Project Title: Residential Impacts To Water Quality & Aquatic Habitat

Research Importance & Context

The media, design professionals and government agencies consider the Pacific Northwest (PNW) a region leading others in environmental awareness, advocacy and achievements. This research confirms that trend as it was conducted in Seattle and was a part of the first large scale, multidisciplinary study of suburban impacts on water quality and aquatic habitat. The study investigated landscapes familiar to landscape architects (suburban residential), identified the needs (documented existing impacts) to provide better ecological design in these landscapes and addressed the challenges (human behavior) faced by the profession if it is to provide better water quality designs in ordinary backyard situations. The findings of this research apply specifically to the study landscapes, but they may be considered representative of conditions landscape architects would find in similar settings.

This submission was the sole responsibility of a landscape architect on an interdisciplinary team funded ($670K) for 3 years by the U. S. Environmental Protection Agency. The other disciplines on the team conducted separate research agendas included geomorphology, aquatic biology and hydrology. The research team met frequently to coordinate strategy and incorporate ongoing results, but this submission represents only the work of the landscape architectural group. While team components worked on separate research agendas, all were within an umbrella research question regarding declining habitat that still continues in 2004: ***Meta-Question: Why does, "despite the massive efforts and expenditures, salmon habitat in the suburban Seattle area continue to decline significantly?"*** May (1996).

The Problem

Watershed planners and units of government have assumed that regulations can be effective and education would modify public attitudes so that successful water management could be implemented. This has not happened. Resource management at the watershed scale continues to be contentious and in western Washington has been largely ineffective in improving water quality/quantity and protecting aquatic habitat.

For two decades, King County (Seattle) has recognized the limitations of the watershed scale plans it had formulated and partially implemented. County, city, media and environmental groups have taken a multitude of varied actions to educate all citizens about salmon habitat needs and to protect smaller local, streams as critically important salmon habitat. Examples of these efforts include:

1. Extensive storm water management and stream buffer regulations were instituted to help ensure that new development does no or minimal damage to streams.
2. The county and city spend millions of dollars annually on staffs (biologists, engineers and landscape architects) to administer rehabilitation projects, provide technical assistance, provide regulatory oversight and monitor landscape changes.

Salmon is the beloved icon for the PNW quality of life. It is safe to say that most citizens and school children know about the biology/life cycles of salmon. **Nevertheless, salmon habitat in suburbia continues to decline. Why?**

Research Focus & Questions

Salmon spawning streams are located in one physiographic region lying between the mountains and the marine environment, the Puget Sound Lowlands. Salmon streams in this zone flow predominantly through Seattle's suburbs, mostly in the backyards of single-family residential property. Thus individuals can directly impact the riparian zone. In the past, suburban impacts to water quality have been considered mainly a result of total impervious area (TIA). Municipalities measured residential TIA and in many cases use these figures as a basis for storm water assessment fees. The assumption of this exploratory study is that the *cumulative* impact of individual residents in their backyard may be as important as TIA.

Hypothesis: ***Human actions create stressors at different spatial and temporal levels that affect stream biology in different ways.***

Research question: ***What are the range of and reasons behind individual design decisions and human behaviors in residential backyards that effect water quality and aquatic habitat?***

Research Goals & Methods

Phase 1 Identify behavior categories. From 18 face-to-face interviews and 20 mailings (32% response rate) professionals with day-to-day involvement in the study area streams answered the question--**"From your personal knowledge, what types of individual behavior takes place in the riparian corridor?"**

Phase 2 Identify reasons given by residents making for landscape changes. Eighteen residents, nine in each of two areas that contrast in demographics and urban density, were asked in their home setting to cognitively map (Golledge and Stimson 1997) the landscape design changes they would make to their backyards **"if time and money were not constraints."** The mapping occurred interactively with the interviewer using a base mylar map of their property with the house foot print and the creek shown. Mylar peel-offs of landscape elements were used as props so the residents could make choices and changes with no drawing skills. No mention was made of the stream, salmon water quality or habitat by the interviewers who identified themselves as students studying design.

Phase 3 Compare three potential reasons for making backyard landscape changes. Two reasons, *privacy/control/territory* (e.g. Chermayeff and Alexander 1963) and *signature gardening* (e.g. Stahl 2000) emerged from the design literature review and the results of Phase 2. A third reason, *ecological care,* was added to test if PNW individuals made habitat-enhancing choices in their backyards. Researchers designed a 12 question survey to ask residents to rate "without regard to time and money," the importance of these reasons along a 5-point scale from "very important" to "never a consideration." Additionally the survey asked them to list the three "most important considerations in the landscaping or gardening." The survey was mailed to 520 streamside homes in three basins. Home values and urban density varied among the three. All have active salmon runs and are extremely valuable habitat. Ninety-six (18%) completed surveys were returned. No follow-up measures were taken to increase the response level. Data were compiled using an analysis of means.

Phase 4 Compare respondents ranking of reasons with actual backyards conditions. Phase 4 research questions were: Do the actions and/or behaviors of a resident align with their design reasons? What do these backyards look like in reality? Researchers photographed 40 backyards of those responding to the survey. Additionally, ten other backyards where the conditions differed dramatically from those responding to the survey were recorded. These backyards were visible and were mentioned by survey respondents. Photo surveys and field data were content analyzed (Neuendorf, 2001) to find common themes and situations.

Phase 5 Value identification. Given the range of behaviors found in Phases 1-4, researchers sought to better understand the underlying values residents hold for the stream by exploring two questions: 1) Does living along a creek make a difference in an individual's concept of it? 2) Do the concepts of members of a stream advocacy group differ from nonmembers?

Using the Conceptual-Content Cognitive Map Technique developed by Kearney & Kaplan (1997), researchers interviewed individuals living in the basin where Seattle's most active stream advocacy group works. Ten individuals in each of three categories were interviewed: 1) living on creek, active advocate; 2) living on creek, not an advocate; and 3) not living on the creek but an active advocate.

Research Results

Phase 1 Identify behavior categories. Experts reported that degrading individual behaviors predominate. Of 46 behaviors listed by experts, 85% were negative and 15% were positive. One expert with lengthy experience said, *"people think first of their personal, financial or aesthetic concerns and what the stream needs secondarily. Even ardent conservationists mostly fall into this group."*

Phase 2 Identify reasons given by residents for making landscape changes. Respondents gave two main reasons for changing backyard landscapes--control or privacy and the creation of a personalized or signature garden.

Phase 3 Compare three potential reasons for backyard landscape changes The analysis of means of a mailed survey results showed *ecological care* rated higher than *privacy* or *signature garden design*. This was true for each stream corridor studied and all the responses taken together. However, the differences between the mean values for the three categories were not statistically significant. In the response to the question--**what are the three "most important considerations in the landscaping or gardening,"** less than 10% indicated that any ecological considerations were important. The overwhelming response (75%) to this question was "low maintenance."

Phase 4 Compare respondent's ranking of reasons for change with actual backyards conditions Backyards where "ecological care" rated as the most preferred motive for landscape change did show some ecological care behaviors such as composting, but no stream-side or aquatic habitat enhancements were found on any site. The most prominent "ecological care" decision was benign, mere compliance with corridor buffer regulations in the newer subdivisions. Interestingly, in older subdivisions where buffers had previously been cleared, no resident had replanted trees or even shrubs to create a buffer. No obvious correlation could be seen between the high ranking of the other two landscape design reasons (security and signature gardens) and the backyard of those who did the ranking. The content analysis disclosed several categories of changes in backyards that made measurable degrading impacts to aquatic habitat. These categories were: 1) *ecopathy* (intentional destruction of stream edges); 2) *oblivious gardening* (gardens, often elaborate, that either encroached upon the stream edge or surreptitiously diverted stream water or adjacent ground water and 3) *salmon watching* (gardens that feature watching salmon spawning while at the same time destroying their habitat). A final category, 4) *nature communing*, had no negative habitat impacts.

Phase 5 Value identification. People who lived on the stream but were not advocates cited only property issues and erosion (problems) as underlying their concept of the creek; advocates who did not live on the stream listed education and wildlife habitat as the most important creek concepts and advocates who lived on the creek listed personal connections, aesthetics, flow of the water, and/or their connection to the community.

Conclusions

In summary these study area results suggest:

1) No evidence was found in any phase to contradict the experts' observation that actions of individuals in the private spaces of their backyard were mostly negative.

2) There was no evidence in any phase that residents had knowledge of ecological design alternatives for protecting or improving stream habitat. Information exists for creating backyard wildlife habitats, but little specific guidance exists for managing stream edges and aquatic habitat.

3) General PNW public knowledge of salmon habitat needs has not resulted in proactive changes to improve habitats in backyard settings. "Environmental"gardening techniques (composting), do not worsen water quality, they alone do not improve it. The opinion of one expert in Phase 1 that *"people think first of their personal, financial or aesthetic concerns"* seemed to hold true. Landscape architects could develop informational materials demonstrating how proactive aquatic habitat enhancement is personally rewarding, financially feasible and aesthetically beautiful.

4) Regulations, stream stewards and massive education have not prevented ecopathy toward salmon streams in a metropolitan area lauded for its environmental sensibility. Eliminating ecopathy could be a community goal much like a neighborhood watch on crime. In the future, more efforts could be made to change the behavior of individuals toward protecting habitats rather than mass education for the public.

5) The backyard category, *nature communing,* was a positive result and clear signal that individuals do want to "connect" with these streams. This hold much promise as focus for educational and motivational materials.

Discussion and Implications for Landscape Architects

Experts cited predominately negative behaviors regarding individual stream stewardship. This and the results of Phases 2-4 should clue landscape architects working on stream rehab projects that they should pay much more attention to individuals rather than primarily working with local government and organized stream advocacy groups.

One example of how that additional attention might occur is through the site analyses process. For example, detailed site analyses for stream rehab projects could look beyond the stream bank into the back yards of residences, including documenting residents' aspirations for their backyards. This documentation might sort several 'categories' of aspirations, including: potential ecopaths; devotees to conservation; and residents who simply don't understand the consequences of their actions. Landscape architects working stream-related projects should keep in mind that the best rehab design is not necessarily one that works in "my" backyard.

The experts used as advisors believed more corridor protection could occur by encouraging individual stewardship. These beliefs have great potential because society cannot hope to sustain the aquatic habitat in the PNW (or any place) unless citizens beyond the already committed individuals are reached. The fact that many individual contemplative places (simple benches along the stream) were found in Phase 4 in all residential settings coupled with the values expressed by those who live along the creek in Phase 5 leads this researcher to believe that landscape architects could do more to help people experience a "defining" moment within nearby landscape. In other words, landscape architectural design has a spiritual, emotional aspect that the profession acknowledges, but individual practitioners rarely discuss or attempt to create these aspects in a design focusing on ecological restoration. Merely inviting people to participate in rehab projects may bring more people to the table, but it will not necessarily change their values. If as Hester (1984) has written, design can change social conditions, and if it can spiritually connect an individual to the landscape, as good designs always have, then ordinary stream rehab designs can also change human behavior and values toward nearby, ordinary nature.

Some people in this study saw themselves "making a difference" as good stewards even as they continued to destroy habitat. Elaborate, signature garden designs featured dug ponds that either usurped the high ground water normally available to supply the stream or surreptitiously piped stream water directly into the ponds. They did not see the contradictions in how their land management actions virtually destroyed the habitat of their beloved salmon. Landscape architects have a role in educating the "individual" about their management and maintenance activities.

Field work did not document any backyard stream enhancement designs. For example, installing a buffer where none existed was not observed. The results of the first cognitive mapping interviews emphatically show that when asked about *"landscaping your backyard without regard for time and money,"* people never considered ecological designs. They think first and foremost about decorative changes and overwhelmingly (75%) desired landscapes with "low maintenance." We saw no evidence of available guidance on how an individual can achieve backyard design that accounted for their aesthetic and maintenance desires and additionally provided the ecological imperatives to improve water quality and aquatic habitat. Landscape architects are the professionals who could successfully integrate and synthesize the ecological, the aesthetic and the functional into one's individual design choices.

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