APPENDIX A CONT'D

DRAFT RESEARCH NEEDS

In this draft, two major areas of peatland research have been identified for the western Washington area. They include a synoptic overview of peatlands, as well as water chemistry investigations. Other areas are certainly of importance, and will be examined further in the second Phase of the Community Profile.

1. Proposal for Inventory and status of peat systems in western Washington

Background and objectives

The last inventory of peat systems in the state of Washington was completed in 1958 (Rigg, 1958). Rigg's work was thorough with respect to size, location and general characteristics of peat systems, but did not emphasize human impacts which may have occurred. In the intervening 40 plus years, the landscape in general and the peat systems specifically, have been greatly altered by numerous human endeavors. Principal among these are extraction of forest resources, residential, commercial and industrial development, road construction and peat mining. In some cases human activities have completely eliminated the peat system (e.g. by peat mining or filling). In other cases hydrologic modification and/or introduction of nutrients has caused significant change in the fundamental characteristics of peat systems.

In the years since the work of Rigg, the unique biological and ecological features of peat systems have become highly valued and widely recognized. Combine this uniqueness with the difficulty (probably impossibility) of restoring such systems in other than a geologic time frame, and a need for protection of peat systems becomes apparent. Some additional protection has occurred in recent time through various land use laws, sensitive area ordinances, growth management and wetland regulation. However, peat systems are still being subjected to both direct loss and degradation by development activities including mining and filling.

An obvious first step to responsible stewardship of peat resources is to documeent both the changes which have occurred since previous inventories and the current status of peat resources. This research has been initiated for King County by Bell (2000). This type of research needs to be expanded to include information on the biological, ecological and hydrological status of peat systems. Objectives of the research are to:

- document the type, extent and rate of human impacts to our peat systems
- document the ecological, biological, chemical and hydrological diversity of our peat systems
- document how peat systems of western Washington compare to peat systems across North America and how/if they fir wihtin currently used systems classification.

Research approach

Carefully review the results of Rigg (1958) and Kunze(1994). Based on this review, select about 50 peat systems representing a breadth of geographic, hydrologic, vegetation and landscape location types. The sample set should include sites from urban, urbanizing, suburban and rural areas. For each peat system, gather the following information using aerial photos and site visits:

- Determine the general condition of the system. i.e. is it intact, logged, filled, drained, hydrologically altered, etc.

- Determine if the system has a defined inflow and/or outflow and whether it is seasonal or perennial.
- For each system, identify the basic vegetation cover types (herbaceous, scrub/shrub, forested, etc.).
- For each cover type, identify the dominant plant species (including Sphagnum species).
- Determine the area of each cover type.
- Measure the basic chemical properties in each cover type, including pH, temperature, D.O,, conductivity, calcium and nutrients.

Data from the above studies will provide a basis for assessing current status and ongoing impacts to western Washington peat systems. It will also provide a basis for placing our peat systems in a standard classification system, or if necessary, point the need to developan independent approach to classification. These two types of information will help to provide a sound basis for proper stewardship of our peat resources.

Chemical/hydrological processes

Sphagnum and other vegetation features

Ecological processes

Wildlife (e.g. rare species inventories)

2. Proposal for investigating chemical processes

It is striking, in a region with good water quality data on wetlands, lakes, streams and marine waters, that little water chemistry information exists for *Sphagnum*-dominated peatlands. For the few data that do exist, sample sizes very small, making it difficult to determine what the normal range of natural variability might be, and impossible to discern trends. There has been no consistent criteria in selecting sample locations for the studies that were done, and the parameters monitored vary considerably from one peatland to another, making meaningful comparisons difficult. A consistent high-quality data set of chemical, physical and floristic parameters is needed to understand the basic functioning of acid peatlands and compare them to other aquatic systems.

1. Standarize sampling methodology for *Sphagnum*-mat pool waters.
   - Pool water sample collection methods should be standardized. Piezometers do not seem to have been used in most literature studies, and the extensive bailing required to purge piezometers could very well draw water from the lower catotelm into the acrotelm, making data interpretation confusing and misleading.
   - Protocols for field or laboratory filtering of samples should be developed.

   - Establish standard chemical and physical parameters for monitoring *Sphagnum*-dominated peatland complexes or waters than may enter *Sphagnum*-dominated peatlands.

2. Determine the typical water chemistry of healthy *Sphagnum*-dominated peatlands.
   - Mat pool water, mat pool water and moat water should all be investigated, as they are likely to have different chemistry characteristics.
   - Criteria for sample location in relation to any inflow streams or groundwater seepages should be developed.
   - Water level fluctuation should be noted for the same time period water chemistry samples are collected.
   - Sample size should be large enough so that variance in the dataset is small. If funds are limited, consider limiting variability by taking samples over a shorter time period. Data interpretation should consider seasonal variability.
   - Vegetation data, particularly regarding the presence and physical characteristics of *Sphagnum*, should be gathered at the same locations and time that water samples are drawn so that the relationship between water chemistry and vegetation can be investigated. *Sphagnum* species identification should be made and verified by experts.

3. Determine how *Sphagnum* growth is affected by changes in water chemistry and hydroperiod. One of the most pressing needs in conserving *Sphagnum*-dominated peatlands is knowledge of how the *Sphagnum* moss of the peatland will respond to changes in chemistry and hydroperiod due to development in the watershed. Both these attributes are know to change dramatically with urbanization (US EPA, Nationwide Urban Runoff Program, Summary report, 1984 and King County Surface Water Design Manual, 1998, Chapter 3, hydrological analysis). If the response of *Sphagnum* is not investigated prior to watershed disturbance, irreversible changes may occur and unique plant communities may be lost.
   - In addition to other studies, determine the buffering capacity of acid waters to absorb changes in pH due to the addition of ion-rich waters such as stormwater runoff or groundwater. .
   - Different species of *Sphagnum* respond differently to chemical and water level changes (McQueen, 1990). Studies should be designed so that a range of *Sphagnum* species are examined. .
   - Species identification or verification by an expert bryologist is required, since the taxonomy of *Sphagnum* is difficult, and substantial variability in morphological traits occurs.

4. Determine the depth of the acrotelm and water level fluctuations for healthy *Sphagnum*-dominated peatlands and attempt to determine a causal relationship between the depth of the acrotelm with environmental variables.
   - Peat decomposition yields an enriched supply of nutrients to downstream waters, often to the detriment of downstream lakes. Determining what stable acrotelm conditions are and what conditions cause acceleration in normal decomposition rates is both an important factor in managing peatlands and in managing lakes and marine embayments.
   - Standardize a method to measure chemical parameters at depth in the peat mat. Standard field D.O. meters may not be designed to measure values near zero, so specialized equipment may be needed.