaria	Turbellaria	na	na	C/O	"...on the whole, turbellarians feed on a variety of food items."; "the majority of turbellarians appear to be predators"; "Turbellarians are known to eat ciliates, hydroids, nematodes, turbellarians, copepods, amphipods, annelids, and also dead animals"; "there is no strong evidence that turbellarians feed on bacteria"; "From the data now available we conclude that bacteria and detritus play a minor role (if any at all) in turbellarian diet, that some turbellarians prefer diatoms, and that the majority of them are mainly predators or scavengers"; can be more abundant in shallow burrows <3 cm, but can also be present at depth (up to 16 cm)	6.78E-07	0.252	2.69	75%	Thorp and Covich (2010); Pilarczyk et al. (2007); Depatra and Levin (1989) (abstract); Martens and Schockaert (1986)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Turbellaria)	X
<i>Alitta succinea</i>	Annelida	Polychaeta	Nereididae	DEP	Deposit feeder; form burrows; up to 30 cm burrowing	6.27E-07	0.16	3.92	84%	Pearson and Rosenberg (1978); Llanso (2002); Hines and Comtois (1985); Fauchald and Jumars (1979); SMS (2008b); Kristensen (1984) (based on <i>A. virens</i> and <i>A. diversicolor</i>); ISSG (2014a)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X
<i>Apocorophium lacustre</i>	Crustacea	Amphipoda	Corophiidae	DEP	Based on <i>Corophium volutator</i> surrogate, a true deposit feeder also capable of filter feeding; up to 10 cm depth	9.98E-08	0.16	0.624	84%	Holton (1984); Prato and Biandolino (2006) (based on <i>Corophium insidiosum</i>); Hines and Comtois (1985); Levinton (1982) (based on <i>Corophium volutator</i>)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Amphipoda)	X
<i>Apocorophium</i> sp.	Crustacea	Amphipoda	Corophiidae	DEP	Based on <i>Corophium volutator</i> surrogate, a true deposit feeder also capable of filter feeding; up to 10 cm depth	1.00E-06	0.16	6.25	84%	Holton (1984); Levinton (1982) (based on <i>Corophium volutator</i>); Prato and Biandolino (2006) (based on <i>Corophium insidiosum</i>)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Amphipoda)	X
<i>Arcteonais lomondi</i>	Annelida	Oligochaeta	Naididae	DEP	Up to ~ 8 mm (based on several Naidid species); "Arcteonais lomondi and [Uncinai] uncinata have similar diets composed mainly of diatoms that are sometimes found in association with aquatic vegetation"; "During summer, algae accounted for up to 57-75% of volume of ingested matter in A. lomondi...whereas in winter the corresponding range was 10-22%..."; the average of the two range-midpoints from summer (66%) and winter (16%) is 41%, rounded here to a fraction of 0.4 for feeding as a detritivore; the rest of the diet is assumed to be from deposit feeding.	2.02E-07	0.182	1.11	82%	Soster and McCall (1990); Germano & Associates (2005); Smith et al. (1991); Arslan and Sahin (2003) (based on 9 Naidid species); Vieira et al. (2006); Moore 1981; Brinkhurst and Jamieson 1971 (as cited by Caires et al 2013)	CBBMP (2014) (average of Naididae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
<i>Aulodrilus limnobius</i>	Annelida	Oligochaeta	Tubificidae	DEP	Organic components of substrate; may feed at depth (i.e., head-down); small body size (3-6 mm based on other <i>Aulodrilus</i> spp.)	1.07E-07	0.182	0.585	82%	Soster and McCall (1990); Germano & Associates (2005); Smith et al. (1991); Arslan and Sahin (2002); Vieira et al. (2006)	CBBMP (2014) (<i>Aulodrilus pigueti</i> surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
<i>Aulodrilus pigueti</i>	Annelida	Oligochaeta	Tubificidae	DEP	Organic components of substrate; may feed at depth (i.e., head-down); small body size (3 mm)	1.07E-07	0.182	0.585	82%	Soster and McCall (1990); Germano & Associates (2005); Smith et al. (1991); Arslan and Sahin (2002); Vieira et al. (2006)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
<i>Aulodrilus pluriseta</i>	Annelida	Oligochaeta	Tubificidae	DEP	Organic components of substrate; may feed at depth (i.e., head-down); small body size (3-6 mm)	1.07E-07	0.182	0.585	82%	Soster and McCall (1990); Germano & Associates (2005); Smith et al. (1991); Arslan and Sahin (2002); Vieira et al. (2006)	CBBMP (2014) (<i>Aulodrilus pigueti</i> surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
<i>Bratislavia unidentata</i>	Annelida	Oligochaeta	Naididae	DEP	Up to ~ 8 mm (based on several Naidid species)	2.02E-07	0.182	1.11	82%	Soster and McCall (1990); Germano & Associates (2005); Arslan and Sahin (2003) (based on 9 Naidid species)	CBBMP (2014) (average of Naididae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
<i>Dero digitata</i>	Annelida	Oligochaeta	Naididae	DEP	Up to ~ 8 mm (based on several Naidid species)	1.76E-07	0.182	0.968	82%	Soster and McCall (1990); Germano & Associates (2005); Arslan and Sahin (2003) (based on 9 Naidid species)	CBBMP (2014) (<i>Dero</i> spp. surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
<i>Dero</i> sp.	Annelida	Oligochaeta	Naididae	DEP	Up to ~ 8 mm (based on several Naidid species)	1.76E-07	0.182	0.968	82%	Soster and McCall (1990); Germano & Associates (2005); Arslan and Sahin (2003) (based on 9 Naidid species); Vieira et al. (2006)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
Enchytraeidae	Annelida	Oligochaeta	Enchytraeidae	DEP	Subsurface deposit feeder	5.76E-08	nd	nd	nd	Soster and McCall (1990); Rodriguez et al. (2002) (based on <i>Enchytraeus coronatus</i>); Vieira et al. (2006); Glime (2012)	nd -- data unavailable	X

Database of Benthic Invertebrate Taxonomy, Traits, and Estimates of Biomass/Percent Moisture

Taxonomy (a)				Ecology		Biomass/Percent Moisture				Reference		Infaunal presence/absence (b)
Lowest Practical Taxon	Phylum, Subphylum, or Class	Order or Subclass	Family or Suborder	Feeding Group	Notes on Ecology	Dry Biomass (kg dw/ind)	Wet-to-Dry Conversion Factor	Wet Biomass (mg ww/ind)	Moisture Content (%)	Ecology References (and rationale)	Biomass References (and rationale)	
<i>Heteromastus filiformis</i>	Annelida	Polychaeta	Capitellidae	DEP	"...nonselective deposit feeder. Its food is derived from sediment in the anaerobic layer below the surface. It is a "conveyor-belt feeder", living vertically in the sediment, feeding indiscriminately on smaller sediment particles 4-12 inches below the sediment surface"; deep burrowing (up to 15-30 cm and into anoxic sediment)	5.16E-07	0.16	3.22	84%	Pearson and Rosenberg (1978); Llanso (2002); Fauchald and Jumars (1979); Aller and Yingst (1985); Hines and Comtois (1985); PWS RCAC (2004)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X
<i>Ilyodrilus frantzi</i>	Annelida	Oligochaeta	Tubificidae	DEP	Moderate body size (1-3 cm) (based on <i>I. templetoni</i>); "Consumes detritus and organic components of substrate; often consumes largely filamentous algae, diatoms, or miscellaneous plant and animal detritus."	1.72E-07	0.182	0.947	82%	Soster and McCall (1990); Germano & Associates (2005); Gustafson (1996a) (based on <i>I. templetoni</i>); Vieira et al. (2006) (based on multiple Tubificid worms)	CBBMP (2014) (<i>Ilyodrilus templetoni</i> surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
<i>Ilyodrilus templetoni</i>	Annelida	Oligochaeta	Tubificidae	DEP	Moderate body size (1-3 cm); "Consumes detritus and organic components of substrate; often consumes largely filamentous algae, diatoms, or miscellaneous plant and animal detritus."	1.72E-07	0.182	0.947	82%	Soster and McCall (1990); Llanso (2002); Germano & Associates (2005); Gustafson (1996a); Vieira et al. (2006) (based on multiple Tubificid worms)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
<i>Limnodrilus cervix</i>	Annelida	Oligochaeta	Tubificidae	DEP	Feed on bacteria in sediment; likely small (<2 cm)	1.00E-07	0.182	0.55	82%	Soster and McCall (1990); Thorp and Covich (2010); Llanso (2002); Germano & Associates (2005); EOL (2014b) (based on <i>L. hoffmeisteri</i>); Vieira et al. (2006) (based on multiple Tubificid worms)	CBBMP (2014) (<i>Limnodrilus hoffmeisteri</i> surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
<i>Limnodrilus claparedeianus</i>	Annelida	Oligochaeta	Tubificidae	DEP	Feed on bacteria in sediment; likely small (<2 cm)	1.00E-07	0.182	0.55	82%	Soster and McCall (1990); Thorp and Covich (2010); Llanso (2002); Germano & Associates (2005); EOL (2014b) (based on <i>L. hoffmeisteri</i>); Vieira et al. (2006) (based on multiple Tubificid worms)	CBBMP (2014) (<i>Limnodrilus hoffmeisteri</i> surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
<i>Limnodrilus hoffmeisteri</i>	Annelida	Oligochaeta	Tubificidae	DEP	Feed on bacteria in sediment; generally moderately small (up to 2-3.5 cm, generally <2 cm)	3.01E-08	0.182	0.165	82%	Soster and McCall (1990); Thorp and Covich (2010); Llanso (2002); Germano & Associates (2005); EOL (2014b) (based on <i>L. hoffmeisteri</i>); Vieira et al. (2006) (based on multiple Tubificid worms)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
<i>Limnodrilus udekemianus</i>	Annelida	Oligochaeta	Tubificidae	DEP	Feed on bacteria in sediment	3.33E-07	0.182	1.83	82%	Soster and McCall (1990); Thorp and Covich (2010); Llanso (2002); Germano & Associates (2005); EOL (2014b) (based on <i>L. hoffmeisteri</i>); Vieira et al. (2006) (based on multiple Tubificid worms)	CBBMP (2014) (<i>Limnodrilus hoffmeisteri</i> surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
Lumbricina	Annelida	Oligochaeta	na	DEP	Group is very diverse	nd	nd	nd	nd	Thorp and Covich (2010); Vieira et al. (2006) (based on Lumbricidae)	nd -- diverse taxon	X
Lumbriculidae	Annelida	Oligochaeta	Lumbriculidae	DEP	Consumes detritus and organic components of substrate; often consumes largely filamentous algae, diatoms, or miscellaneous plant and animal detritus, "Ingest sediment, extract nutrition from organic matter, esp. bacteria", "Detritivore", "Including algae" (based on Lumbriculidae, <i>Lumbriculus</i> sp. and <i>L. variegatus</i>)	7.34E-05	0.16	459	82%	Thorp and Covich (2010); Vieira et al. (2006) (based on Lumbriculidae, <i>Lumbriculus variegatus</i> , and <i>Styiodrilus heringianus</i>)	nd -- data unavailable	X
<i>Macoma balthica</i>	Bivalvia	Veneroida	Tellinidae	DEP	"Feeding behavior is predictable. It extends the separate inhalent siphon 2-3 cm radially from the siphon hole. The siphon is then withdrawn radially, bottom material being sucked up indiscriminately meanwhile. This activity leaves a characteristic "stellate" pattern on the bottom. A crowded individual will reduce its feeding radius. This behavioral pattern, the restriction of the species' distribution to muddy bottoms, and the hollow tubular cross section of the inhalent siphon indicate that this species is probably exclusively adapted to deposit feeding"; "For subtidal species, the availability of substrate and suspended food determine whether a given species will be a suspension feeder, a fine-deposit feeder, or a sand-grain feeder (Reid 1970)."; "In intertidal wave-swept beaches, one would expect selection to be for permanent suspension feeding (Wade 1967, 1969). However, in protected intertidal areas, where some detritus can accumulate, deposit feeding would probably be selected. But, since currents will still be present with the coming of the tide, suspension feeding can also be used, and the presence of predatory fish may thus lead to selection for suspension feeding when the tide is in and for deposit feeding when the bottom is uncovered."	6.37E-06	0.058	110	94%	Pearson and Rosenberg (1978); Hines and Comtois (1985) Llanso (2002); Marine Life Information Network (2002); Holme (1961); Aller and Yingst (1985); Zwarts and Wanink (1989); Levinton (1971); Reid (1970) and Wade (1967; 1969) (cited by Levinton [1971])	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Bivalvia)	X

Database of Benthic Invertebrate Taxonomy, Traits, and Estimates of Biomass/Percent Moisture

Taxonomy (a)				Ecology		Biomass/Percent Moisture				Reference		
Lowest Practical Taxon	Phylum, Subphylum, or Class	Order or Subclass	Family or Suborder	Feeding Group	Notes on Ecology	Dry Biomass (kg dw/ind)	Wet-to-Dry Conversion Factor	Wet Biomass (mg ww/ind)	Moisture Content (%)	Ecology References (and rationale)	Biomass References (and rationale)	Infaunal presence/ absence (b)
Macoma tenta	Bivalvia	Veneroida	Tellinidae	DEP	"Feeding behavior is predictable. It extends the separate inhalent siphon 2-3 cm radially from the siphon hole. The siphon is then withdrawn radially, bottom material being sucked up indiscriminately meanwhile. This activity leaves a characteristic "stellate" pattern on the bottom. A crowded individual will reduce its feeding radius. This behavioral pattern, the restriction of the species' distribution to muddy bottoms, and the hollow tubular cross section of the inhalent siphon indicate that this species is probably exclusively adapted to deposit feeding"; "For subtidal species, the availability of substrate and suspended food determine whether a given species will be a suspension feeder, a fine-deposit feeder, or a sand-grain feeder (Reid 1970)."; "In intertidal wave-swept beaches, one would expect selection to be for permanent suspension feeding (Wade 1967, 1969). However, in protected intertidal areas, where some detritus can accumulate, deposit feeding would probably be selected. But, since currents will still be present with the coming of the tide, suspension feeding can also be used, and the presence of predatory fish may thus lead to selection for suspension feeding when the tide is in and for deposit feeding when the bottom is uncovered."	3.97E-06	0.058	68.5	94%	Pearson and Rosenberg (1978); Holme (1961); Rhoads and Young (1970); Levinton (1971) (based on <i>M. balthica</i>); Reid (1970) and Wade (1967; 1969) (cited by Levinton [1971])	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Bivalvia)	X
Mediomastus sp.	Annelida	Polychaeta	Capitellidae	DEP	Tube-dwelling subsurface deposit feeder; large body size (1-10 cm)	8.49E-08	0.16	0.531	84%	Llanso (2002); Levin et al. (2009); MES et al. (2014); Fauchald and Jumars (1979); Gaston (1987); Warren et al. (1994); Rudy (2013)	CBBMP (2014) (<i>Mediomastus ambiseta</i> surrogate); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X
Nais bretscheri	Annelida	Oligochaeta	Naididae	DEP	Surface feeder; up to ~ 8 mm (based on several Naidid species)	1.58E-07	0.182	0.869	82%	Soster and McCall (1990); Germano & Associates (2005); Pilarczyk et al. (2007); Arslan and Sahin (2003) (based on several <i>Nais</i> spp.); Vieira et al. (2006)	CBBMP (2014) (<i>Nais</i> spp. surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	(c)
Nais sp.	Annelida	Oligochaeta	Naididae	DEP	Surface feeder; up to ~ 8 mm (based on several <i>Nais</i> spp.)	5.00E-07	0.182	2.75	82%	Soster and McCall (1990); Germano & Associates (2005); Pilarczyk et al. (2007) (based on 8 <i>Nais</i> spp.); Arslan and Sahin (2003) (based on several <i>Nais</i> spp.); Vieira et al. (2006)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
Ophidonais serpentina	Annelida	Oligochaeta	Naididae	DEP	Approximately 2 to 8 mm	2.02E-07	0.182	1.11	82%	Soster and McCall (1990); Germano & Associates (2005); Pilarczyk et al. (2007); Arslan and Sahin (2003); Vieira et al. (2006)	CBBMP (2014) (average of Naididae taxa); ww conversion from Smith et al. (1993) (abstract) (based on Oligochaeta)	X
Paranais grandis	Annelida	Oligochaeta	Naididae	DEP	Up to ~ 8 mm (based on several Naidid species)	2.02E-07	0.182	1.11	82%	Soster and McCall (1990); Germano & Associates (2005); Arslan and Sahin (2003) (based on 9 Naidid species); Vieira et al. (2006)	CBBMP (2014) (average of Naididae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
Paranais litoralis	Annelida	Oligochaeta	Naididae	DEP	Up to ~ 8 mm (based on several Naidid species)	2.02E-07	0.182	1.11	82%	Soster and McCall (1990); Germano & Associates (2005); Arslan and Sahin (2003) (based on 9 Naidid species); Vieira et al. (2006)	CBBMP (2014) (average of Naididae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
Paranais sp.	Annelida	Oligochaeta	Naididae	DEP	Up to ~ 8 mm (based on several Naidid species)	2.02E-07	0.182	1.11	82%	Soster and McCall (1990); Germano & Associates (2005); Arslan and Sahin (2003) (based on 9 Naidid species); Vieira et al. (2006)	CBBMP (2014) (average of Naididae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
Pectinaria gouldii	Annelida	Polychaeta	Pectinariidae	DEP	Head-down deep deposit feeder family	5.27E-07	0.16	3.29	84%	Llanso (2002); Fauchild and Jumars (1979); Levinton (1982); SMS (2008c)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X
Potamothrix bavaricus	Annelida	Oligochaeta	Tubificidae	DEP	Moderately small body size (15-35 mm)	2.25E-08	0.182	0.124	82%	Germano & Associates (2005); Pilarczyk et al. (2007) (based on Tubificidae); Gustafson (1996); Vieira et al. (2006) (based on multiple Tubificid worms)	CBBMP (2014) (based on Tubificidae w/ cap. setae); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
Quistadrilus multisetosus	Annelida	Oligochaeta	Tubificidae	DEP	Moderately small body size (19-35 mm); no feeding data is available for this species; its diet is assumed to be similar to other oligochaetes (e.g., <i>Limnodrilus hoffmeisteri</i>)	2.25E-08	0.182	0.124	82%	Thorp and Covich (2010); Llanso (2002); Germano & Associates (2005); Pilarczyk et al. (2007) (based on Tubificidae); Gustafson (1996); Vieira et al. (2006) (based on multiple Tubificid worms)	CBBMP (2014) (based on Tubificidae w/ cap. setae); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
Slavina appendiculata	Annelida	Oligochaeta	Naididae	DEP	Up to ~ 8 mm (based on several Naidid species); Based on other naidid worms, most likely a deposit feeder, predominately. Feeding information is not currently available for this species specifically.	2.02E-07	0.182	1.11	82%	Soster and McCall (1990); Germano & Associates (2005); Pilarczyk et al. (2007); Arslan and Sahin (2003) (based on 9 Naidid species); Vieira et al. (2006)	CBBMP (2014) (average of Naididae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
Specaria josinae	Annelida	Oligochaeta	Naididae	DEP	Up to ~ 8 mm (based on several Naidid species)	2.02E-07	0.182	1.11	82%	Soster and McCall (1990); Germano & Associates (2005); Vieira et al. (2006)	CBBMP (2014) (average of Naididae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
Tubifex tubifex	Annelida	Oligochaeta	Tubificidae	DEP	Feed on bacteria in sediment; can grow very large (up to 20 cm) and burrow	2.25E-08	0.182	0.124	82%	Soster and McCall (1990); Thorp and Covich (2010); Germano & Associates (2005); Pilarczyk et al. (2007); EOL (2014d); Vieira et al. (2006)	CBBMP (2014) (based on Tubificidae w/ cap. setae); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
Tubificidae w/ capilliform setae	Annelida	Oligochaeta	Tubificidae	DEP	Sediment ingester	2.25E-08	0.182	0.124	82%	Soster and McCall (1990); Llanso (2002); Germano & Associates (2005); Pilarczyk et al. (2007)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
Tubificidae w/o capilliform setae	Annelida	Oligochaeta	Tubificidae	DEP	Sediment ingester	3.92E-08	0.182	0.215	82%	Soster and McCall (1990); Llanso (2002); Germano & Associates (2005); Pilarczyk et al. (2007)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X

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Taxonomy (a)				Ecology		Biomass/Percent Moisture				Reference		
Lowest Practical Taxon	Phylum, Subphylum, or Class	Order or Subclass	Family or Suborder	Feeding Group	Notes on Ecology	Dry Biomass (kg dw/ind)	Wet-to-Dry Conversion Factor	Wet Biomass (mg ww/ind)	Moisture Content (%)	Ecology References (and rationale)	Biomass References (and rationale)	Infaunal presence/absence (b)
<i>Tubificoides brownae</i>	Annelida	Oligochaeta	Tubificidae	DEP	May live up to 10 cm deep in anoxic sediments; may be up to 25 cm	5.28E-08	0.182	0.29	82%	Soster and McCall (1990); Llanso (2002); Germano & Associates (2005); Pilarczyk et al. (2007) (based on Tubificidae); Giere and Dubilier (1999) (based on <i>T. benedii</i>); Hines and Comtois (1985); Vieira et al. (2006) (based on multiple Tubificid worms)	CBBMP (2014) (<i>Tubificoides</i> spp. surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
<i>Tubificoides heterochaetus</i>	Annelida	Oligochaeta	Tubificidae	DEP	May live up to 10 cm deep in anoxic sediments; may be up to 25 cm	5.28E-08	0.182	0.29	82%	Soster and McCall (1990); Llanso (2002); Germano & Associates (2005); Pilarczyk et al. (2007) (based on Tubificidae); Giere and Dubilier (1999) (based on <i>T. benedii</i>); Hines and Comtois (1985); Vieira et al. (2006) (based on multiple Ttubificid worms)	CBBMP (2014) (<i>Tubificoides</i> spp. surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
<i>Tubificoides</i> sp.	Annelida	Oligochaeta	Tubificidae	DEP	May live up to 10 cm deep in anoxic sediments; may be up to 25 cm	5.28E-08	0.182	0.29	82%	Soster and McCall (1990); Llanso (2002); Hines and Comtois (1985); Germano & Associates (2005); Pilarczyk et al. (2007) (based on Tubificidae); Giere and Dubilier (1999) (based on <i>T. benedii</i>); Vieira et al. (2006) (based on multiple Tubificid worms)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
<i>Vejdovskyella intermedia</i>	Annelida	Oligochaeta	Naididae	DEP	Up to ~ 8 mm (based on several Naidid species)	2.02E-07	0.182	1.11	82%	Soster and McCall (1990); Germano & Associates (2005); Arslan and Sahin (2003) (based on 9 Naidid species); Vieira et al. (2006)	CBBMP (2014) (average of Naididae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
Amphipoda	Crustacea	Amphipoda	na	DET	Surface feeder, sometimes from within superficial tubes; most are detritivores, although some feed on other items including plants, sediment, and live or dead animal tissues	3.33E-07	0.16	2.08	84%	Thorp and Covich (2010); Pilarczyk et al. (2007); Vieira et al. (2006) (based on Gammaridae)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Amphipoda)	X
<i>Ancyronyx variegatus</i>	Insecta	Coleoptera	Elmidae	DET	Collector, filterer, and scraper; most likely a surface feeder; fairly small bodied (1-2 mm, generally > 1.4 mm); burrow	7.07E-08	0.129	0.548	87%	Thorp and Covich (2010); Smock (1988); Vieira et al. (2006); Marine Biology Resource Network (2014)	CBBMP (2014) (average of Elmidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Antocha</i> sp.	Insecta	Diptera	Tipulidae	DET	Surface-feeding collector-gatherer; feed on detritus, algae, and, in some species, other benthic invertebrates; Tipulidae are generally found under rocks, in sand, snags, or mats of litter or algae; may be small to fairly large (3-60 mm)	5.94E-08	0.129	0.46	87%	Murray Darling Freshwater Research Centre (MDFRC) (2014); Thorp and Covich (2010); Fetznern (2007) (based on <i>A. saxicola</i>)	Whiles and Goldowitz (2005) (based on Diptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
Baetidae	Insecta	Ephemeroptera	Baetidae	DET	Collector-gatherer, scraper-grazer	2.40E-07	0.129	1.86	87%	Thorp and Covich (2010); Vieira et al. (2006); Hynes (1970)	Whiles and Goldowitz (2005) (based on Ephemeroptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	(c)
<i>Baetis flavistriga</i>	Insecta	Ephemeroptera	Baetidae	DET	Collector-gatherer, scraper-grazer	2.40E-07	0.129	1.86	87%	Thorp and Covich (2010); Pilarczyk et al. (2007); Vieira et al. (2006); Hynes (1970)	Whiles and Goldowitz (2005) (based on Ephemeroptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	(c)
<i>Caecidotea</i> sp.	Crustacea	Isopoda	Asellidae	DET	Shredder and scavenger feeding on leafy detritus and invertebrate matter; "Scavengers; feed on dead and injured aquatic animals, and both green and decaying leaves, grass, and aquatic vegetation." (based on various <i>Caecidotea</i> spp.)	5.28E-07	0.142	3.72	86%	Wilfrid Laurier University (WLU) (2014); Pilarczyk et al. (2007); Vieira et al. (2006) (based on various <i>Caecidotea</i> spp.)	CBBMP (2014) (average of Idoteidae taxa); ww conversion based on Ricciardi and Bourget (1998) (based on Isopoda)	X
<i>Chiridotea almyra</i>	Crustacea	Isopoda	Chaetiliidae	DET	"Carrion" feeder; burrows into sand but likely feeds at surface; burrows ~ 1 cm; " <i>Chiridotea caeca</i> competes with other predators...for benthic prey within the surf zone"; "...the isopod grazes upon organic detritus..." from within or after emerging from shallow (1 cm) burrows along sandy beaches (based on <i>C. caeca</i>); "...feeding behavior of the isopod <i>C. caeca</i> can be correlated to the TOC in sediment." (based on <i>C. caeca</i>).	2.86E-07	0.142	2.01	86%	Britton and Morton (1993); Llanso (2002); Hauck et al. (2008) (based on <i>C. caeca</i>); Griffith and Telford (1985) (based on <i>C. caeca</i>); Naylor (1955) (based on <i>Idotea emarginata</i>); McDermott 2005 (based on <i>C. caeca</i>)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Isopoda)	X
<i>Chiridotea</i> sp.	Crustacea	Isopoda	Chaetiliidae	DET	Surface-feeding detritivore or predator, depending on species; burrows ~ 1 cm; " <i>Chiridotea caeca</i> competes with other predators...for benthic prey within the surf zone"; "...the isopod grazes upon organic detritus..." from within or after emerging from shallow (1 cm) burrows along sandy beaches (based on <i>C. caeca</i>); "...feeding behavior of the isopod <i>C. caeca</i> can be correlated to the TOC in sediment." (based on <i>C. caeca</i>).	5.48E-07	0.142	3.86	86%	Britton and Morton (1993); Llanso (2002); Hauck et al. (2008) (based on <i>C. caeca</i>); Griffith and Telford (1985) (based on <i>C. caeca</i>); Naylor (1955) (based on <i>Idotea emarginata</i>); McDermott 2005 (based on <i>C. caeca</i>)	CBBMP (2014) (<i>Chiridotea almyra</i> surrogate); ww conversion based on Ricciardi and Bourget (1998) (based on Isopoda)	X
Chironomini	Insecta	Diptera	Chironomidae	DET	Based on other chironomids	3.33E-07	0.129	2.58	87%	Thorp and Covich (2010); Charbonneau and Hare (1998); Vieira et al. (2006)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	(c)
<i>Chironomus</i> sp.	Insecta	Diptera	Chironomidae	DET	Up to 4-6 cm burrows; "Collector-gatherer", "Detritivore", "Shredder", "Few collector-filterer, Herbivore" (based on various <i>Chironomus</i> spp.)	1.40E-07	0.129	1.08	87%	Langston University Aquaculture (LUA) (2014); Yan et al. (1999); Llanso (2002); Charbonneau and Hare (1998); Vieira et al. (2006) (based on various <i>Chironomus</i> spp.)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Cladopelma</i> sp.	Insecta	Diptera	Chironomidae	DET	Up to 7 mm long as larvae; associated with sand and muddy bottoms	9.84E-08	0.129	0.763	87%	Vieira et al. (2006); Cranston (2010); Pilarczyk et al. (2007)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
Corophiidae	Crustacea	Amphipoda	Corophiidae	DET	Ecological data for this taxon are based on <i>Corophium</i> spp. (see references for more information)	3.16E-07	0.16	1.97	84%	Holton (1984); Pearson and Rosenberg (1978); Levinton (1982) (based on <i>Corophium volutator</i>); Prato and Biandolino (2006) (based on <i>Corophium insidiosum</i>)	CBBMP (2014) (<i>Apocorophium</i> spp. surrogate); ww conversion based on Ricciardi and Bourget (1998) (based on Amphipoda)	X

Database of Benthic Invertebrate Taxonomy, Traits, and Estimates of Biomass/Percent Moisture

Taxonomy (a)				Ecology		Biomass/Percent Moisture				Reference		
Lowest Practical Taxon	Phylum, Subphylum, or Class	Order or Subclass	Family or Suborder	Feeding Group	Notes on Ecology	Dry Biomass (kg dw/ind)	Wet-to-Dry Conversion Factor	Wet Biomass (mg ww/ind)	Moisture Content (%)	Ecology References (and rationale)	Biomass References (and rationale)	Infaunal presence/ absence (b)
<i>Corynoneura</i> sp.	Insecta	Diptera	Chironomidae	DET	Collector-gatherer; larvae no longer than 3 mm	9.84E-08	0.129	0.763	87%	Vieira et al. (2006); Cranston (2010); Pilarczyk et al. (2007)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Cricotopus bicinctus</i>	Insecta	Diptera	Chironomidae	DET	Up to 8 mm long as larvae; associated with aquatic macrophytes, algae, and cyanobacteria	5.00E-08	0.129	0.388	87%	Vieira et al. (2006); Cranston (2010) (based on <i>Crictopus</i> spp.); Pilarczyk et al. (2007) (based on <i>Crictopus</i> spp.)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Cricotopus</i> sp.	Insecta	Diptera	Chironomidae	DET	Up to 8 mm long as larvae; associated with aquatic macrophytes, algae, and cyanobacteria	5.00E-08	0.129	0.388	87%	Vieira et al. (2006); Cranston (2010); Pilarczyk et al. (2007)	CBBMP (2014) (<i>Crictopus bicinctus</i> surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Cricotopus trifascia</i>	Insecta	Diptera	Chironomidae	DET	Up to 8 mm long as larvae; associated with aquatic macrophytes, algae, and cyanobacteria	5.00E-08	0.129	0.388	87%	Vieira et al. (2006); Cranston (2010) (based on <i>Crictopus</i> spp.); Pilarczyk et al. (2007)	CBBMP (2014) (<i>Crictopus bicinctus</i> surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Cyathura polita</i>	Crustacea	Isopoda	Anthuridae	DET	Small-bodied, approximately 8 mm; may burrow up to 15 cm; detritivore (based on <i>C. carinata</i>)	6.72E-07	0.142	4.73	86%	Dean and Haskin (1964); Llanso (2002); Craft and Sacco (2003); EOL (2014a); Hines and Comtois (1985); Olafsson and Persson (1986) (based on <i>C. carinata</i>); Martins et al. (1997)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Isopoda)	X
<i>Dicrotendipes fumidus</i>	Insecta	Diptera	Chironomidae	DET	Collector-gatherer, scraper, filterer; larvae up to 11 mm long	9.84E-08	0.129	0.763	87%	Vieira et al. (2006); Cranston (2010); Pilarczyk et al. (2007) (based on <i>Dicrotendiptes</i> spp.); Cranston (2010) (based on <i>Dicrotendiptes</i> spp.)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Dicrotendipes lucifer</i>	Insecta	Diptera	Chironomidae	DET	Collector-gatherer, scraper, filterer; larvae up to 11 mm long	9.84E-08	0.129	0.763	87%	Vieira et al. (2006); USEPA (2012); Cranston (2010) (based on <i>Dicrotendiptes</i> spp.); Pilarczyk et al. (2007) (based on <i>Dicrotendiptes</i> spp.)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Dicrotendipes modestus</i>	Insecta	Diptera	Chironomidae	DET	Collector-gatherer, scraper, filterer; larvae up to 11 mm long	9.84E-08	0.129	0.763	87%	Vieira et al. (2006); USEPA (2012); Cranston (2010) (based on <i>Dicrotendiptes</i> spp.); Pilarczyk et al. (2007) (based on <i>Dicrotendiptes</i> spp.)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Dicrotendipes neomodestus</i>	Insecta	Diptera	Chironomidae	DET	Collector-gatherer, scraper, filterer; larvae up to 11 mm long	9.84E-08	0.129	0.763	87%	Vieira et al. (2006); USEPA (2012); Cranston (2010) (based on <i>Dicrotendiptes</i> spp.)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Dicrotendipes</i> sp.	Insecta	Diptera	Chironomidae	DET	Collector-gatherer, scraper, filterer; larvae up to 11 mm long	9.84E-08	0.129	0.763	87%	Vieira et al. (2006); USEPA (2012); Cranston (2010); Pilarczyk et al. (2007)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
Diptera	Insecta	Diptera	na	DET	Highly variable	5.94E-08	nd	nd	nd	Vieira et al. (2006); Thorp and Covich (2010)	nd -- diverse taxon	X
<i>Dubiraphia</i> sp.	Insecta	Coleoptera	Elmidae	DET	Herbivorous both as adults and larvae	1.00E-07	0.129	0.775	87%	Vieira et al. (2006); Thorp and Covich (2010); Smock (1988); Pilarczyk et al. (2007)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Edotia montosa</i>	Crustacea	Isopoda	Idoteidae	DET	Surface herbivore; may burrow up to ~5 cm	1.63E-07	0.142	1.15	86%	Macdonald et al. (2010) (based on Idoteidae); Hines and Comtois (1985); Griffith and Telford (1985) (based on <i>Chiridotea caeca</i>); Naylor (1955) (based on <i>Idotea emarginata</i>)	CBBMP (2014) (<i>Edotia triloba</i> surrogate); ww conversion based on Ricciardi and Bourget (1998) (based on Isopoda)	X
<i>Edotia</i> sp.	Crustacea	Isopoda	Idoteidae	DET	Surface herbivore; may burrow up to ~5 cm	1.63E-07	0.142	1.15	86%	Macdonald et al. (2010) (based on Idoteidae); Hines and Comtois (1985); Griffith and Telford (1985) (based on <i>Chiridotea caeca</i>); Naylor (1955) (based on <i>Idotea emarginata</i>)	CBBMP (2014) (<i>Edotia triloba</i> surrogate); ww conversion based on Ricciardi and Bourget (1998) (based on Isopoda)	X
Ephydriidae	Insecta	Diptera	Ephydriidae	DET	Mostly scraper-grazer with some predators; generally found in mud or on algal or detrital mats; small body size (1-14 mm)	5.94E-08	0.129	0.46	87%	Vieira et al. (2006); Thorp and Covich (2010); Steinly (1992); Bouchard (2004)	Whiles and Goldowitz (2005) (based on Diptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Erioptera</i> sp.	Insecta	Diptera	Tipulidae	DET	Collector-gatherer; Tipulidae are generally found under rocks, in sand, snags, or mats of litter or algae; may be small to fairly large (3-60 mm)	5.94E-08	0.129	0.46	87%	Young (2007); Bouchard (2004); Thorp and Covich (2010)	Whiles and Goldowitz (2005) (based on Diptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Ferrissia</i> sp.	Gastropoda	Gastropoda	Planorbidae	DET	Scraper-grazer; attaches to stones	1.00E-07	0.138	0.725	86%	Vieira et al. (2006) (based on Ancyliidae); Soster and McCall (1990) mentions gastropods indicative of more stable areas; WLU (2014); Pilarczyk et al. (2007)	Whiles and Goldowitz (2005) (based on Planorbidae); ww conversion based on Ricciardi and Bourget (1998) (based on shelled Opisthobranchia)	X
<i>Fossaria</i> sp.	Gastropoda	Gastropoda	Lymnaeidae	DET	Scraper-grazer	2.22E-06	nd	nd	nd	Vieira et al. (2006); Soster and McCall (1990) mentions gastropods indicative of more stable areas	nd -- data unavailable	X
Gammaridae	Crustacea	Amphipoda	Gammaridae	DET	Mostly detritivorous, but some are predatory or true omnivores	2.30E-07	0.16	1.44	84%	Pennak 1989, Thorp and Covich (2010); Vieira et al. (2006) (size based on multiple species); Pilarczyk et al. (2007) (based on 2 <i>Gammarus</i> spp.)	CBBMP (2014) (<i>Gammarus</i> spp. surrogate); ww conversion based on Ricciardi and Bourget (1998) (based on Amphipoda)	X
<i>Gammarus minus</i>	Crustacea	Amphipoda	Gammaridae	DET	Shredder	2.30E-07	0.16	1.44	84%	Thorp and Covich (2010); Pilarczyk et al. (2007) (based on other <i>Gammarus</i> spp.); Viera et al. (2006)	CBBMP (2014) (<i>Gammarus</i> spp. surrogate); ww conversion based on Ricciardi and Bourget (1998) (based on Amphipoda)	X
<i>Gammarus mucronatus</i>	Crustacea	Amphipoda	Gammaridae	DET	"Generally omnivorous, scavengers, or detritus feeders; chews food mass without tearing into smaller pieces first. Feeds on all kinds of animal and plant matter, seldomly attacks living animals. Scavenges on freshly killed animals, the film of microscopic plants, animals, and organic debris; aufwuchs." (based on various <i>Gammarus</i> spp.)	2.30E-07	0.16	1.44	84%	Thorp and Covich (2010); Pilarczyk et al. (2007) (based on other <i>Gammarus</i> spp.); Viera et al. (2006) (based on various <i>Gammarus</i> spp.)	CBBMP (2014) (<i>Gammarus</i> spp. surrogate); ww conversion based on Ricciardi and Bourget (1998) (based on Amphipoda)	X

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Lowest Practical Taxon	Phylum, Subphylum, or Class	Order or Subclass	Family or Suborder	Feeding Group	Notes on Ecology	Dry Biomass (kg dw/ind)	Wet-to-Dry Conversion Factor	Wet Biomass (mg ww/ind)	Moisture Content (%)	Ecology References (and rationale)	Biomass References (and rationale)	
<i>Gammarus</i> sp.	Crustacea	Amphipoda	Gammaridae	DET	Ecological data for for this taxon were based on various gammarid species (see references for more information); "Generally omnivorous, scavengers, or detritus feeders; chews food mass without tearing into smaller pieces first. Feeds on all kinds of animal and plant matter, seldomly attacks living animals. Scavenges on freshly killed animals, the film of microscopic plants, animals, and organic debris; aufwuchs." (based on various <i>Gammarus</i> spp.)	5.00E-08	0.16	0.313	84%	Thorp and Covich (2010); Pilarczyk et al. (2007) (based on 2 <i>Gammarus</i> spp.); Viera et al. (2006) (based on various potential gammarids)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Amphipoda)	X
Gastropoda	Gastropoda	Gastropoda	na	DET	Generally scraper-grazer	4.52E-07	0.107	4.24	89%	Soster and McCall (1990) mentions gastropods indicative of more stable areas; Vieira et al. (2006) (based on multiple species)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (average of Prosobranchia and shelled Opisthobranchia values)	X
<i>Glyptotendipes</i> sp.	Insecta	Diptera	Chironomidae	DET	Collector-gatherer, chewer, herbivore; ~2 cm burrows	9.84E-08	0.129	0.763	87%	Vieira et al. (2006); Cranston (2010); Llanso (2002); Pilarczyk et al. (2007); Charbonneau and Hare (1998)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Grandidierella bonnieroides</i>	Crustacea	Amphipoda	Aoridae	DET	Scrape plant surfaces of thin detritus layers (i.e., shallow or epibenthic)	1.67E-07	0.16	1.04	84%	Zimmerman et al. (1979) (abstract); Brusca and Brusca (2003); Nayar (1956)	CBBMP (2014) (<i>Leptocheirus plumulosus</i> surrogate); ww conversion based on Ricciardi and Bourget (1998) (based on Amphipoda)	X
<i>Haminoea solitaria</i>	Gastropoda	Gastropoda	Haminoeidae	DET	Herbivore, dwelling on mudflats or in coralline turf	2.24E-07	0.138	1.62	86%	Soster and McCall (1990) mentions gastropods indicative of more stable areas; Malaquias et al. (2004) (abstract); Rudman (1971); Malaquias and Sprung (2005) (based on <i>H. orbygniana</i>)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on shelled Opisthobranchia)	X
<i>Harnischia</i> sp.	Insecta	Diptera	Chironomidae	DET	Collector-gatherer, scraper-grazer; larvae up to 9 mm long; associated with soft sediments	4.45E-08	0.129	0.345	87%	Vieira et al. (2006), USEPA (2012), Cranston (2010)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Hobsonia florida</i>	Annelida	Polychaeta	Ampharetidae	DET	"...a surface deposit feeder, picking up particles with tentacles; family eats detritus, unicellular algae, larval invertebrates (Fauchald and Jumars 1979). Worms begin feeding as newly settled juveniles of 2-3 setigers, by muscular pumping of lips, before tentacles develop (Zottoli 1974). When feeding, adult stretches out of tube, spreads tentacles over substratum, keeps branchiae up in water...Food ingestion dependent on particles' surface texture, size; sorting for specific gravity done in gut (Self and Jumars 1978)"; small bodied (up to 15 mm);	1.19E-07	0.16	0.742	84%	Fauchald and Jumars (1979); Rudy et al. (2013); Zottoli (1974) and Self and Jumars (1978)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X
<i>Hobsonia</i> sp.	Annelida	Polychaeta	Ampharetidae	DET	Tentaculate surface deposit feeder; small bodied (up to 15 mm)	1.19E-07	0.16	0.742	84%	Fauchald and Jumars (1979); Rudy et al. (2013) (based on <i>H. florida</i>)	CBBMP (2014) (based on <i>Hobsonia florida</i>); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X
<i>Hyalella</i> sp.	Crustacea	Amphipoda	Hyalellidae	DET	Scavenging shredder-grazer	3.33E-07	0.16	2.08	84%	Vieira et al. (2006); WLU (2014)	CBBMP (2014) (based on Amphipoda); ww conversion based on Ricciardi and Bourget (1998) (based on Amphipoda)	X
Hydrobiidae	Gastropoda	Gastropoda	Hydrobiidae	DET	"Consume mostly the thin film of algae that covers most submerged surfaces; also occasionally feed on dead plant and animal materials."	4.85E-07	0.138	3.52	86%	Soster and McCall (1990) mentions gastropods indicative of more stable areas; Pearson and Rosenberg (1978); Vieira et al. (2006)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on shelled Opisthobranchia)	X
<i>Hydroptila</i> sp.	Insecta	Trichoptera	Hydroptilidae	DET	Scraper-grazer	7.21E-08	0.129	0.559	87%	Vieira et al. (2006); Pilarczyk et al. (2007); Charbonneau and Hare (1998) (based on a trichopteran)	CBBMP (2014) (Orthotrichia spp. surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
Hydroptilidae	Insecta	Trichoptera	Hydroptilidae	DET	Scraper-grazer	5.00E-08	0.129	0.388	87%	Vieira et al. (2006) (based on taxa within family); Charbonneau and Hare (1998) (based on a trichopteran)	CBBMP (2014) (<i>Orthotrichia</i> spp. surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
Idoteidae	Crustacea	Isopoda	Idoteidae	DET	Surface herbivore	5.28E-07	0.142	3.72	86%	Macdonald et al. (2010) (based on Idoteidae); Griffith and Telford (1985) (based on <i>Chiridotea caeca</i>); Tuomi et al. (1988) (based on <i>Idotea balthica</i>)	CBBMP (2014) (average of Idoteidae taxa); ww conversion based on Ricciardi and Bourget (1998) (based on Isopoda)	X
<i>Ilyanassa obsoleta</i>	Gastropoda	Gastropoda	Nassariidae	DET	Detritivore; selectively feeds on <i>Ulva</i> sp. detritus	4.99E-05	0.138	361	86%	Soster and McCall (1990) mentions gastropods indicative of more stable areas; Scheltema (1964); Llanso (2002); Levinton (1982); ISSG (2014c) (longevity based on <i>Nassarius obsoletus</i> surrogate); Kelaher et al. (2003)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on shelled Opisthobranchia)	X
<i>Laeonereis culveri</i>	Annelida	Polychaeta	Nereididae	DET	Surface forager; gut contents found to contain detritus and sediment; assumed to consume primarily detritus and not sediment	8.93E-07	0.16	5.58	84%	Mazurkiewicz (1975); Fauchald and Jumars (1979); Checon et al. (2016); Magalhaes and Barros (2011)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X
<i>Laevapex fuscus</i>	Gastropoda	Gastropoda	Ancylidae	DET	Scraper-grazer; attaches to stones	2.00E-07	0.138	1.45	86%	Soster and McCall (1990) mentions gastropods indicative of more stable areas; Vieira et al. (2006); FWGNA (2014a)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on shelled Opisthobranchia)	X
<i>Leitoscoloplos fragilis</i>	Annelida	Polychaeta	Orbiniidae	DET	Deep feeder between 1-10 cm near anoxic sediment; "...potential food items (organic POC/PON, diatoms, bacteria)...", "In these coarse-grained sediments benthic diatoms are the major food resource for <i>L. fragilis</i> "	3.41E-06	0.16	21.3	84%	Llanso (2002); Levin et al. (2009); Fauchald and Jumars (1979); Waldbusser et al. (2004); Bianchi (1988)	CBBMP (2014) (<i>Leitoscoloplos</i> spp. surrogate); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X

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Lepidoptera	Insecta	Lepidoptera	na	DET	Diverse taxon, although most are herbivorous shredders	7.56E-06	0.129	58.6	87%	MDFRC (2014) (based on Crambidae family); Thorp and Covich (2010)	Barbone et al. (2007) (based on Lepidoptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
Leucotrichia pictipes	Insecta	Trichoptera	Hydroptilidae	DET	Scraper-grazer	5.00E-08	0.129	0.388	87%	Vieira et al. (2006); McAuliffe (1982) (abstract); Charbonneau and Hare (1998) (based on a trichopteran); Thorp and Covich (2010)	CBBMP (2014) (<i>Orthotrichia</i> spp. surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	(c)
Limnophyes sp.	Insecta	Diptera	Chironomidae	DET	Small body size (up to 6 mm as larvae); found in a variety of habitats	9.84E-08	0.129	0.763	87%	Vieira et al. (2006); USEPA (2012); Cranston (2010)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
Lirceus sp.	Crustacea	Isopoda	Asellidae	DET	Scavengers on detritus and animal matter	5.28E-07	0.142	3.72	86%	Vieira et al. (2006); Pilarczyk et al. (2007)	CBBMP (2014) (average of Idoteidae taxa); ww conversion based on Ricciardi and Bourget (1998) (based on Isopoda)	X
Lymnaeidae	Gastropoda	Gastropoda	Lymnaeidae	DET	"Consume mostly the thin film of algae that covers most submerged surfaces; also occasionally feed on dead plant and animal materials"; "Omnivorous scavengers; consume algae that covers most submerged surfaces, dead plant and animal materials"; "Consume long strands of filamentous algae; scrape algae and diatoms from rocks or macrophytes" (based on various lymnaeids).	2.22E-06	0.138	16.1	86%	Soster and McCall (1990) mentions gastropods indicative of more stable areas; Pilarczyk et al. (2007); Vieira et al. (2006) (based on various lymnaeid species)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on shelled Opisthobranchia)	X
Macronychus glabratus	Insecta	Coleoptera	Elmidae	DET	Collector-gather, filterer	7.07E-08	0.129	0.548	87%	Thorp and Covich (2010); Smock (1988); Pilarczyk et al. (2007); Vieira et al. (2006)	CBBMP (2014) (average of Elmidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
Manayunkia sp.	Annelida	Polychaeta	Sabellariidae	DET	Colonial tentacular feeder living in shallow tubes formed in sand or shell fragments	3.60E-07	0.16	2.25	84%	Fauchald and Jumars (1979)	CBBMP (2014) (<i>Sabellaria vulgaris</i> surrogate; high level of uncertainty due to degree of taxonomic difference); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X
Marenzelleria viridis	Annelida	Polychaeta	Spionidae	DET	Tube-dwelling surface feeder; deep-burrowing; although sometimes referred to as a deposit feeder, palp-feeding at the surface acts to trap primarily detritus; "Marenzelleria viridis" is a deep-burrowing surface deposit feeder that uses a pair of tentaculate palps to search for food (George 1966) as well as occasional irregular lashing of both palps in the water column for suspension feeding (Dauer et al. 1981)."	1.41E-06	0.16	8.82	84%	Dauer (1997); Fauchald and Jumars (1979); Llanso (2002); Dale and Miller (2008); Jovanovic et al. (2014); George (1966) and Dauer et al. (1981)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X
Marinogammarus stoerensis	Crustacea	Amphipoda	Gammaridae	DET	Ecological data for this species was based on various surrogate gammarid species (see references for more information)	2.30E-07	0.16	1.44	84%	Thorp and Covich (2010); Pilarczyk et al. (2007) (based on Gammaridae); Viera et al. (2006) (based on various gammarids)	CBBMP (2014) (<i>Gammarus</i> spp. surrogate); ww conversion based on Ricciardi and Bourget (1998) (based on Amphipoda)	X
Melita nitida	Crustacea	Amphipoda	Melitidae	DET	Ecological data for this species was not readily available	1.25E-07	0.16	0.783	84%	Thorp and Covich (2010); Faasse and van Moorsel (2003)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Amphipoda)	X
Micromenetes dialatus	Gastropoda	Gastropoda	Planorbidae	DET	Surface or shallow subsurface sediment; no feeding data is available for this species, but its diet is assumed to be similar to other planorbid snails: "Consume mostly the thin film of algae that covers most submerged surfaces; also occasionally feed on dead plant and animal materials"; "Prefers consuming detritus, but will also eat periphyton and bacteria" (based on various other planorbid snails)	4.86E-07	0.138	3.52	86%	Thorp and Covich (2010) (assumed from other planorbid snails); Vieira et al. (2006) (based on Planorbidae)	Whiles and Goldowitz (2005) (based on Planorbidae); ww conversion based on Ricciardi and Bourget (1998) (based on shelled Opisthobranchia)	X
Micromenetes sp.	Gastropoda	Hygrophila	Planorbidae	DET	Surface or shallow subsurface sediment; scraper	4.86E-07	0.138	3.52	86%	Thorp and Covich (2010) (assumed from other planorbid snails)	Whiles and Goldowitz (2005) (based on Planorbidae); ww conversion based on Ricciardi and Bourget (1998) (based on shelled Opisthobranchia)	X
Microtendipes pedellus	Insecta	Diptera	Chironomidae	DET	Collector-gatherer; up to 15 mm long as larvae	9.84E-08	0.129	0.763	87%	Beck (1977); Pilarczyk et al. (2007); Cranston (2010)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
Naididae	Annelida	Oligochaeta	Naididae	DET	Surface deposit feeders, mostly, but also filterers and predators; up to ~ 8 mm (based on several Naidid species)	2.02E-07	0.182	1.11	82%	Soster and McCall (1990); Germano & Associates (2005); Arslan and Sahin (2003) (based on 9 Naidid species); Vieira et al. (2006)	CBBMP (2014) (average of Naididae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Oligochaeta)	X
Nanocladius sp.	Insecta	Diptera	Chironomidae	DET	Collector-gatherer; small as larvae (up to 5 mm); some species may be parasitic	8.33E-08	0.129	0.646	87%	Beck (1977); Pilarczyk et al. (2007); Cranston (2010)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
Nereididae	Annelida	Polychaeta	Nereididae	DET	Surface forager, typically; other strategies possible	7.99E-07	0.16	5	84%	Fauchald and Jumars (1979); Kristensen (1984) (based on <i>A. virens</i> and <i>A. diversicolor</i>)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X
Orthocladius sp.	Insecta	Diptera	Chironomidae	DET	Generally collector-gatherer and scraper-grazer genus; larvae up to 12 mm long	9.84E-08	0.129	0.763	87%	Beck (1977); Vieira et al. (2006); Cranston (2010)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
Ostracoda	Crustacea	na	na	DET	Surface feeder	nd	nd	nd	nd	Soster and McCall (1990); Germano & Associates (2005); Pilarczyk et al. (2007)	nd -- diverse taxon	X
Palaemonetes pugio	Crustacea	Decapoda	Palaemonidae	DET	Epibenthic omnivore, feeding on detritus, algae, or meat as available	5.00E-08	nd	nd	nd	Vernberg and Piyatiratitivorakuli (1998); Vieira et al. (2006) (based on <i>Palaemonetes</i> spp.); Anderson and Shanks (1985) (based on <i>P. pugio</i>); Viera et al. (2006)	nd -- not present in infaunal samples; collected during fish surveys (epibenthic)	(d)

Database of Benthic Invertebrate Taxonomy, Traits, and Estimates of Biomass/Percent Moisture

Taxonomy (a)				Ecology		Biomass/Percent Moisture				Reference		Infaunal presence/absence (b)
Lowest Practical Taxon	Phylum, Subphylum, or Class	Order or Subclass	Family or Suborder	Feeding Group	Notes on Ecology	Dry Biomass (kg dw/ind)	Wet-to-Dry Conversion Factor	Wet Biomass (mg ww/ind)	Moisture Content (%)	Ecology References (and rationale)	Biomass References (and rationale)	
<i>Paracladopelma</i> sp.	Insecta	Diptera	Chironomidae	DET	Larvae up to 10 mm long; associated with sandy habitat; generally intolerant of eutrophication according to Cranston (2010)	9.84E-08	0.129	0.763	87%	Beck (1977); Pilarczyk et al. (2007); Cranston (2010)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Parakiefferiella</i> sp.	Insecta	Diptera	Chironomidae	DET	Collector-gatherer; small as larvae (up to 4 mm)	9.84E-08	0.129	0.763	87%	Vieira et al. (2006); Pilarczyk et al. (2007); Cranston (2010)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	(c)
<i>Paralauterborniella nigrohalteralis</i>	Insecta	Diptera	Chironomidae	DET	Small as larvae (up to 5 mm); associated with soft sediment or Aufwuchs (i.e., overgrown periphyton/ invertebrate communities around rocks or macrophytes)	9.84E-08	0.129	0.763	87%	Beck (1977); Pilarczyk et al. (2007) (based on <i>Paralauterborniella</i> spp.); Cranston (2010)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Paraleptophlebia</i> sp.	Insecta	Ephemeroptera	Leptophlebiidae	DET	Shredder, collector-gatherer	2.40E-07	0.129	1.86	87%	Vieira et al. (2006); Pilarczyk et al. (2007)	Whiles and Goldowitz (2005) (based on Ephemeroptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Paratanytarsus</i> sp.	Insecta	Diptera	Chironomidae	DET	Collectors, filterers, or gatherers; larvae up to 7 mm long	9.42E-08	0.129	0.73	87%	Johnson and Krieger (2005); Pilarczyk et al. (2007); Cranston (2010); Viera et al. (2006)	CBBMP (2014) (based on Tanitarsini); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Paratendipes</i> sp.	Insecta	Diptera	Chironomidae	DET	Collector-gatherer; larvae up to 8 mm long	9.84E-08	0.129	0.763	87%	Beck (1977); Pilarczyk et al. (2007); Cranston (2010); Vieira et al. (2006) (based on <i>P. albimanus</i>)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Petrophila</i> sp.	Insecta	Lepidoptera	Crambidae	DET	Scraper-grazer and herbivore feeding on undersides of rocks and SAV	7.56E-06	0.129	58.6	87%	Vieira et al. (2006); MDFRC (2014); Dray et al. (1989); Thorp and Covich (2010) (based on Lepidoptera)	Barbone et al. (2007) (based on Lepidoptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	(c)
<i>Phaenopsectra</i> sp.	Insecta	Diptera	Chironomidae	DET	Scraper-grazer; larvae approximately 8 mm; associated with sandy or muddy bottoms, Aufwuchs	9.84E-08	0.129	0.763	87%	Beck (1977); Pilarczyk et al. (2007); Cranston (2010)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Physa</i> sp.	Gastropoda	Gastropoda	Physidae	DET	Ecological data for this taxon was not readily available	7.16E-07	nd	nd	nd	Soster and McCall (1990) mentions gastropods indicative of more stable areas; Pilarczyk et al. (2007); Viera et al. (2006)	nd -- data unavailable	X
Planorbidae	Gastropoda	Gastropoda	Planorbidae	DET	Scraper-grazer and true detritivore	4.86E-07	0.138	3.52	86%	Thorp and Covich (2010); Pilarczyk et al. (2007); Vieira et al. (2006); Vieira et al. (2006) (based on Planorbidae)	Whiles and Goldowitz (2005) (Based on Planorbidae); ww conversion based on Ricciardi and Bourget (1998) (based on shelled Opisthobranchia)	X
<i>Polydora</i> sp.	Annelida	Polychaeta	Spionidae	DET	Tentaculate surface feeder; burrows into hard substrates; <i>Polydora</i> spp. live approximately 13 months, but may last up to 31 months; moderate body size (approximately 1 in [or 2.5 cm long]);	1.20E-07	0.16	0.751	84%	Llanso (2002); Pearson and Rosenberg (1978); Levin et al. (2009); Fauchald and Jumars (1979); SMS (2008d) (based on <i>P. ligni</i>)	CBBMP (2014) (<i>Polydora websteri</i> surrogate); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X
<i>Polypedilum flavum</i>	Insecta	Diptera	Chironomidae	DET	Shredder, collector-gatherer; larvae approximately 8 mm; associated with sediment or hard substrates (i.e., foraging algae)	8.03E-08	0.129	0.622	87%	USEPA (2012); Cranston (2010) (based on <i>Polypedilum</i> spp.); Llanso (2002); Boesel (1985); Vieira et al. (2006)	CBBMP (2014) (<i>Polypedilum</i> spp. surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Polypedilum halterale</i>	Insecta	Diptera	Chironomidae	DET	Shredder, collector-gatherer; larvae approximately 8 mm; associated with sediment or hard substrates (i.e., foraging algae)	3.15E-08	0.129	0.244	87%	Beck (1977); Llanso (2002); Boesel (1985); Cranston (2010) (based on <i>Polypedilum</i> spp.); Vieira et al. (2006)	CBBMP (2014) (<i>Polypedilum</i> spp. surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Polypedilum illinoense</i>	Insecta	Diptera	Chironomidae	DET	Shredder, collector-gatherer; larvae approximately 8 mm; associated with sediment or hard substrates (i.e., foraging algae)	8.03E-08	0.129	0.622	87%	Beck (1977); Llanso (2002); Boesel (1985); Cranston (2010) (based on <i>Polypedilum</i> spp.); Vieira et al. (2006)	CBBMP (2014) (<i>Polypedilum</i> spp. surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Polypedilum scalaenum</i>	Insecta	Diptera	Chironomidae	DET	Shredder, collector-gatherer; larvae approximately 8 mm; associated with sediment or hard substrates (i.e., foraging algae)	8.33E-09	0.129	0.0646	87%	Vieira et al. (2006); USEPA (2012); Cranston (2010) (based on <i>Polypedilum</i> spp.); Llanso (2002)	CBBMP (2014) (<i>Polypedilum</i> spp. surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Polypedilum</i> sp.	Insecta	Diptera	Chironomidae	DET	Shredder, collector-gatherer; larvae approximately 8 mm; associated with sediment or hard substrates (i.e., foraging algae)	4.16E-07	0.129	3.23	87%	Beck (1977); Llanso (2002); Cranston (2010); Vieira et al. (2006)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X

Database of Benthic Invertebrate Taxonomy, Traits, and Estimates of Biomass/Percent Moisture

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Lowest Practical Taxon	Phylum, Subphylum, or Class	Order or Subclass	Family or Suborder	Feeding Group	Notes on Ecology	Dry Biomass (kg dw/ind)	Wet-to-Dry Conversion Factor	Wet Biomass (mg ww/ind)	Moisture Content (%)	Ecology References (and rationale)	Biomass References (and rationale)	
<i>Promenetus exacuus</i>	Gastropoda	Gastropoda	Planorbidae	DET	Biological traits data for this taxon were not readily available in the literature	4.86E-07	0.138	3.52	86%	FWGNA (2014b); Vieira et al. (2006) (based on Planorbidae)	Whiles and Goldowitz (2005) (based on Planorbidae); ww conversion based on Ricciardi and Bourget (1998) (based on shelled Opisthobranchia)	X
<i>Pseudosmittia</i> sp.	Insecta	Diptera	Chironomidae	DET	Small bodied (up to 5 mm as larvae); species is either <i>P. oxoniana</i> or <i>P. ruttneri</i> as these are the only two aquatic species in this genus	9.84E-08	0.129	0.763	87%	Vieira et al. (2006); Pilarczyk et al. (2007); Cranston (2010)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
Psychodidae	Insecta	Diptera	Psychodidae	DET	Collector-gatherer; very small (3-6 mm); some Psychodidae associated with sewage streams or other organic-rich sediments	5.94E-08	0.129	0.46	87%	Vieira et al. (2006); Bouchard (2004)	Whiles and Goldowitz (2005) (based on Diptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Rictaxis punctostriatus</i>	Gastropoda	Gastropoda	Acteonidae	DET	Small bodied; small bodied (3-7.5 mm); associated with muddy and sandy substrate	3.18E-07	0.138	2.3	86%	Llanso (2002); Marine Biology Resource Network (2013)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on shelled Opisthobranchia)	X
<i>Saetheria tylus</i>	Insecta	Diptera	Chironomidae	DET	Small larvae (up to 5 mm); associated with sandy bottoms	9.84E-08	0.129	0.763	87%	Beck (1977); Pilarczyk et al. (2007); Cranston (2010) (based on <i>Saetheria</i> spp.); Vieira et al. (2006)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
Sphaeriidae	Bivalvia	Veneroida	Sphaeriidae	DET	Burrow during drought; "Deposit and suspension feeders; consume plankton, algae, bacteria, and microdetritus"; "Consumes fine organic detritus dislodged from the substrate and in suspension. Larvae are parasitic on fish" (based on Sphaeriidae, <i>Sphaerium</i> sp. and <i>S. striatinum</i>)	5.61E-07	0.058	9.67	94%	WLU (2014); Vieira et al. (2006) (based on various sphaeriid species)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Bivalvia)	X
Spionidae	Annelida	Polychaeta	Spionidae	DET	Tentaculate surface feeder	3.30E-07	0.16	2.06	84%	Fauchald and Jumars (1979); Liu and Hsieh (2000)	CBBMP (2014) (average of Spionidae taxa); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X
<i>Stempellinella</i> sp.	Insecta	Diptera	Chironomidae	DET	Collector-gatherer; small as larvae (up to 3 mm); construct transportable cases	9.42E-08	0.129	0.73	87%	Beck (1977); Pilarczyk et al. (2007); Cranston (2010); Vieira et al. (2006)	CBBMP (2014) (based on Tanitarsini); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Stenacron</i> sp.	Insecta	Ephemeroptera	Heptageniidae	DET	Collector-gatherer and opportunistic grazer	2.40E-07	0.129	1.86	87%	Vieira et al. (2006); Pilarczyk et al. (2007) (based on <i>S. interpunctatum</i>)	Whiles and Goldowitz (2005) (based on Ephemeroptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	(c)
<i>Stenelmis</i> sp.	Insecta	Coleoptera	Elmidae	DET	Scraper-grazer, collector-gatherer	5.00E-08	0.129	0.388	87%	Stagliano and Whiles (2008); Pilarczyk et al. (2007); Vieira et al. (2006)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Stenochironomus</i> sp.	Insecta	Diptera	Chironomidae	DET	Collector-gatherer, shredder; larvae up to 18 mm long; obligate miners of living and dead herbaceous tissues including wood	9.84E-08	0.129	0.763	87%	Beck (1977); Pilarczyk et al. (2007); Cranston (2010); Vieira et al. (2006)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Stictochironomus</i> sp.	Insecta	Diptera	Chironomidae	DET	Collector-gatherer, shredder, and herbivore; larvae up to 14 mm long; associated with soft sediments or sand	1.62E-07	0.129	1.26	87%	Beck (1977); Pilarczyk et al. (2007); Cranston (2010); Vieira et al. (2006)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Streblospio benedicti</i>	Annelida	Polychaeta	Spionidae	DET	Tentaculate surface feeder	6.73E-08	0.16	0.421	84%	Pearson and Rosenberg (1978); Llanso (2002); Levin et al. (2009); Fauchald and Jumars (1979); Levinton (1982); Levin (1984)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X
<i>Synorthocladius</i> sp.	Insecta	Diptera	Chironomidae	DET	Small as larvae (up to 4 mm long)	9.84E-08	0.129	0.763	87%	Tall et al. (2006); Cranston (2010); Vieira et al. (2006)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X

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Tanytarsini	Insecta	Diptera	Chironomidae	DET	Taxonomically diverse group of chironomids; ecological data based on several surrogates (see references for more information)	9.42E-08	0.129	0.73	87%	Johnson and Krieger (2005); Thorp and Covich (2010) (based on <i>Tanytarsus</i> spp.); Cranston (2010); Vieira et al. (2006) (based on <i>Tanytarsus</i> sp. and <i>Cladotanytarsus</i> sp.)	CBBMP (2014) (data available for taxon); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Tanytarsus</i> sp.	Insecta	Diptera	Chironomidae	DET	Collector-gatherer; up to 9 mm long as larvae	1.89E-07	0.129	1.46	87%	Beck (1977); Pilarczyk et al. (2007); Cranston (2010); Vieira et al. (2006)	CBBMP (2014) (based on Tanitarsini); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Telmatogeton</i> sp.	Insecta	Diptera	Chironomidae	DET	Larvae up to 11 mm long; create tubes in green algae, and are territorial	9.84E-08	0.129	0.763	87%	Beck (1977); Cranston (2010)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Thienemanniella</i> sp.	Insecta	Diptera	Chironomidae	DET	Collector-gatherer; small larvae (up to 3 mm); often associated with large pore spaces between stones and wood	9.84E-08	0.129	0.763	87%	Vieira et al. (2006); Pilarczyk et al. (2007); Cranston (2010)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Tipula</i> sp.	Insecta	Diptera	Tipulidae	DET	Shredder, collector gatherer; Tipulidae are generally found under rocks, in sand, snags, or mats of litter or algae; may be small to fairly large (3-60 mm)	5.94E-08	0.129	0.46	87%	Vieira et al. (2006); Pilarczyk et al. (2007); Bouchard (2004)	Whiles and Goldowitz (2005) (based on Diptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Tvetenia discoloripes</i>	Insecta	Diptera	Chironomidae	DET	Collector-gatherer (based on genus); larvae up to 7 mm long	9.84E-08	0.129	0.763	87%	Vieira et al. (2006); Pilarczyk et al. (2007) (based on <i>Tvetenia</i> spp.); Cranston (2010) (based on <i>Tvetenia</i> spp.)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	(c)
<i>Valvata</i> sp.	Gastropoda	Heterobranchia	Valvatidae	DET	Scraper-grazer	9.65E-07	nd	nd	nd	Vieira et al. (2006); Pilarczyk et al. (2007)	nd -- data unavailable	X
<i>Ampelisca abdita</i>	Crustacea	Amphipoda	Ampeliscidae	FF	Likely a shallow-burrowing filter feeder upon constructing tube	1.08E-07	0.16	0.674	84%	Collie (1985); Cuomo and Zinn (1997); Levinton (1982)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Amphipoda)	X
<i>Ampelisca</i> sp.	Crustacea	Amphipoda	Ampeliscidae	FF	Likely a shallow-burrowing filter feeder upon constructing tube	4.98E-07	0.16	3.11	84%	Collie (1985); Cuomo and Zinn (1997)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Amphipoda)	X
<i>Balanus</i> sp.	Crustacea	Sessilia	Balanidae	FF	"filter feed on plankton and edible detritus"; "When water covers a barnacle, the trap door opens, and the barnacle's feathery legs emerge to sweep the water for plankton and detritus. When the tide is out, barnacles close their trap doors to conserve moisture"	4.63E-07	0.123	3.77	88%	Pennak (1989); SMS (2007) (based on <i>B. amphitrite</i>); Monterey Bay Aquarium (2017)	CBBMP (2014) (<i>Balanus improvisus</i> surrogate); ww conversion based on Ricciardi and Bourget (1998) (average of available crustacean values)	X
<i>Boccardia</i> sp.	Annelida	Polychaeta	Spionidae	FF	Forms tubes in shells of living or dead organisms; likely a filter feeder	3.30E-07	0.16	2.06	84%	Simon et al. (2009); Fauchald and Jumars (1979)	CBBMP (2014) (average of Spionidae taxa); ww conversion based on Ricciardi and Bourget (1998) (based on all Polychaeta)	X
<i>Cheumatopsyche</i> sp.	Insecta	Trichoptera	Hydropsychidae	FF	Filter-feeding omnivore, clinger	3.69E-07	0.129	2.86	87%	Vieira et al (2006); Zuellig et al. (2004); WLU (2014); Pilarczyk et al. (2007); Charbonneau and Hare (1998) (based on a trichopteran)	Whiles and Goldowitz (2005) (based on Trichoptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Chthamalus fragilis</i>	Crustacea	Sessilia	Chthamalidae	FF	Suspension feeder	4.63E-07	0.123	3.77	88%	Fofonoff et al. (2003); Yan (2002)	CBBMP (2014) (<i>Balanus improvisus</i> surrogate; high level of uncertainty due to degree of taxonomic difference); ww conversion based on Ricciardi and Bourget (1998) (average of available crustacean values)	X
<i>Cladotanytarsus</i> sp.	Insecta	Diptera	Chironomidae	FF	Collector-filterer; up to 5 mm long as larvae	1.99E-07	0.129	1.54	87%	Vieira et al. (2006); Cranston (2010); Llanso (2002)	CBBMP (2014) (data available for taxon); ww conversion based on Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Corbicula</i> sp.	Bivalvia	Veneroida	Corbiculidae	FF	Filter feeder; fish parasites as larvae; "Collector-filterer", "Parasite", "Deposit and suspension feeders; consume plankton, algae, bacteria, and microdetritus", "Consumes fine organic detritus dislodged from the substrate and in suspension. Larvae are parasitic on fish." (based on <i>C. fluminea</i> , and <i>Corbicula</i> sp.)	2.56E-06	0.058	44.1	94%	Vieira et al. (2006); Llanso (2002); Lauritsen (1986); Sousa et al. (2008); Vohmann (2008)	CBBMP (2014) (<i>Corbicula fluminea</i> surrogate); ww conversion based on Ricciardi and Bourget (1998) (based on Bivalvia)	X
<i>Crassostrea virginica</i>	Bivalvia	Ostreoida	Ostreidae	FF	Filter-feeder	1.74E-04	0.058	3010	94%	Pales-Espinosa et al. (2008)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Bivalvia)	X
Culicidae	Insecta	Diptera	Culicidae	FF	Collector-filterer, grazer	5.94E-08	0.129	0.46	87%	Vieira et al. (2006); Thorp and Covich (2010); MDFRC (2014); Pilarczyk et al. (2007)	Whiles and Goldowitz (2005) (based on Diptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Hydropsyche bronta</i>	Insecta	Trichoptera	Hydropsychidae	FF	Collector-filterer	3.69E-07	0.129	2.86	87%	Vieira et al. (2006); Pilarczyk et al. (2007) (based on <i>Hydropsyche</i> spp.); Charbonneau and Hare (1998) (based on a trichopteran)	Whiles and Goldowitz (2005) (based on Trichoptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Hydropsyche morosa</i>	Insecta	Trichoptera	Hydropsychidae	FF	Collector-filterer	3.69E-07	0.129	2.86	87%	Vieira et al. (2006); Pilarczyk et al. (2007) (based on <i>Hydropsyche</i> spp.); Charbonneau and Hare (1998)	Whiles and Goldowitz (2005) (based on Trichoptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	(c)
<i>Leptocheirus plumulosus</i>	Crustacea	Amphipoda	Aoridae	FF	Predominately filter feeding, but will switch to deposit feeding on surficial sediment and detritus; sexually mature in 3-4 weeks; likely shallow-burrowing; may burrow fairly deep	1.67E-07	0.16	1.04	84%	Llanso (2002); Block et al. (2003); Hines and Comtois (1985); Thiel (1997) (based on <i>L. pinguis</i>)	CBBMP (2014) (<i>Leptocheirus plumulosus</i> surrogate); ww conversion based on Ricciardi and Bourget (1998) (based on Amphipoda)	X

Database of Benthic Invertebrate Taxonomy, Traits, and Estimates of Biomass/Percent Moisture

Taxonomy (a)				Ecology		Biomass/Percent Moisture				Reference		Infaunal presence/absence (b)
Lowest Practical Taxon	Phylum, Subphylum, or Class	Order or Subclass	Family or Suborder	Feeding Group	Notes on Ecology	Dry Biomass (kg dw/ind)	Wet-to-Dry Conversion Factor	Wet Biomass (mg ww/ind)	Moisture Content (%)	Ecology References (and rationale)	Biomass References (and rationale)	
<i>Leucon americanus</i>	Crustacea	Cumacea	Leuconidae	FF	Shallow infaunal filter feeder, emerging diurnally to feed in the water column	2.22E-07	0.076	2.92	92%	Kaestner (1980); Watling (1979) (based on Leuconidae)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Cumacea)	X
<i>Leucon</i> sp.	Crustacea	Cumacea	Leuconidae	FF	Shallow infaunal filter feeder, emerging diurnally to feed in the water column	2.22E-07	0.076	2.92	92%	Brusca and Brusca (2003); Watling (1979) (based on Leuconidae)	CBBMP (2014) (<i>Leucon americanus</i> surrogate); ww conversion based on Ricciardi and Bourget (1998) (based on Cumacea)	X
<i>Mulinia lateralis</i>	Bivalvia	Veneroida	Macridae	FF	Between 15 and 20 mm in length; reach maturity in 1-2 mo; can be incredibly dense in sediment; filter feeder on mostly suspended bacteria	5.85E-07	0.058	10.1	94%	Lu et al. (1996); Rhoads and Germano (1982); Llanso (2002); Cuomo and Zinn (1997); Levin et al. (2009); SMS (2008a)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Bivalvia)	X
<i>Mya arenaria</i>	Bivalvia	Myoida	Myidae	FF	May burrow as deep as ~29 cm	1.73E-06	0.058	29.9	94%	Pearson and Rosenberg (1978); Hines and Comtois (1985) Llanso (2002); Zwarts and Wanink (1989)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Bivalvia)	X
Mysidae	Crustacea	Mysida	Mysidae	FF	Omnivorous filter feeders, which eat both smaller zooplankters and phytoplankton as well as detritus	4.00E-07	0.155	2.58	85%	Kaestner (1980); Brusca and Brusca (2003); Mees et al. (1994)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Mysidacea)	X
<i>Neomysis americana</i>	Crustacea	Mysida	Mysidae	FF	Omnivorous filter feeders, which eat both smaller zooplankters and phytoplankton as well as detritus	2.09E-07	0.155	1.35	85%	Kaestner (1980); Mees et al. (1994); Brusca and Brusca (2003)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Mysidacea)	X
<i>Pisidium</i> sp.	Bivalvia	Veneroida	Pisidiidae	FF	"Deposit and suspension feeders; consume plankton, algae, bacteria, and microdetritus."; "Consumes fine organic detritus dislodged from the substrate and in suspension. Larvae are parasitic on fish."	2.71E-07	0.058	4.67	94%	Soster and McCall (1990); Pennak (1989); Germano & Associates (2005); WLU (2014); Vieira et al. (2006)	CBBMP (2014) (data available for taxon); ww conversion based on Ricciardi and Bourget (1998) (based on Bivalvia)	X
<i>Psychoda</i> sp.	Insecta	Diptera	Psychodidae	FF	Collector-filterer; very small (3-6 mm); some Psychodidae associated with sewage streams or other organic-rich sediments	5.94E-08	0.129	0.46	87%	Vieira et al. (2006); Division of Agricultural Sciences and Natural Resources (2009); Bouchard (2004) (based on Psychodidae)	Whiles and Goldowitz (2005) (based on Diptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Rheotanytarsus exiguus</i>	Insecta	Diptera	Chironomidae	FF	Collector-filterer; small larvae (up to 5 mm long); feed by constructing cases with silk nets that filter detritus from the water column (for feeding or constructing casings); cases are typically attached to hard substrates such as stones or SAV	5.00E-08	0.129	0.388	87%	Beck (1977); Pilarczyk et al. (2007) (based on <i>Rheotanytarsus</i> spp.); Cranston (2010) (based on <i>Rheotanytarsus</i> spp.); Viera et al. (2006)	CBBMP (2014) (<i>Rheotanytarsus</i> spp. surrogate); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X
<i>Simulium</i> sp.	Insecta	Diptera	Simuliidae	FF	Collector-filterer; generally found attached to rocks, logs, or other hard substrates	5.94E-08	0.129	0.46	87%	Vieira et al. (2006); Thorp and Covich (2010); Blackfly.org.uk (2009); Butler and Hogsette (2013); Pilarczyk et al. (2007); Bouchard (2004)	Whiles and Goldowitz (2005) (based on Diptera); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	(c)
<i>Smittia</i> sp.	Insecta	Diptera	Chironomidae	FF	Collector-filterer; small to medium sized relative to other larvae (not given quantitatively) (Cranston 2010); genus is almost exclusively terrestrial	9.84E-08	0.129	0.763	87%	Beck (1977); Cranston (2010); Vieira et al. (2006)	CBBMP (2014) (average of Chironomidae taxa); ww conversion from Smit et al. (1993) (abstract) (based on Chironomidae)	X

na -- not applicable
nd -- not determined
(a). Lowest practical taxon was determined by expert taxonomists; cells are left blank within subsequent taxonomy columns if an appropriate taxon could not be assigned for the lowest practical taxon identified.
(b). All taxa in this database were observed in the LPRSA (Windward 2010, 2011, 2014a, 2014b), although not all were collected in infaunal surveys. Presence in infaunal surveys is indicated with the symbol "X"
(c). Taxon was observed in kick-net samples within the LPRSA at locations that were subsequently removed from the SQT dataset due to the methodological difference. Such taxa are included here for completeness, but they were not used to parameterize the bioaccumulation model.
(d). Large epibenthic omnivore invertebrates were observed during the 2009 fish and decapod collection surveys, but were not included in the SQT dataset; these species were not included in the parameterization of the bioaccumulation model, although they may contribute significant biomass in the LPRSA due to their large size.
(e). Taxon is terrestrial and therefore not a part of the aquatic invertebrate community. It was identified by taxonomists, but was likely incorporated into sediment samples as terrestrial detritus.