APPENDIX A

NMP Equipment Box Content List

1 compass
1 clipboard
m^2 vegetation plotters
slide sleeves
1 trout net
1 50-m tape
computer disks

APPENDIX B

Sample Map and Description Form

APPENDIX C

Sample Data Forms

APPENDIX D

Formulas and Statistical Testing Procedures

All formulas and statistical tests, with the exception of the percent similarities which were calculated by hand, were computed using SAS software.

Formulas

1. Shannon Index of Diversity

Diversity indices can be calculated for each plot within a site using the Shannon Index of Diversity according to the following formula:

$$H' = -\sum p_i \ln p_i$$

where "p_i" is the proportion of all animals tallied as species " i ". This index takes into account the number of species and abundances of each species (Ludwig and Reynolds 1988).

2. Jaccard Similarity Index (qualitative)

This similarity index is a qualitative index that considers only presence/absence data and is calculated by the formula:

$$\text{Percent Similarity} = c/(a+b+c) * 100$$

where "c" is the number of species in common between sites A and B (restored and reference wetlands), "a" is the number of unique species at site A and "b" is the number of unique species at B.

3. Sorensen's Coefficient of Community (quantitative)

This similarity index is quantitative and considers both species richness and abundances and is calculated by the formula:

$$\text{Percent Similarity} = 2c/(a+b)$$

where "c" is the minimum number of individuals per species in common between sites A and B, "a" is the total number of all individuals for all species observed at site A, and "b" is the total number of all individuals for all species observed at site B.

4. Wetland Dependency Ranking for Bird Species (Brooks and Croonquist 1990)

Wetland ranking provides additional insight into the functional characteristics of a wetland community and how communities change in response to restoration. Bird species are ranked by their degree of dependency on wetland habitat according to the following categories:

5 = obligate species (>99% in wetlands)
4 = facultative wet (57-99% in/near wetlands)
3 = facultative (34-66% frequent wetlands, not essential)
2 = facultative dry (1-33% occasionally in wetlands)
1 = upland species (> 99% in uplands)

5. Relative Abundance/Cover

Relative abundances for birds and amphibians and relative cover for plants can be calculated per plot using the following formulas:

5a. **WILDLIFE:** $$\frac{\textbf{\# of individuals of species A}}{\textbf{$\sum$ \# of individuals for all species}}$$

5b. **PLANTS:** $$\frac{\textbf{\% cover of species A}}{\textbf{$\sum$ \% cover for all species}}$$

6. Weighted Average Wetland Index (WI) (Brown 1995)

A WI for each plot is calculated by the following formula:

$$\mathbf{WI = \frac{\sum (IV_i * WIS)}{100}}$$

where IV = importance value of species "i" in that sample, and WIS = the wetland indicator status of that species (Reed 1988). Importance values are calculated by dividing the cover of each species in each plot by the total cover of all plants in that plot and multiplying by 100 (formula 5b). The calculated value is the Wetland Index (WI) for that plot, lower numbers indicate greater importance of wetland plant species.

Statistical Tests

There are many choices for testing for differences among means of sample populations. Which tests are used is often up to the individual and/or nature of the data being examined. For a detailed discussion on statistical choices, consult general statistics guides and the references provided in this document. There are also a variety of methods for computing statistics once a test, or tests, have been chosen. Again, this is up to the individual to select. Following are brief descriptions of two statistical tests that were calculated using SAS software for 1995 and 1996 data collected at restored and reference wetlands.

1. Fisher's Protected Least Significant Difference (FPLSD) (Steel and Torrie 1980)

The FPLSD is a method of comparing means among treatments only if the overall F-test is significant (this requires prior calculation of the F statistic). The FPLSD is valid for planned comparisons and is more efficient relative to using multiple t-tests since the LSD need only be computed once for comparisons of all treatment means. In 1996, the four treatments were: (1) Restored 1995; (2) Restored 1996; (3) Reference 1995; and (4) Reference 1996. The protection against making excessive Type I errors is in part accomplished by only comparing treatment means when the F-test is significant. Refer to Peterson (1985), Steel and Torrie (1980) and other statistical references, and/or a statistical software package to perform the FPLSD and associated F-test.

2. Mann-Whitney U Test (Steel and Torrie 1980)

The U Test is a non-parametric test for comparing means by ranks. Non-parametric tests are used when data is not normally distributed, often a result of small sample sizes, frequent zero values and high variances. The test is actually a version of the Wilcoxin Signed Rank Test, extended to deal with unequal sample sizes. Refer to Steel and Torrie (1980), other statistical references, and/or a statistical software package to perform the Mann-Whitney U Test.