

1. Effects of land use change on streams

Booth D.B., J.R. Karr, et al. 2004. Reviving Urban Streams: Land Use, Hydrology, Biology, and Human Behavior. *Originally from Journal of the American Water Resources Association. Acquired Online*

- This paper relates to the stream ecology project because it is a continuation of the work of Morley and Karr. Because they used similar methodology to their earlier paper (2002) as well as working in the same general region, their results will hopefully relate to our findings.

Kanehl P., J. Lyons, and L. Wang. 2002. Effects of watershed best management practices on habitat and fish in Wisconsin Streams. *Journal of the American Water Resources Association*. 38(3): 663-681.

- The research that was performed at the two Wisconsin Streams relates to the stream ecology project because of the habitat areas they studies. Both projects also practiced similar data collection such as observing physical habitat and counting organisms.

Liu Y.B., Y.N. Chen. 2006. Impact of population growth and land-use change on water resources and ecosystems of the arid Tarim River Basin in Western China. *International Journal of Sustainable Development and World Ecology* 13: 295-305.

- This paper relates to the stream ecology project because the researchers did a good job in describing the types of factors that are driving the changes in the environment that we might encounter later on in this project.

Neill C., L. A. Deegan, S.M. Thomas, C. C. Cherri. 2001. Deforestation for Pasture Alters Nitrogen and Phosphorus in Small Amazonian Streams. *Ecological Applications*. 11(6): 1817 – 1828

- We can relate this paper to our stream ecology project because it compares two streams, using some similar methods. It could also provide insight on what role nutrient concentration has on stream cycles.

Paul, Michael J., Judy L. Meyer. 2001. Streams in the Urban Landscape. *Annual Review of Ecology and Systematics*. 32:333-365

- This relates to the stream ecology project and will have relevance to our findings because the researchers looked at similar consequences that urbanization is having on streams such as: hydrology, geomorphology (channel width and channelization), stream temperature, chemical effects, invertebrates affected and effects on Washington streams.

Toran, Laura, David Grandstaff. 2007. Variation of Nitrogen Concentrations in Stormpipe Discharge in a Residential Watershed 1. *Journal of the American Water Resources Association* 43(3): 630 - 642

- This relates to the stream ecology project because the researchers were trying to find out if local urbanization had direct effects on the health of the watershed.

Tsegaye, T, Sheppard, D et al. 2006. Development of chemical index as a measure of in-stream water quality in response to land-use and land cover changes. *Water, Air and Pollution* (2006) 174: 161-179.

- This investigation is much like the one we will be conducting in class. It analyzes multiple stream sites by measuring nitrogen and phosphorus concentrations relative to location (ie urbanized, forested and wetland areas), and how this corresponds to the amount of runoff expected seasonally and on average according to how the land is being used.

2/3. Stream invertebrates and/or biotic indices/metrics as a tool for stream assessment

Black R.W., M.D. Munn, R.W. Plotnikoff. 2004. Using macroinvertebrates to identify biota-land cover optima at multiple scales in the Pacific Northwest, USA. *Journal of North American Benthological Society* 23:340-361.

- This relates to our project because they gathered some of the same information we will gather to assess stream health, such as: % forest cover, flow rate/velocity and number and variety of macroinvertebrates. They also took measurements at Padden Creek so it could help us when analyzing data.

Busse L.B., J.C. Simpson, S.D. Cooper. 2006. Relationships among nutrients, algae, and land use in urbanized southern California streams. *Canadian Journal of Fisheries and Aquatic Sciences* 63, 12: 2621

- The article assesses urbanization and its effect on water quality and subsequently the effects on biotic factors, specifically, algal populations. Although the study takes place in California, its framework parallels the Bio 326 study. This paper used algae as a biotic indicator of stream health in relation to urbanization whereas we will be using macroinvertebrates.

Hall M.J., G.P. Closs, R.H. Riley. 2001. Relationships between land use and stream invertebrate community structure in a South Island, New Zealand, coastal stream catchment. *New Zealand Journal of Marine and Freshwater Research* 35: 591-603.

- Although this study was not conducted in the Puget Sound area, it relates to our stream ecology project because the researchers used macroinvertebrate samples, and Quantitative Macroinvertebrate Community Index (QMCI) scores to investigate the effects of urbanization on stream health. This is similar to the procedure we will be following. Additionally, the results section of this paper contains data on some of the same taxa we will be looking at, which is important background information to have.

Kiffney P.M., P. Roni. 2007. Relationships between productivity, physical habitat, and aquatic invertebrate and vertebrate populations of forest streams: An information-theoretic approach. *Transactions of the American Fisheries Society*. 136: 1088-1103.

- This relates to the stream ecology project because the researchers used similar methodology. The researchers conducted surveys and measured slope, water depth and width, substrate composition and current velocity to see the affects of the physical habitat on stream invertebrates and vertebrates. The climatic conditions of Oregon are similar to our study sites and so their results may support our findings.

Walker, Christopher E., Pan Yangdong. 2006. Using diatom assemblages to assess urban stream conditions. *Hydrobiologia* 561: 179-189.

This relates to the stream ecology project because the researchers used a similar bioassessment tool (biotic metrics) to evaluate stream conditions, use study sites across an urban to rural gradient (similar to Padden Creek and Chuckanut Creek), and these study sites occur in the Pacific Northwest; therefore, these similarities suggest that their results may have relevance to our project's findings.

Wolff, R.H. 2005, Feasibility of using benthic invertebrates as indicators of stream quality in Hawaii. U.S. Geological Survey Scientific Investigations Report 2005-5079, 78 p.

- This relates to our study in that it is exactly what we are trying to do. Although the ecosystem in which we are completing our study is different, tropical forest vs. temperate forest, the idea and the methods will be very similar.

4. Padden Creek or other local stream studies, as well as chemical and physical parameters of water quality

Cushman, S. F., K. M. Kline, R. P. Morgan. 2007. Relationships among nutrients, chloride and biological indices in urban Maryland streams. *Urban Ecosyst* 10: 153-166

- This paper relates in many ways to the stream ecology project. It deals with the effects of urbanization on the biological health of streams just as our project does. It focuses on conductivity and nutrient levels, along with diversity of invertebrates and fish, which could help direct our own research.

Hachmoller B., R.A. Matthews, and D.F. Brakke.1991. Effects of riparian community structure, sediment size, and water quality on the macroinvertebrate communities in a small, suburban stream. *Northwest Science* 65:125-132.

- This relates to the stream ecology project because the research was done on one of the same creeks that we will be studying and looked at similar aspects of stream quality (riparian growth, sediment size, and macroinvertebrate numbers) that we will be looking at.

- This relates very well to what we'll be doing because it is an article about macroinvertebrate populations in one of the creeks that we could be looking at, and it did it look at some of the same variables that we will be looking at.

Haggerty S.M., D.P. Batzer, and C.R. Jackson. 2002. Macroinvertebrate assemblages in perennial headwater streams of the Coastal Mountain range of Washington, U.S.A. *Hydrobiologia* 479: 143-154.

- This relates to the stream ecology project because they researched species in streams similar to the ones we will be studying, and since they are in the same general region, the patterns they found may be relevant to our findings.

Hall L.W., W.D. Killen. 2005. Temporal and spatial assessment of water quality, physical habitat, and benthic communities in an impaired agricultural stream in California's San Joaquin Valley. *Journal of Environmental Science and Health, Part A* 40:959-989.

- This article holds relevance to our stream ecology project in that it illustrates how the identification and collection of benthic organisms can indicate whether a stream is under stress and specifically what water qualities are creating the disturbance; the researchers also used similar methodologies to what we will be performing.

Vandersypen, J., M. LeMoine, R. Matthews. 2002. Padden creek monitoring project final report. Institute for Watershed Studies, Huxley College of Environmental Studies, Western Washington University.
<http://www.watershedpledge.org/docs/PaddenMacros2000.pdf>

- Water quality and macroinvertebrate samples were taken at six different sites along Padden Creek as part of the *Waste integration Pollution Prevention-Whatcom Watersheds Project*. In this class we will be comparing Padden Creek, which is greatly affected by urbanization, to Chuckanut Creek, which is a more natural water flow. This study looks at water quality variables over time that we have already discussed in class. It looks at the differences between the beginning of the creek near the lake compared to the areas of Connelly Creek and Fairhaven park. The assessment of macroinvertebrates looks at taxonomic richness and uses the EPT index to relate the species found to pollution levels of the water.

5. Linking stream water quality to biodiversity, salmon habitat, or other ecosystem services (benefits people derive from natural ecosystems)

Gibbins C. N., H. M. Jackson, C. Soulsby. 2007. Role of discharge and temperature variation in determining invertebrate community structure in a regulated river. *River Research and Applications*. 23:651-669.

- This study relates to the stream ecology project because the study is testing two of the possible variables that could be used in the stream ecology project, temperature and water discharge. Also, the study is focusing on the effects to the invertebrate community of the rivers, again as in the stream ecology project.

Groves, P.A., J.A. Chandler. 2005. Habitat quality of historic Snake River fall Chinook salmon spawning locations and implications for incubation survival. Part 2: Intra-gravel water quality. *River Research and Applications* 21:469-483

- This paper relates to our stream ecology project because we are also determining water quality, including dissolved O₂ levels, and relating that to the abundance of the animals studied. Also, both salmon embryos and macroinvertebrates are at very vulnerable stages in their lives and remain in one area of the water, thus they serve as good indicators of stream health.

Hancock P.J. 2002. Human impacts on stream-groundwater exchange zones. *Environmental Management* 29:763-781.

- This study relates to the ecology project because it discusses the impact of urbanization and river regulation, two factors the stream ecology project considers, and the effect on invertebrates living in the stream.

Lewis B.R., Juttner I., Reynolds B., Omerod S.J. Comparative assessment of stream acidity using diatoms and macroinvertebrates: implications for river management and conservation. *Aquatic Conservation-Marine and Freshwater Ecosystems* 17 (5): 502-519 JUL-AUG 2007.

- ◆ This relates to our topic because the biodiversity of macroinvertebrates and phytobenthic organisms are indicative of the quality of the water stream.

S.F. McKay, A.J. King. 2006. Potential Ecological Effects of Water Extraction in Small, Unregulated Streams. *River Res. Applic.* 22: 1023-1037.

- ◆ This relates to our stream ecology project because Padden Creek is regulated by an artificial dam on Lake Padden that, in similar ways to water extraction, regulates and decreases the flow of the creek.

Ndiritu G.G., Gichuki N.N., Triest L. 2004. Distribution of epilithic diatoms in response to environmental conditions in an urban tropical stream, Central Kenya. *BIODIVERSITY AND CONSERVATION* 15 (10): 3267-3293

- ◆ This relates to our stream ecology project in that it deals with linking biodiversity and stream quality based upon a measurable water quality factor such as NO₃ levels.

Karen G. Wayland, David T. Long, David W. Hyndman, Bryan C. Pijanowski, Sarah M. Woodhams, and Sheridan K. Haack. 2003. Identifying relationships between Baseflow Geochemistry and land use with synoptic sampling and r-mode factor analysis. *Journal of Environmental Quality* 32:180-190.

- ◆ This paper is a good help to our project because it gives us examples on what we should look for as far as chemicals and organisms in the water sites we are studying. And it also shows the effect of urbanization on the water streams.