THE ECOLOGICAL BASIS AND EFFICACY OF LOW IMPACT URBAN DESIGN, DEVELOPMENT AND RESTORATION

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What is Low Impact Urban Design and Development (LIUDD)?

LIUDD (sometimes also referred to as Water Sensitive Urban Design and Development) aims to minimise the impacts of development upon ecological processes. It therefore aims to create hydrological neutrality, reduce and contain contaminants at source,and to optimise vegetation and terrestrial habitat retention. In order to achieve hydrological neutrality there needs to be negligible change in hydrological regime and discharge of water from the catchment as a result of development. As changes in stormwater discharges are the primary causes of contaminant transfer, sedimentation and loss of habitat in receiving waters achievement of hydrological neutrality arrests the multiplicity of factors causing ecological degradation from conventional urban development. The emphasis in LIUDD is therefore on control of stormwater at source, that is, where the rain falls within the catchment. Techniques involve infiltration and evapotranspiration, the emphasis being placed on whichever is most appropriate according to soil type and climate. The rain garden pictured below addeesses both techniques. Because of the emphasis on stormwater LIUDD is best planned and implemented in an 'Integrated catchment management' context.

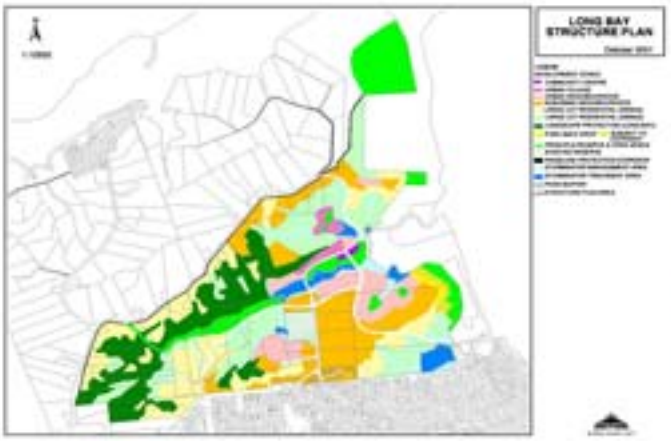
PhD Objectives

It is my objective to demonstrate using New Zealand case studies, the ecological benefits to accrue from designing and developing our cities using LIUDD principles and technologies. Following a long career experience in managing the ecological impacts of development I see this as a major opportunity to provide conviction to developers, councils, politicians and the community that there are major tangible benefits to be gained from this approach.

Scenarios that might be monitored for Ecological gains of LIUDD

Greenfield Paired catchment study

Stream ecosystem health may be monitored (using an index of biotic integrity or a macroinvertebrate community index) downstream of a catchment developed using LIUD principles. In order to determine ecological benefits comparable monitoring
would be necessary in an adjacent stream within a biophysically comparable catchment developed in the conventional urban style.To illustrate the type of catchment development intended for monitoring I have inserted below North Shore City Council's proposed structure plan for such a LIUDD catchment at Long Bay.



LIUD Brownfield Street Restoration

Within brownfield catchments (existing urban areas) LIUD technologies and methods can be gradually used to replace existing developments and infrastructure when individual lots, drainage networks and streets are scheduled for upgrading. Over a generation therefore whole city blocks can gradually be converted to conform with LIUD principles. It is anticipated that such gradual conversion will be accompanied by an equally gradual improvement in the integrity and health of ecological processes brought about by a decline in toxic contamination, sedimentation and disturbances to the natural hydrological regime. Streets in such places as Seattle, USA, (shown below) are being rebuilt with reduced impervious surfaces (narrow streets), rain gardens (replacing stormwater pipes) and increased plantings which together improve hydrological neutrality, contaminant capture and improved terrestrial biodiversity. It is my hope to engage with a NZ District Council in adopting similar reconstructions that I can monitor for efficacy in improving receiving water ecosystems.

Sea Streets Project
Seattle City
Washington
Left: Rain-garden
Below: Reconstructed narrow meandering street in Brownfield site with rain-gardens and interspersed parking.

A comparison of terrestrial and wetland ecosystem coverage and quality in conventional versus LIUD catchments.

LIUDD is dependent upon the retention or creation of increased open space (relative to conventional subdivisional allocation) which is then planted, if possible, in (preferably) indigenous vegetation. These plantings are particularly important along the riparian margins of waterways (see below) and on unstable steep land. Similarly LIUDD encourages the retention or creation of wetlands. It may therefore be possible to assess the typical terrestrial and wetland biodiversity gains to be made in the typical LIUDD catchment versus conventional subdivision. These gains may be measurable in terms of habitat coverage, connectivity and quality.

Te Whanau Drive, Greenhithe