Ecological Classification of Wetland Plant Associations in the Lahontan Valley, Nevada

Final Report
June 3, 1996

Prepared by:

Robert M. Bundy
The Nature Conservancy
Northern Nevada Project Office
443 Marsh Ave.
Reno, NV 89509

Jeffrey V. Baumgartner
Marion S. Reid
Patrick S. Bourgeron
Hope C. Humphries
The Nature Conservancy
Western Regional Office
2060 Broadway, Suite 230
Boulder, CO 80302

and

Barbara Lyn Donohue
The Nature Conservancy
Northern Nevada Project Office
443 Marsh Ave.
Reno, NV 89509

Submitted to:

Team Leader, Water Rights Acquisition Planning
Manager, Stillwater National Wildlife Refuge
U.S. Fish and Wildlife Service
P.O. Box 1236
Fallon, NV 89407-1236

and

Christine Wisnewski
Ecosystem Research Program
The Nature Conservancy
1815 N. Lynn St.
Arlington, VA 22209

CONTENTS

PREFACE iii

INTRODUCTION 1

DESCRIPTION OF THE STUDY AREA 1
Biophysical Characteristics in the Lahontan Valley 2

METHODS 3
General Study Approach 3
Sampling Design 3
Biophysical Environments in the Lahontan Valley 3
Allocation of Sampling Sites to Biophysical Environments 5
Sample Site Location 5
Data Collection: Vegetation and Environmental Variables 6
Sample Plots 6
Sample Points 8
Laboratory Analysis 8
Analytical Methods 8

RESULTS 10
Bioenvironment Distribution 10
Sampling Site Distribution 10
Application of Sampling Design 11
Vegetation 12
Historically Described Plant Associations 14
Vegetation-Environment Relationships 14
Species and Association Modeling 15
Species Modeling 15
Association Modeling 16
Representativeness among Lahontan Valley Management Areas . . . 16
Distribution of Plant Associations 16
Plant Association Distribution by Management Area 17

DISCUSSION 20
Plant Association Distribution 20
Environmental Gradients 20
Representativeness Assessment 21
Management Recommendations 23
Habitat Condition Improvement 23
Management Area Recommendations 26
Summary and Future Research Recommendations 29

ACKNOWLEDGEMENTS 30

REFERENCES CITED 31

TABLES

1: Biophysical Environments in the Lahontan Valley 37
2: Distribution of Grid Points among Bioenvironments 38
3: Information Collected for Different Sampling Formats 39
4: Allocation of Sample Sites based on Wetland Types and Soil Series . . 41
5: Currently Present and Historically Documented Plant Associations . . 42
6: Distribution of Plant Associations by Electrical Conductivity 44
7: Distribution of Plant Associations by Standing Water Depth 46
8: Distribution of Plant Associations by Management Area 48
9: Distribution of Plant Associations at Stillwater National Wildlife Refuge 49
10: Distribution of Plant Associations at Stillwater Wildlife Management Area 50
11: Distribution of Plant Associations at Carson Lake and Pasture 51
12: Distribution of Plant Associations Outside Management Units 52
13: Surface Soil Texture, Soil pH, Soil Electrical Conductivity and Sodium Absorption Ratio Ranges for Soil Series 53

FIGURES

1: Wetland Types and Managed Areas within the Lahontan Valley
2: (a, b, and c) Soil Series and Managed Areas within the Lahontan Valley
3: Gradsects A, B and C used in the Lahontan Valley Sampling Design, and Managed Areas
4: Sites Sampled During 1993 and 1995 Field Seasons in the Lahontan Valley

APPENDICES

A: Description of Soil Series of Lahontan Valley
B: Survey Forms Utilized for Lahontan Valley Wetlands
C: Statistical Analyses and Discussion of Results
D: List of all Plant Species, Family, Common Name, and Wetland Indicator Status for the Lahontan Valley Wetlands
E: Average Cover and Constancy of Important Plants
F: Wetland Plant Association Classification for the Lahontan Valley
G: Preliminary Dichotomous Field Key to the Major Wetland Plant Associations
H: Sample Site Locations and Associated Data

PREFACE

The Nature Conservancy is working cooperatively with the U.S. Fish and Wildlife Service toward the long-term conservation of functional wetlands in the Lahontan Valley by acquiring water rights and assisting with the development of a water management model. While a water acquisition program and water management information are critical, an understanding of components and structure of wetland biological diversity also is needed for successful protection and management of the wetland resource. The U.S. Fish and Wildlife Service and the Stillwater National Wildlife Refuge, in cooperation with The Nature Conservancy, initiated a field study to produce an ecological classification of wetland plant associations and a representative analysis of Lahontan Valley wetlands. This study began in 1993 in response to concerns by the U.S. Fish and Wildlife Service and The Nature Conservancy regarding the conservation and management of wetland biodiversity within the Lahontan Valley.

INTRODUCTION

The distribution, composition, and structure of wetland plant communities that occupy the Lahontan Valley in western Nevada has long been of interest to naturalists and biologists (Fremont 1845; Monroe 1867; Simpson 1876; Bailey 1898; Sperry 1929; Billings 1945; Marshall 1949; DeQuille 1963). The Lahontan Valley wetlands can be distinguished from surrounding habitats by a unique set of physical and ecological characteristics which include: intermittent periods of waterlogged or flooded soil conditions (Mitsch and Gosselink 1986; Padgett 1990); fine textured and low porosity soils (Federal Interagency Report 1989); periodic anaerobic soil conditions (Mitsch and Gosselink 1986); and high species density, diversity, and productivity in comparison to adjacent upland communities (Padgett 1990). These wetlands are associated invariably with playas, ephemeral and perennial water courses, and remnant lakes of the arid, lowland basin.

There is no comprehensive analysis of the floristics and ecology of the wetland vegetation in the Lahontan Valley (Nachlinger 1993; Donohue 1993). The existing information is confined to studies of either specific areas (Fremont 1845; Bailey 1898; Sperry 1929; Billings 1945; Marshall 1949; Department of Navy 1990) or selected emergent and submergent plant species (Marshall 1949, 1952; Giles 1953; Sutherland 1957; Macklin et al. 1960; DeQuille 1963; Osugi 1973, 1974; Osugi and Barber 1976; Barber 1976, 1977; USFWS 1986; Gerdes 1986). Many wetland types are neither described nor documented. Generally, community and qualitative data describing short emergents, graminoid meadows, grasslands, or alkali scrub is limited.

In response to concerns regarding the conservation and management of wetland biodiversity within the Lahontan Valley, The Nature Conservancy (TNC), in cooperation with the U.S. Fish and Wildlife Service (USFWS), initiated a study in May 1993 to inventory and classify the Lahontan Valley wetland vegetation. The primary objectives of the study were to: (1) identify and describe wetland plant associations that occur in the Lahontan Valley; (2) identify the relationships between wetland plant associations and environmental conditions; and (3) identify the range of wetland plant associations and environmental conditions that occur within wetland management areas, and compare them to those that occur outside the managed areas. Additionally, the results of this study could be used to validate and update the National Wetlands Inventory National List of Plant Species that occur in Wetlands for the Intermountain Region (Reed 1988).

DESCRIPTION OF THE STUDY AREA

The study area encompasses the Lahontan Valley, located approximately 60 miles east of Reno in Churchill County, Nevada. The Lahontan Valley is on the western edge of the Great Basin in the rain shadow of the Sierra Nevada mountains at approximately 1120 meters (4,000 feet) above sea level. The valley is bounded on the north by the West Humboldt Range, an uplift that separates the Carson Sink from the Humboldt River. The southern boundary generally follows the Desert Mountains. The Stillwater Range marks the eastern boundary with the Hot Spring Mountains marking the western boundary.

The valley contains a variety of distinct wetland areas, including: Carson Lake, a mixture of shallow lacustrine and palustrine systems; Carson Sink, an ephemeral playa lake and the ultimate terminus of the river and lake systems in the valley; the Stillwater marshes, primarily lacustrine systems; Indian Lakes, a small collection of both natural and artificial lakes with adjacent palustrine wetland communities; S-Line and Harmon Reservoirs which contain both lake and meadow wetland types; Big and Little Soda Lakes as well

as a myriad of canals, small wetland pastures and ponds located on private or Fallon Paiute-Shoshone Reservation land.

Biophysical Characteristics in the Lahontan Valley

Lahontan Valley is a closed basin and ultimate terminus for the Carson River which flows east out of the Sierra Nevada Mountains. Snyder (1962) defines a closed basin as one where surface and subsurface hydrologic flows have no outlet except to the atmosphere. In the Great Basin, whether a closed basin is fed from surface inflow or from groundwater determines the variation of hydrologic processes in the region, which has important consequences for patterns of sedimentation and salinity. The distribution of closed basin wetland communities has been attributed to environmental gradients created by the progressively finer sediments from the edge of shallow lakes and increasing concentration of soluble salts that are left behind by evaporation (Billings 1945; Young et al. 1986; Jackson and Patten 1988; Dobrowski et al. 1991). In addition, plant community structure has been correlated with soil water availability and depth to the water table (Sperry 1929; Billings 1945; Marshall 1952).

Most of the region was covered by the southern part of Lake Lahontan during the pluvial and glacial periods of the Pleistocene (Billings 1945). Lake-laid sediments now cover almost all areas of the valley below an elevation of 1330 meters. Two major types of post-Lahontan accumulations overlie the old lake sediments in a number of places. The first of these types consists of light-colored sands which form either active dunes or flat, stable landforms that support distinct vegetation types. Mud flats or playas constitute the second kind of post-Lahontan accumulation. The lower parts of the basins not occupied at present by permanent lakes are filled during winters and wet years with shallow temporary lakes. Silts, clays, and salts carried by water or wind into these playa lakes are left behind upon evaporation of water during summer months or drought years (Dobrowski et al. 1991).

Soil characteristics, soil water availability and ground-water quality (salinity) are thought to be the environmental drivers of wetland plant distribution in southern Nevada (Jackson and Patten 1988). Soil characteristics play a very important role in modulating plant-water relations and thus affect species distribution and vegetation zonation within the Intermountain Region (Smith and Nowak 1990). Much of the mosaic structure observed in the vegetation of many basins of the region reflects local physical and chemical patterns in the soil. Within a closed drainage basin, substrate (superficial geology) or soils are often the primary determinants of vegetation zonation, since only plants capable of tolerating high salinities and/or low soil oxygen can exist on the fine-textured soils of the basin floor.

In addition, the seasonality of water availability and the depth to the water table affect plant-water relations, and thus plant community structure, of the Intermountain Region (Smith and Nowak 1990). Soil moisture storage and the availability of soil water during the dry season affects competition between plants for limiting soil moisture reserves (Ehleringer 1984). The importance of soil water availability and plant-water relations on the fitness of individual species and their distribution along environmental gradients has been illustrated for several Great Basin plant species (Freeman et al. 1976). The hydrologic periodicity of a particular wetland system will determine the spatial distribution and composition of its associated plant community. In summary, fluctuations in surface water and groundwater availability, as well as salinity, can be hypothesized to directly influence the variation in vegetation patterns among wetland systems in the Lahontan Valley.

METHODS

General Study Approach

The study design included two years of data collection (vegetation and environmental variables) in the field. The first field season focused on the identification and description of wetland plant associations in the Lahontan Valley and resulted in a preliminary classification. To accomplish this, intensive sampling of plant communities, including a measured vegetation plot, was performed for approximately 250 sampling sites; these sampling sites are referred to as **sample plots.** Plot level information was used to formally define plant associations (see discussion in Bourgeron and Engelking 1994), hereinafter referred to as associations, and their environmental relations. The second field season focused on characterizing the spatial distribution of plant associations within the valley and refining the vegetation-environment relationships. At each of an additional 750 sites, the existing plant community was assigned to the appropriate plant association, but was not formally sampled. These sites are referred to as **sample points.** Vegetation and environmental data collected at all plots and points was used to build models of vegetation-environment relations for selected plant species and associations.

Sampling Design

The vegetation sampling design was developed using a gradient-directed transect (gradsect) strategy (Gillison and Brewer 1985; Austin and Heyligers 1989; Bourgeron et al. 1994). In the gradsect approach, driving variables (i.e., environmental variables assumed or known to determine the structure and composition of the vegetation) are identified and mapped, and used to define distinct biophysical environments (BIOEs: specific combinations of driving variable classes). Sample sites are then allocated to individual BIOEs in proportion to their areal representation, with the flexibility to over-sample rare environments and under-sample common ones.

The underlying assumption of the gradsect design is that the composition and structure of plant associations will vary according to environmental gradients, as represented by the BIOEs. Therefore, in order to sample all aspects of the variability in vegetation patterns, all BIOEs should be sampled. The gradsect approach has been used successfully for cost-effective vegetation analysis in Australia (e.g., Austin and Heyligers 1989) and in the western United States (e.g., Bourgeron et al. 1995; DeVelice et al. 1993; Reid and Bourgeron 1993).

Biophysical Environments in the Lahontan Valley

For purposes of the sampling design, two environmental gradients were selected as driving variables for defining the wetland-related BIOEs in the Lahontan Valley: a hydrologic gradient and a soil gradient. The hydrologic gradient is represented by **wetland type**, a composite of three other wetland factors: wetland form (riverine, lacustrine, palustrine), water source (natural or artificial), and hydrologic periodicity (perennial or ephemeral). These three factors, when combined, defined ten wetland types. Values for the wetland factors (form, water source, hydrologic periodicity) were determined from National Wetland Inventory (NWI) maps and the U.S. Forest Service wetland sampling procedures guide (Manning 1990).

Riverine systems include all wetlands and deepwater habitats confined within a channel, and include vegetation occurring in, or immediately adjacent to the stream channel. Lacustrine systems include wetlands and deepwater

habitats which are situated in topographic depressions or dammed river channels greater than 20 acres. Lacustrine systems include vegetation along permanently flooded lakes and reservoirs and intermittent (or ephemeral) lakes. Palustrine systems include wetlands dominated by trees, shrubs and persistent emergents and include floodplain wetlands and small, shallow, perennial or ephemeral water bodies often called ponds.

Wetlands with an artificial water source include areas where the hydrology has been artificially created or sustained by water management and irrigation practices, and are categorized as altered systems. Wetlands with natural or unmanaged water sources are categorized as natural. Hydrologic periodicity was derived from Cowardin et al. (1979) and simplified into two classes, perennial or ephemeral: perennial systems have soil water available on a continuous basis throughout the year, whereas ephemeral systems have seasonal or transitory soil water availability.

Thirty-three soil series that occur within the Lahontan Valley (Soil Conservation Service 1975) were selected to represent the soil gradient. These **soil types** are described in Appendix A.

Combining the ten wetland types with the 33 soil types defines 330 BIOEs that potentially could occur in the Lahontan Valley (Table 1).

To identify which of the 330 potential BIOEs (wetland type x soil type) actually occur within the Lahontan Valley, digitized grid overlays were generated for each U.S. Geological Survey (USGS) 1:24,000 scale topographic quadrangle map encompassing any portion of the study area. Grid points were spaced every 250 meters within the boundary of the study area. The grid was overlaid on the NWI maps and all grid points that intercepted a wetland map unit were coded to indicate the associated wetland type. A total of 14,200 grid points intercepted wetland units and were classified by wetland type (Figure 1). In addition, soil types were digitized at the same scale, and overlaid by the same grid; each of the 14,200 wetland grid points was coded to indicate the soil type that it intercepted (Figure 2). In this way, each of the 14,200 wetland grid points was classified into a specific BIOE (wetland type x soil type; e.g., a lacustrine natural perennial wetland type found on alluvial soil). Out of the possible 330 BIOEs, 178 were identified as existing in the study area (i.e., intercepted by at least one grid point) (Table 2).

All mapping and digitizing work was performed on the Geographic Information System (GIS) at TNC's Western Conservation Science Department, Boulder, CO.

Allocation of Sampling Sites to Biophysical Environments

The 1,000 sample sites were allocated to BIOEs based on the relative areal representation of each BIOE. For example, a BIOE that represented 5% of the wetland area in the Lahontan Valley would be allocated 50 sampling sites, or 5% of the total. Percent areal representation for each of the 178 BIOEs was determined as the number of grid points intercepting a given BIOE divided by the total number of grid points representing all 178 BIOEs combined (i.e., 14,200) (Table 2). Rare BIOEs (i.e., areal coverage less than 1% of the wetland area) were allocated at least one sample site each.

Sample Site Location

For both 1993 and 1995 field seasons, sampling sites were chosen to efficiently sample wetland vegetation associated with the full range of environmental variation (i.e., as allocated to BIOEs) while at the same time to minimize logistical constraints and costs (e.g., assure ease of accessibility; minimize travel time between sampling sites). For the intensive plot-level vegetation sampling during the 1993 field season, sites that had been hydrated on a regular basis during the preceding seven-year drought were given highest priority. For the more extensive point-level sampling of the 1995 field season, three distinct areas within the Lahontan Valley that together best captured the range of BIOEs were identified (Figure 3) and as many sampling sites as possible were located within these areas; these areas are referred to as gradient-directed transects (gradsects). Gradsect A includes the area from Carson Lake to Sheckler Reservoir, gradsect B encompasses the Carson River corridor from Lahontan Dam to the river's terminus at the Carson Sink, and gradsect C encompasses most of the Stillwater NWR.

Topographic maps were used in conjunction with the map of BIOEs and gradsects to select sampling sites for field sampling. Accessibility and location of wetland areas were taken into consideration for cost effectiveness and to allow for geographic distribution of sampling sites within BIOEs. The locations of sampling sites were selected and mapped based on the following set of rules:

1) The 1000 sampling sites were selected from the set of 14,200 grid points that represent the 178 BIOEs; in the field, sampling sites were located as close to grid points as possible;

2) Sampling sites had to have been hydrated on a regular basis during the preceding drought period (1993 field season only);

3) Sampling sites for a BIOE allocated 10 or more samples were selected randomly from among the set of grid points representing the BIOE, but constrained to be within one of the three gradsects[1] (1995 only);

4) Sampling sites for a BIOE assigned less than 10 samples were randomly selected from those grid points considered to have easy access, or were close to other sample sites, but constrained to be within one of the three gradsects (1995 only);

---

[1] exceptions include the Carson Sink where samples were collected where access could be obtained and not a priori selected based on our sampling rules.

5) Sampling sites could be located outside of gradsect boundaries if:
   a) the BIOE did not occur within a gradsect, or
   b) access to a BIOE within a gradsect was unavailable or limited;

6) For any given BIOE, sampling sites were distributed across the geographic range of the BIOE, to the extent possible;

7) Near the end of the study, rare BIOEs were preferentially sampled over common BIOEs that had a sufficient (but fewer than allocated) number of samples.

8) A designated sampling site could be replaced by a site with the same BIOE that was sampled opportunistically if the exchange increased logistical efficiency.

Data Collection: Vegetation and Environmental Variables

In the field, a suite of biotic and environmental variables were recorded at each sampling site. Data collection followed the standardized methodology of Bourgeron et al. (1991). Information collected for sample plots and for sample points is included in Table 3. Examples of the field forms used for collecting data are presented in Appendix B.

In 1993 all samples were collected at the plot level. In 1995 the decision to collect plot- or point-level data for a given sampling site was determined by the following criteria: the number of sampling sites allocated to the BIOE; the number of samples already collected for the BIOE; and how many samples already collected for the apparent plant association present on the site. Classification and definition of plant associations, based on samples of existing plant communities, requires a minimum number of samples; for this study, seven samples were considered the minimum. The decision rules applied at each site were as follows:

1) If the **BIOE** was allocated >50 sampling sites, and less than three sampling sites within the BIOE had been sampled at the plot level, then plot level sampling was conducted at the site;

2) If the apparent **plant association** at the site had not been sampled previously, <u>or</u> if it had been sampled at the plot-level at less than seven sampling sites (regardless of BIOE), then plot-level sampling was conducted at the site;

3) If neither 1 nor 2 were true, then point-level sampling was conducted at the site.

In the field, some selected sampling sites supported a complex or mosaic of plant associations. For example, two distinct perennial and two distinct ephemeral plant communities were found at Massie Slough. Typically under these circumstances, each physiognomic or dominance type was independently sampled at the appropriate level, and considered to be a separate sampling site.

Sample Plots

A vegetation plot was placed centrally within a stand of vegetation so as to be representative of the stand. Plot size varied depending upon the structure of the vegetation: a 10 x 5 m plot was used for stands dominated by herbaceous vegetation, whereas shrub-dominated stands were sampled using a 20 x 10 m plot. All plant species present in a sample plot were recorded. Species were listed under five categories: tree, shrub, graminoid, forb and

aquatic. Percent canopy cover was estimated in cover classes using ocular methods. Percent total cover and mean height of the different vegetation layers was noted. Voucher specimens were collected and prepared for each plant species and deposited at the Stillwater NWR headquarters.

The physiographic and topographic location of each sampling site was recorded using a global positioning satellite (GPS) system, and each site was charted on a USGS topographic map. Physiographic features of percent slope, aspect, slope position of the plant association, elevation, landform, and microrelief of the soil surface were recorded. Percent cover for rock, gravel, bare soil surface, litter, and cryptograms was estimated. Riparian features of channel width, channel entrenchment, surface water, channel depth, and distance from water were recorded when applicable. In addition, field condition rankings based upon quality, quantity, and condition of the plant association were estimated. Disturbance history and use by wildlife or cattle were noted. Photo documentation of most sites was taken to provide visual support for the data analyses and community field key.

A soil pit was dug at the center of each vegetation plot to a depth of 150 cm. Soil profile features noted in the field were horizonization, gleyed or oxidized layers, gross differences in texture and structure, and color of the different horizons within the soil profile. The color was estimated using Munsell Soil Color Charts (Macbeth Division, Baltimore, Maryland). Soil texture classes were estimated using the techniques of Thien (1979). Soil samples for laboratory analysis were collected at a depth of 25 to 90 cm within the rooting zone.

Sample Points

Point level data collection procedures were similar to those used for sample plots, except instead of using a measured vegetation plot to sample the existing plant community, the general vicinity of the sample site was visually scanned for species presence and coverage, and the apparent plant association was noted; voucher specimens were not collected. In addition, soil pits were not dug at the sample points, but a surface soil sample was collected and analyzed in the laboratory for pH and electrical conductivity.

Laboratory Analysis

Electrical conductivity (EC), sodium absorption ratio (SAR), and pH of the soil samples were estimated under laboratory conditions at the University of Nevada, Reno (1993) and a home laboratory (1995). Soil samples were air dried for a period of at least two weeks. The samples were then ground with a cast iron mortar and pestle, and sieved using a standard screen scale (W.S. Tyler Co., Mentor, Ohio) of 1.981 mm. The soils were weighed out into 250 gram samples using a Mettler scale (Mettler Instrument Corp., Princeton, NJ). The 250 gram soil samples were saturated with distilled water and allowed to sit overnight. The pH of the saturated soil paste was estimated at a temperature of 20°C using a Beckman Expandomatic SS-2 pH meter. The soil water was then extracted from the saturated paste using a Baroid Low Pressure Filter Press set at 100 psi. Electrical conductivity (EC) was estimated on the soil water extract at 25°C using an Instant EC Salinity Drop Tester (Model M33-1, GLA Agricultural Electronics, Montclair, CA).

To prepare the samples for SAR analyses, a set of serial dilutions were then performed on the soil water extracts. The first dilution was comprised of one milliliter (ml) of extract plus 9 ml of 0.025 $LaCl_3$ (lanthanum chloride) - a 1/10 dilution; this solution was further diluted with an additional 9 ml of $LaCl_3$ creating a 1/100 dilution; one ml of the 1/100 dilution was further attenuated with nine ml of $LaCl_3$ to create a 1/10,000 solution. The serial dilutions were tested for nitrogen (Na), magnesium (Mg), and calcium (Ca) using a Perkin-Elmer 5000 Atomic Absorption Spectrophotometer. Concentrations of Mg were determined using absorption, while concentrations of Ca and Na were analyzed on the emission spectrum. SAR was calculated using the equation:

$$SAR = \frac{(Na\ mm\ l^{-1})}{SQRT(\ (Ca\ mm\ l^{-1} + Mg\ mm\ l^{-1})/2)}.$$

Analytical Methods

Two multivariate statistical techniques were utilized to define plant associations and determine the environmental conditions indicative of a plant associations presence at a given site. Classification of plant associations was completed using a nonhierarchical clustering technique (ALOC within software package PATN, Belbin 1990). Direct gradient analysis (canonical correlation analysis in software package CANOCO, ter Braak 1987, 1990) was performed on the vegetation and environmental data to elucidate relationships among plant associations and environmental gradients. Direct gradient analysis is a descriptive statistical technique that results in a simultaneous characterization of the responses of many species to the environment. Details of these analyses are included in Appendix C, part 1.

An additional method, predictive statistical modeling, was used to

relate the distributions of a set of individual plant species and plant associations to selected environmental attributes using the method of generalized linear models. Development of each model results in a predictive relationship between the response of a single species or association and the environment. Appendix C, part 2 contains a complete description of the modeling approach and results.

The representativeness analysis was based on a comparison of wetland plant associations that occurred within versus outside wetland management areas in the Lahontan Valley. For this purpose, we recognized six wetland management areas (Figure 4), including:

Carson Lake and Pasture (CLAKE)
Canvasback Gun Club (CCLUB)
Fallon National Wildlife Refuge (FNWR)
Fallon Paiute-Shoshone Indian Reservation (FIR)
Stillwater National Wildlife Refuge (SNWR)
Stillwater Wildlife Management Area (SWMA)

Sampling sites located within any of these six areas are considered to represent "managed" wetlands; sampling sites located outside of these six areas represent "unmanaged" wetlands. The names of the managed areas above are followed by the acronyms used in tables and figures. For our purposes, the Stillwater Wildlife Management Area excludes the portions of the Fallon and Stillwater refuges that overlap with the Stillwater WMA.

RESULTS

Bioenvironment Distribution

One BIOE (LNe-P3: lacustrine natural ephemeral wetland type on playa soil series) comprised 50.2% of the wetland area (7127 of 14,200 grid points) (Table 2); this BIOE largely encompasses the Carson Sink. Additionally, seven other BIOEs represent between 2% and 5.4% of the study area each: LNe-L2; LAp-L2; PAp-M1; PAe-M1; PAe-L1; LAp-M1; and PNe-T1. Together these seven BIOEs account for about 22.4% of the wetland area (3179 of 14,200 grid points). There are another four BIOEs represented by at least 142 grid points corresponding to an areal representation of more than 1%. In sum, these 12 BIOEs account for 77.3% of the wetland area in the Lahontan Valley. The remaining 166 BIOEs were all considered rare, with less than 1% areal representation (142 grid points) each; 128 of the rare BIOEs had 20 or fewer grid points (see Table 1 for acronym definitions).

Based on percent areal representation, the LNe-P3 BIOE should have been allocated 50% of the sample sites, or 500. However, because of its uniform character, and the explicit intention of sampling design to undersample common environments and over-sample rare ones, it was assigned only 200 sample sites; ultimately, only 158 sites in the LNe-P3 BIOE were actually sampled (16.7% of total sites sampled; Table 4) based on limited access to the Carson Sink. The 300 sample sites that were not allocated to LNe-P3 were distributed among the rarer BIOEs.

Sampling Site Distribution

A total of 948 sampling sites, covering all major recognized areas within the Lahontan Valley, were sampled over the 1993 and 1995 field seasons (Figure 4). The first field season was accomplished from 21 June to 3 September 1993, over which time 202 sample sites were sampled, all at the plot level (Donohue and Baumgartner 1994). Between 30 June and 29 September 1995, an additional 746 sampling sites were sampled, 81 at the plot level and 665 at the point level; the second field season was postponed until the summer of 1995 because of below-normal water conditions in the Lahontan Valley in 1994. Sample sites, and level of sampling were distributed among management areas as follows:

	Information Level		
Management Unit	Plot	Point	Total
Stillwater NWR	32	215	247
Stillwater WMA	43	49	92
Fallon NWR	1	44	45
Carson Lake and Pasture	57	130	187
Canvasback Gun Club	9	0	9
Fallon Indian Reservation	19	0	19
Unmanaged Areas	122	227	349
	283	665	948

The distribution of sampling sites among BIOEs is given in Table 4. Among the 948 sampling sites, 167 of 178 wetland BIOEs were sampled. The nine BIOEs that were not sampled were rare (Table 2) and located on private property. Areal representation of these nine rare BIOEs ranged from 0.007% (1 grid point) to 0.08% (11 grid points).

Application of Sampling Design

We evaluated the success of the sampling design for this study by looking at the range of variability in both environmental variables and plant species and associations among the 948 sampling sites. Although nine of the 178 BIOEs were not sampled (Table 4), all ten wetland types and all 33 soils series were sampled at least once. Examination of the environmental data collected reveals that the range of variability in the Valley was successfully sampled. Some ranges of values for the environmental data are shown below:

Elevation	1179 to 1246 m (3867 to 4087 feet)
Surface water	0 to 100% cover
Bare soil	0 to 100% cover
Gravel	0 to 50% cover
Litter	0 to 80% cover
Water depth	0 to 1.5 m
Channel width	0.5 to 100 m+
Distance from water	0 to 500 m+
Soil Ph	3.9 to 10.0
Soil EC	0.3 to 221.0 mmhos/cm^{-1}
Soil SAR	1 to 1772

The range of variability in biological elements also appears to have been well sampled, as represented by the vegetation. Out of 948 sample sites, 688 supported vegetation. On these vegetated sites, 192 plant taxa were recorded (Appendix D), and total canopy cover varied from less than 5% to well over 95%. The 260 unvegetated sites were distributed in the Carson Sink (158 sites), various deepwater areas, highly saline irrigation ditches, and playa lake depressions.

The quantitative analyses of the data resulted in the definition of 44 plant associations plus sampling of agricultural fields. When compared to other regions outside of the Great Basin, the communities sampled in the Lahontan Valley do not display high species richness (with from 1 to 20 species found on a site (typically five or fewer), but the number of taxa and plant associations found indicate adequate sampling of the diversity of Lahontan Valley wetland vegetation.

Vegetation

Plant Species

A total of 192 species were identified and collected during the 1993 and 1995 sampling efforts. These species represent 50 families and 134 genera of both hydrophytic and upland species. Divided by lifeform they include:

5	Trees
19	Shrubs
44	Graminaceous species
	10 emergent
	10 low graminoids (wet meadow)
	24 grass
109	Forbs
13	Aquatic
2	Agricultural
192	Total

Aquatic species include all submergent (e.g. *Potamogeton* sp.) or non-rooted floating plants (e.g. *Lemna minor*); however, *Bacopa eisenii* was included in the aquatic category based on an observed preference for perennially hydrated wetland habitats. A complete list of species including local common names, family, and wetland indicator status is included in Appendix D. No federally listed or candidate species were found among the plants sampled in this study.

Plant Associations

Classification analysis revealed the presence of 48 separate groupings of plant species. Forty-four of these groupings were formally defined as plant associations. Of the remaining four groupings, two represented agricultural assemblages, one was composed of sites supporting plant communities that could not be classified, and one represented sites that had no vegetation. The 44 defined plant associations were placed into one of eight classes, based largely on physiognomy (Table 5). Appendix E presents summary tables for each of the defined plant associations, including species average canopy cover and constancy. The tall shrub-dominated *Salix exigua* association is considered as one of the tree-dominated associations for ease of discussion.

Tree communities were typically associated with, but not limited to, the Carson River flood plain, irrigation ditches, or other natural water courses. The *Populus fremontii/Elymus triticoides*, *Salix exigua*, and *Salix laevigata* associations were only observed in the upper reaches of the Carson River, either in the existing channel or immediately adjacent to the channel in fresh water. The *Populus fremontii* association was sampled in the lower, more saline stretches of the Carson River, and was also observed along the edge of more permanent, palustrine and lacustrine wetlands (Bundy, pers. obs.). It is possible that this plant association results from a degradation of habitat conditions and historically retained a graminaceous component such as *Elymus triticoides*. The *Elaeagnus angustifolia* association can occupy the wet or hydrated edge of any saturated habitat including riverine, palustrine, or lacustrine systems. It is dominated by an introduced species (*Elaeagnus angustifolia*) which displayed a generalist, pioneering strategy and may be capable of outcompeting native plant species.

The eight shrub communities were commonly distributed along upland breaks or edges of ephemeral or perennial lake and palustrine systems and the Carson River corridor. Soil salinity, as indicated by electrical

conductivity, may be the primary driving variable as the *Artemisia tridentata* ssp. *tridentata* association was limited to freshwater and normal soils along the upper Carson River while the *Allenrolfea occidentalis, Sarcobatus vermiculatus/Suaeda moquinii*, and *Suaeda moquinii* associations were restricted to saline playas and ephemeral lakes at the northern end of the valley. The remaining associations were less restricted but were invariably associated with drier zones around the wetlands. Three shrub association dominants; *Artemisia tridentata, Atriplex lentiformis*, and *Chrysothamnus nauseosus-Tetradymia tetrameres*, are essentially upland species which can occupy transitional zones between wetland and upland environments.

Number and diversity of graminaceous communities warranted further division of plant associations by physiognomic class. Association distribution generally follows a hydrologic gradient. For example, the tall graminaceous communities are distributed throughout all wetland types but are more common in lake or palustrine systems with perennial water. Low graminaceous associations are characteristically distributed in ephemeral systems (palustrine\wet meadow in particular) but can also be observed on saturated bands around more permanently flooded sites. Grass associations occupy the driest zones in the wetland complex but can be seen in shallowly flooded sites for short periods.

Submerged, aquatic associations were found in deep water sites, with two exceptions. The *Bacopa eisenii* association was located primarily in wet meadow and related palustrine habitats with a more perennial water source. Water depths of 5 - 10 cm were common and the diagnostic species of the association (*Bacopa eisenii*) appeared to senesce when desiccated. Similarly, the *Lemna minor* association was sampled in shallow riverine or palustrine wetlands and found adjacent to freshwater emergent communities. Both of these associations were observed only in standing water. All other aquatic associations were restricted to open water habitats and generally were distributed along a salinity gradient, with the *Ruppia maritima* association occurring exclusively in highly saline wetlands.

The forb associations and those dominated by exotic species were found primarily on disturbed sites and in most cases can be described as monospecific communities of species common to exposed mudflats. Most are composed of annual plant species which are capable of rapid colonization of exposed, saturated soils and irrigation canal banks. An exception is the *Tamarix ramosissima* association, dominated by an introduced tree species. *Tamarix* forms extensive monotypic stands along the banks and flooded margins of all recognized wetland types. Once established, this species is difficult to eradicate, usually outcompeting native species. At present, dense stands are restricted to more saline habitats in the northern part of the valley.

Agricultural fields (*Medicago sativa* and *Zea mays*) were sampled on rare BIOEs where alternate sample sites could not be located. Their presence denotes *conversion* of historic wetland area (USFWS National Wetland Inventory) to agricultural uses. The complete absence of vegetation at 260 sampling sites was probably due to high soil salinity. Most of these sites were near the extreme high end of the salinity gradient and conditions were likely incompatible with vegetation germination and survival. The unclassified plant communities include sample sites where canopy cover for all species was low, and species composition did not fit within the definition of any other plant association.

Descriptions of 40 plant association, complete with historical documentation, current distribution, community structure and composition, soils information, and a field condition ranking, are included in Appendix F. The remaining four plant associations; *Elaeagnus angustifolia, Equisetum*

laevigatum, *Chara* sp., and *Bidens frondosa*, are not included because their identification was based only on point level data where robust quantitative data were lacking. These plant associations are considered tentative plant associations in further discussion. A preliminary dichotomous key for field identification of all 44 plant associations is presented in Appendix G.

Historically Described Plant Associations

To comply with the USFWS stated objective of restoring and preserving "natural biological diversity" [Title 2 of Public Law 101-618, section 206 (b)(2)], it is important to examine the relationship between historically-documented wetland plant associations and those that are currently present. A comprehensive literature review (Donohue 1993) identified 27 historic plant associations and related habitats among Lahontan Valley wetlands (Table 5).

Of the 27 historically described plant associations, 21 were identified and sampled during this study (Table 5). One of these, *Bassia hyssopifolia*, is dominated by an aggressive exotic weed while the other 20 are predominately native plant associations. Of the six associations not sampled, diagnostic species for four (*Potamogeton nodosus*, *Sagittaria latifolia*, *Salicornea europaea*, and Mixed Meadow Grass Association) were sampled in the study area. However, none of these species were dominant at any of the sampling sites, and thus they were not recognized as the dominant species of any plant association. The two co-dominant species of the fifth unsampled historic plant association (*Typha domingensis-Scirpus maritimus*) individually dominated at a number of sampling sites, but were not found to co-dominate at any site. The diagnostic species of the sixth unsampled historic plant associations, *Ceratophyllum demersum*, is known to be present in the Carson Lake area (Norm Saake, pers. comm.; Rob Bundy, pers. obs.) but was not present at any of the sampling sites.

Twenty-five of the 44 plant associations identified during this study are previously undescribed for the Lahontan Valley (Table 5). These include four tree communities, six shrub communities, six graminaceous communities, one submerged aquatic community, and six disturbed forb or exotic-dominated communities.

Vegetation-Environment Relationships

The direct gradient analysis (Appendix C) defined several environmental gradients which help explain plant species and association distributions among the Lahontan Valley wetlands. The identified gradients differ in the spatial scale over which they operate, and can roughly be described as either landscape-scale gradients or local-scale gradients. Landscape-scale environmental gradients explain regional differences in plant distribution patterns. Regionally important variables (e.g. salinity, wetland form) constrain broad geographic patterns in plant distribution at the scale of the entire Valley. Within this broad regional framework, local scale gradients constrain plant association distribution at the site level, therefore contributing to individual plant or plant association establishment. Landscape and local scale gradients sometimes interact with each other.

At the landscape scale, wetland form (palustrine, lacustrine, and riverine) influenced the distribution of plant species and plant associations in the Lahontan Valley. Plant associations such as the *Populus fremontii/Elymus triticoides*, *Salix exigua*, *Salix laevigata*, and *Artemisia tridentata* were distributed in or adjacent to riverine systems; most aquatic submergent plant associations (e.g. *Potamogeton* sp.) occurred in lacustrine systems; while the remaining plant associations were distributed in both lacustrine and palustrine wetland types.

Soil salinity is another landscape-scale gradient, with freshwater systems located towards the southwest end (along the Carson River below Lahontan Dam) and highly saline systems located toward the northeast (e.g. the Carson Sink). Soil salinity varies among sites situated between these locations (based on quality of water used to hydrate the wetlands and salinity of soils) with plant associations distributed throughout the range (Table 6). For example, within plant associations classified as aquatic, the *Ruppia maritima* association was associated with salinity values ranging from 26.0 - 5.2 mmhos/cm^{-1}, while salinity at sites with the *Bacopa eisenii* association ranged from 2.9 - 2.7 mmhos/cm^{-1}.

A third landscape-scale gradient was the percentage of standing water. A few species, such as *Scirpus maritimus*, *Potamogeton* sp., *Zannichellia palustris*, and *Ruppia maritima*, occurred at the wetter end of this gradient, whereas most species and associations occurred on drier sites. Dryer sites tended to have more exposed, bare soil and higher soil salinity. Ranges of water depths for all documented plant associations are included in Table 7.

At the local scale, soil series was highly correlated with certain plant species and the distribution of plant associations. For example, distribution of the *Salix exigua* plant association was related to Badland soils, while Playa soils (when combined with lacustrine wetland form) helped explain the distribution of *Bassia hyssopifolia*, *Sarcobatus vermiculatus*, and *Allenrolfea occidentalis*. *Allenrolfea occidentalis*, commonly occurred in lacustrine wetland types with playa soils and high salinity (electrical conductivity). *Lemna minor* and *Sarcobatus vermiculatus* were most commonly found in unmanaged palustrine wetlands with Lake Bottom soils.

Several other local scale gradients were identified. Sandy soil texture was associated with distribution of species common to playa lakes, and specifically with the *Muhlenbergia asperifolia* association. Sites exhibiting high disturbance (either human or livestock) were often dominated by *Malvella leprosa* and *Polygonum* sp. Sodium adsorption ratio (SAR), another measure of salinity, combined with plot water coverage, was influential in identifying distributions of many sample sites and species including *Scirpus acutus*, *Scirpus pungens*, and *Salix laevigata*.

Several of the more abundant species were defined by multiple gradients (e.g. *Sarcobatus vermiculatus* above) suggesting that regional habitat differences are regulated by different combinations of environmental variables explaining distribution of individual plants or associations. In order to better understand these important gradients, models were prepared to predict the distributions of selected species and plant associations.

Species and Association Modeling

Predictive statistical models were developed to produce quantitative relationships between a single species or association and environmental variables. Such models constructed using species and association or alliance (higher level grouping of related plant associations) distributions for a set of sampling plots and points were generally successful as measured by the percentage of correct predictions for test plots and points (Appendix C: Tables C2-6 and C2-12). However, models constructed using plots only were generally not successful when tested using points (Appendix C: Tables C2-3 and C2-9).

Species Modeling

For species models developed with plot and point level data, the presence of *Bassia hyssopifolia* could best be predicted by intermediate ground

cover of soil, high pH, and intermediate electrical conductivity. *Distichlis spicata* presence was best predicted by the combination of palustrine or riverine wetland form, poorly drained loam soils, and high ground cover of soil. *Eleocharis macrostachya* presence was predicted by palustrine and riverine wetland form, low electrical conductivity, and intermediate elevation. *Juncus balticus* presence was related to palustrine and riverine wetlands, low electrical conductivity, and low ground cover of water. The presence of *Sarcobatus vermiculatus* was related to moderately drained clay-loam soils, intermediate ground cover of soil, and intermediate electrical conductivity.

Association Modeling

For association or alliance models developed with plots and points, occurrence of the *Bassia hyssopifolia* association was predicted to be most likely on intermediate ground cover of soil, intermediate electrical conductivity, and intermediate distance from water. Presence of the *Distichlis spicata* association was related to intermediate ground cover of soil, natural water source, and poorly drained clay loam and loam soils. Presence of the *Juncus balticus - Distichlis spicata* association was related to high ground cover of soil, intermediate ground cover of litter, and high ground cover of water. Occurrence of the *Sarcobatus vermiculatus* alliance (the three plant associations either dominated or codominated by *Sarcobatus vermiculatus*) was predicted by high elevation, intermediate ground cover of soil, and high distance from water. Occurrence of the *Scirpus maritimus* association was related to alkaline pH, clay textured soils, and low elevation.

Representativeness Among Lahontan Valley Management Areas

For purposes of the representativeness analysis, six management areas were recognized (Figure 4) within the Lahontan Valley, including:

Carson Lake and Pasture (CLAKE)
Canvasback Gun Club (CCLUB)
Fallon National Wildlife Refuge (FNWR)
Fallon Paiute-Shoshone Indian Reservation (FIR)
Stillwater National Wildlife Refuge (SNWR)
Stillwater Wildlife Management Area (SWMA)

The two agricultural field types (*Medicago sativa* and *Zea mays*) were omitted and four of the forb and/or exotic-dominated associations (*Bidens frondosa*, *Chenopodium glaucum*, *Kochia scoparia*, *Lactuca serriola*) were combined into one category (various annual forb). Although the *Bidens frondosa* plant association is dominated by a native species, low sample size, disturbance, and distribution along irrigation canals of all four associations results in their combined consideration. Therefore, 38 wetland and three transitional shrub plant associations will be discussed in this assessment (Table 8).

Distribution of Plant Associations

The current distribution, based on our sampling effort, of the documented plant associations within the Lahontan Valley is shown in figures following the plant association descriptions in Appendix F.

Of the 41 plant associations considered in this analysis, 11 (27%) occurred only within one or more of the management areas, 8 (20%) occurred only outside of the six management areas, and 22 (54%) occurred within as well as outside of managed areas (Table 8). Of the 11 associations that occurred only within management areas, five were sampled on a single management area:

the *Atriplex lentiformis*, *Chrysothamnus nauseosus-Tetradymia tetrameres*, and *Eleocharis parishii* associations were found only in the Stillwater WMA; the *Phragmites australis* association was restricted to the Stillwater NWR; and the *Bacopa eisenii* association was restricted to Carson Lake.

Four of the eight plant associations found only outside of managed areas were tree or tall shrub-dominated associations (*Elaeagnus angustifolia*, *Populus fremontii/Elymus triticoides*, *Salix exigua*, and *Salix laevigata*) and two are shrub-dominated associations (*Artemisia tridentata* and *Sarcobatus vermiculatus-Psorothamnus polydenius*); these occur primarily in the upper Carson River corridor. Of the remaining two associations found only in unmanaged areas, one is an emergent community (*Equisetum laevigata*) and one is an aquatic community (*Chara* sp.); each of these was observed in only one location within privately owned ditches.

Plant Association Distribution by Management Area[2]

Stillwater National Wildlife Refuge

A total of 21 plant associations were sampled at 247 sampling sites within the Stillwater NWR. By physiognomic class these include 1 tree, 4 shrub, 5 emergent, 2 low graminaceous, 2 grass, 3 forb and exotic, and 4 aquatic associations (Table 8). The *Phragmites australis* association was unique to the refuge (located near Freeman Pond and Division Lake). Among the six management areas, the *Sarcobatus vermiculatus/Suaeda moquinii* association was found only on the refuge; there also were four occurrences of this association outside the management areas.

The largest number of occurrences of the *Scirpus maritimus* association was documented within the refuge boundaries (28 sampling sites, 11% of samples from the Stillwater NWR). Other plant associations with a large number of occurrences within the refuge include *Distichlis spicata* (32 sites, 13 %), *Bassia hyssopifolia* (18 sites, 7 %), and *Typha latifolia* (12 sites, 5 %). Ninety-two sites (37 %) were either unclassified or unvegetated; these were located within the Big Water Unit and the sand dune areas of the refuge.

Historically-documented plant associations were well represented within the refuge (Table 9). Fifteen of the 25 historical communities were identified, and they occurred at 131 (53%) of the 247 sampling sites in the refuge. Almost half of the sampled occurrences of the *Allenrolfea occidentalis* association (6 of 13 sites), all occurrences of the *Phragmites australis* (3 sites), and 25% (1 of 4) of *Populus fremontii* association occurrences were located within the refuge.

Stillwater Wildlife Management Area

Twenty-one plant associations occurred among 92 sampling sites within the Stillwater Wildlife Management Area. Common associations included *Distichlis spicata* (13 sites, 14%); *Juncus balticus-Distichlis spicata* (9 sites, 10 %), *Juncus balticus* (5 sites, 5 %) and *Bassia hyssopifolia* (5 sites, 5 %)(Table 8). A total of 21 sites (23 %) had no vegetation or had a plant assemblage that was unclassified.

Two shrub and one wet meadow association were restricted to the Wildlife Management Area. The *Atriplex lentiformis* (1 site) and *Chrysothamnus*

---

[2] Throughout the discussion, percentage of sites is based on our sampling of the area and is not intended to depict the actual areal representation of communities within management areas.

nauseosus-Tetradymia tetrameres (2 sites) associations were sampled along the upland edge of ephemeral wetlands. The *Eleocharis parishii* association (1 site) was documented in the dry channel of Vaughn Slough. Although all of these plant associations were discovered in the Indian Lakes area, it is likely that at least the shrub associations exist throughout the entire Management area (Rob Bundy pers. obs.).

Ten of the 25 historically-documented plant associations occur within the WMA, [33 of 92 sites (36%)] (Table 10). None of the three plant associations restricted to the area have been previously described. Based on representativeness among management units, historical plant associations important to the area include *Populus fremontii* (1 site), *Scirpus pungens* (3 sites), *Scirpus acutus-Typha domingensis* (1 site), and *Potamogeton pectinatus* (3 sites).

Fallon National Wildlife Refuge

The Fallon National Wildlife Refuge contained little variability among plant associations. Four plant associations (*Scirpus pungens, Distichlis spicata, Bassia hyssopifolia*, and *Potamogeton pectinatus*) were sampled among 12 sampling sites; the other 73% (33 of 45 sampling sites) were either unclassified or lacked vegetation (Table 8). The four plant associations occurred exclusively along the southern reaches of the refuge, throughout a zone which overlapped the Stillwater Wildlife Management Area. All four plant associations present in the Fallon Refuge have been historically described, and none are restricted to the refuge.

Carson Lake and Pasture

At Carson Lake and Pasture, 20 plant associations were recognized among the 187 sites sampled. Two shrub, 5 emergent, 4 wet meadow, 2 grass, 2 herbaceous, and 5 aquatic associations occurred within the boundaries. The *Bacopa eisenii* association was unique to Carson Lake, and the *Lemna minor* association occurred in no other management area and at only one other unmanaged site. Carson Lake had the lowest percentage of unclassified or unvegetated sites (19 sites, 11 %) among management areas.

Carson Lake was dominated by emergent, wet meadow, and aquatic associations (Table 8). Among emergent associations, the *Typha domingensis* association was most abundant (11 sites, 6 %) followed closely by *Scirpus acutus* (7 sites, 4%). Wet meadow associations were common, with the largest number of occurrences of the *Eleocharis macrostachya* association (13 sites, 7 %) and the *Juncus balticus* association (10 sites, 5 %) documented in the valley. Aquatic communities were not as abundant, with five aquatic community types occurring at 17 (9%) sampling sites.

Fourteen historically-described plant associations were distributed across 73% (136 of 187) of the sampling sites at Carson Lake (Table 11). Included were the largest number of occurrences among management areas of two shrub associations (*Allenrolfea occidentalis* and *Sarcobatus vermiculatus*), 1 emergent association (*Typha domingensis*), 1 wet meadow association (*Juncus balticus*), and 1 grass association (*Distichlis spicata*).

Fallon Paiute-Shoshone Indian Reservation

Nine plant associations were identified at the 19 sampling sites located on the Fallon Paiute-Shoshone Indian Reservation (Table 8). These include 2 emergent, 4 wet meadow, 2 grass, and 1 herbaceous association and the only documented occurrence of the *Elymus triticoides* association within any

management area; the *Elymus triticoides* association also occurred at six sites outside of management areas. Only four of the nine plant associations (*Typha domingensis*, *Scirpus acutus-Typha domingensis*, *Juncus balticus*, and *Elymus triticoides*) have been historically described.

Canvasback Gun Club

Five plant associations were sampled across nine sampling sites at the Canvasback Gun Club (Table 8). All five of these associations occurred in more than one other management area, as well as outside of the management areas.

Areas Outside Management Area Boundaries

Thirty-four (83%) of the 41 plant associations occur in areas outside of any management area, including all 5 tree associations, 5 shrub, 7 emergent, 3 wet meadow, all 4 grass, and 6 aquatic associations. The only remnants of high-quality riverine habitat (including the tree associations and a transitional shrub community) exist in the fresh, flowing water of the upper Carson River which is currently under no management protection. Four plant associations (*Populus fremontii/Elymus triticoides*, *Salix exigua*, *Salix laevigata*, and *Artemisia tridentata*) occurred exclusively in the upper Carson River area, which, is the only stretch of river that maintains instream flow throughout the year. Other plant associations found exclusively outside of management areas include the *Elaeagnus angustifolia*, *Sarcobatus vermiculatus-Psorothamnus polydenius*, *Equisetum laevigata*, and *Chara* sp. associations.

The highest concentration of occurrences of plant associations dominated by introduced exotic and herbaceous species were in areas outside of managed area boundaries. The species *Elaeagnus angustifolia* and *Tamarix ramosissima* tended to dominate the overstory of unmanaged wetlands, while *Trifolium fragiferum* and various other annual forbs (*Bidens frondosa*, *Chenopodium glaucum*, *Lactuca serriola*, and *Kochia scoparia*) were common throughout unmanaged ditches and herbaceous wetlands. Irrigation ditches appear to be an efficient seed dispersal mechanism as the highest diversity of species encountered (predominately annual forbs) was within riverine altered (irrigation canals) environments.

Historically described plant associations occurring exclusively on unmanaged areas include the *Chara* sp. association (Table 12). Although they are not historically described, other rare or native associations include: *Populus fremontii/Elymus triticoides*, *Salix exigua*, *Salix laevigata*, *Artemisia tridentata*, *Sarcobatus vermiculatus-Psorothamnus polydenius*, and *Equisetum laevigata*.

Eight plant associations were sampled only on lands outside of the six management areas (Table 8). These include the *Chara* sp., *Populus fremontii/Elymus triticoides*, *Salix exigua*, *Salix laevigata*, *Artemisia tridentata*, *Sarcobatus vermiculatus-Psorothamnus polydenius*, and *Equisetum laevigata* associations. Of these, only the *Chara* sp. association was historically described.

DISCUSSION

Plant Association Distribution

Plant association distributions documented in this study are a reflection of current conditions (1993 and 1995) and not necessarily indicative of past or future conditions. Wetland vegetation forms a dynamic mosaic of plant associations that is regulated by both spatial and temporal environmental gradients (van der Valk 1981). At any given wetland site, the plant associations that occur one year may, over successive years, gradually shift in species composition and abundance in response to changing environmental conditions, and thus transform into a different set of plant associations. Although plant associations may become locally extirpated, it is unlikely that they will disappear altogether from the Lahontan Valley. The processes of succession, recolonization, and transformation are occurring throughout the wetland complex, resulting in a shifting mosaic of existing plant associations rather than the extirpation of plant associations.

The identification of 21 of 27 historically described plant associations during this study, and the fact that the dominant species for the remaining six historically described associations were sampled or observed, indicates that the Lahontan Valley wetlands retain most, if not all of the wetland plant diversity that had been documented over the past one hundred years. Given the changes in human land use and water management in the Lahontan Valley, this reflects the resiliency of the wetland systems to retain their diversity. Whether a shift in plant association areal percent representation has occurred during this period cannot be documented from our results because historical information regarding areal representation is lacking.

The year of sampling (1993 versus 1995) was found to explain some of the variation among sampling sites, suggesting that environmental change over time may affect plant distributions. However, the source of this between-year effect cannot be explicitly identified with our data. Possible sources include differences in environmental conditions between 1993 and 1995, or observer bias resulting from different personnel conducting the field sampling in the two years.

Environmental Gradients

Environmental gradients influencing the observed plant distributions occur at both landscape and local scales. Wetland form (lacustrine, palustrine, or riverine), relative percent coverage of standing water, soil salinity, and elevation represent the four landscape-scale gradients identified in this study. These gradients influence geographic distribution at the scale of the entire Lahontan Valley, and are reliable indicators of broad distributional patterns of plant species and plant associations.

Within the broader distributional patterns controlled by the landscape scale gradients, smaller-scale environmental gradients affected the local distribution of plant species and associations. These local scale gradients were more varied, and they more specifically affected particular species or associations, than the landscape scale gradients. For example, within the palustrine wetland form, *Lemna minor* and *Sarcobatus vermiculatus* generally occurred in areas with Lake Bottom soils and natural (unmanaged) water source. Thus, for these species, soil series and water source were important environmental factors affecting their distribution. Hydrologic periodicity (ephemeral or perennial) and source of water (anthropogenic or natural) were also identified as important local scale gradients; both of these can be affected by human management of water resources in the valley. In combination

with wetland form (a landscape-scale gradient), they represent the wetland types defined for the sampling design. Other examples of environmental factors affecting the local distribution of plants included soil texture, level of disturbance, percent ground cover by soil, and distance to water.

Although this study identified numerous landscape- and local-scale gradients that affect the distribution of plant species and plant associations in the Lahontan Valley, we have not shown a direct cause-and-effect relationship between these gradients and plant distributions. The identified gradients may truly be the cause of the observed plant distributions. Conversely, the plant distributions may be responding to environmental gradients that were not measured, but that spatially vary with the measured gradients. We cannot distinguish between these alternatives. For example, the distribution of some plant associations was related to soil type (series) (e.g. the *Salix exigua* association on Badland soils, the *Bacopa eisenii* association on Lahontan soils). Soil series are inherently variable with respect to soil texture and chemical characteristics (Table 13). Therefore, the relationship between soil series and plant distribution may not reflect the affect of soil characteristics on plant establishment and survival, but may be more of an indicator of other environmental factors with the same geographic distribution as soil series. Young (1992) offered a similar explanation when exploring variability among hydric soils along the Missouri River floodplain.

Representativeness Assessment

The six management areas in the Lahontan Valley capture within their boundaries 29 (81%) of the 36 plant associations of biodiversity interest, identified during this study. The *Elaeagnus angustifolia*, *Bassia hyssopifolia*, *Tamarix ramosissima*, *Trifolium fragiferum*, and the plant association labeled Various Exotics, are all either dominated by introduced exotic species or contain exotic elements within the association. Eleven of these 29 associations were found exclusively within one (5 associations) or more (6 associations) of the managed areas; the other 22 associations occurred both within and outside of the management areas. In general, the existing managed areas do a relatively good job of capturing the diversity of existing plant associations.

Plant associations found only on specific management areas include the *Chrysothamnus nauseosus - Tetradymia tetrameres*, *Atriplex lentiformis*, and *Eleocharis parishii* associations (Stillwater Wildlife Management Area\Indian Lakes); the *Phragmites australis* association (Stillwater National Wildlife Refuge); and the *Bacopa eisenii* association (Carson Lake).

Of primary concern are the 19 plant associations dominated by native species that either occur only outside of any management areas, or are considered rare (i.e., were found at 10 or fewer sampling sites). By physiognomy, these 19 plant associations (those historically described designated by (H)) include:

Plant Association	Present[3] Distribution	Condition Ranking
Tree Communities		
Populus fremontii (H)	SWNR	Fair
Populus fremontii /Elymus triticoides (H)	OUT	Good
Salix exigua	OUT	Good/Excellent
Salix laevigata	OUT	Fair/Good
Shrub Communities		
Sarcobatus vermiculatus-Psorothamnus polydenius	OUT	Good
Sarcobatus vermiculatus/ Suaeda moquinii	SNWR,OUT	Fair
Suaeda moquinii	SNWR,SWMA,OUT	Fair
Transitional Shrub Communities		
Artemisia tridentata	OUT	Fair/Good
Atriplex lentiformis	SWMA	Poor
Chrysothamnus nauseosus-Tetradymia tetrameres	SWMA	Fair
Emergent Communities		
Equisetum laevigata	OUT	Not Evaluated
Phragmites australis (H)	SNWR	Good
Wet Meadow Communities		
Eleocharis macrostachya-Bacopa eisenii	CLAKE	Fair
Eleocharis parishii	SWMA	Good
Grass Communities		
Elymus triticoides (H)	FIR,OUT	Good
Muhlenbergia asperifolia	SNWR,OUT	Excellent
Aquatic Communities		
Bacopa eisenii (H)	CLAKE	Good
Chara sp. (H)	OUT	Not Evaluated
Lemna minor	OUT,CLAKE	Good

Seven of the these 19 plant associations were located only outside of management areas and, because they were sampled six or fewer times, all seven are considered rare associations. There are 12 additional rare plant associations, seven of which occur only within management areas and five of which occur both within and outside of managed areas.

Only *six* of the 19 plant associations of concern were historically documented. Among the remaining 13, two (*Populus fremontii/Elymus triticoides* and *Sarcobatus vermiculatus-Tetradymia tetrameres*) contain species characteristic of historically described associations.

---

[3] SNWR - Stillwater National Wildlife Refuge, SWMA - Stillwater Wildlife Management Area excluding refuges, CLAKE - Carson Lake and Pasture, FIR - Fallon Paiute-Shoshone Indian Reservation, OUT - located outside management area boundaries.

Of lesser concern are the remaining 17 plant associations dominated by native species that are relatively well represented throughout the Lahontan Valley and were not considered rare. However, they are of interest in that they add to the overall biodiversity of wetland plant associations and provide habitat for a diversity of wildlife species. Although not considered plant associations of concern, eight of these associations received field condition rankings of fair, seven received good rankings, while only two qualified for good-excellent or excellent rankings. These field condition rankings were subjectively derived based on the relative quality, condition, and viability of representative stands. Condition was the most important factor considered. Rankings of fair were usually a result of heavy livestock use and/or presence of exotic species within the plant association. Distribution of condition rankings among all 41 plant associations by vegetative lifeform categories are as follows:

		Condition Ranking						
Plant Association Lifeform	N	Poor	-	Fair	-	Good	-	Excellent
Tree Associations	5	1	-	-	3	-	1	-
Shrub Associations	5	1	-	2	-	2	-	-
Transitional Shrub Associations	3	1	-	1	-	1	-	-
Emergent Associations	8	-	1	-	-	7	-	-
Low Graminaceous Associations	5	-	-	4	-	1	-	-
Grass Associations	4	-	-	2	-	1	-	1
Disturbed Herbaceous and Exotic Associations	4	2	1	-	1	-	-	-
Aquatic Associations	7	-	1	-	1	5	-	-
Total	**41**	**5**	**3**	**9**	**5**	**17**	**1**	**1**

Over half (22) received a condition ranking of less than good while the remaining 19 were classified as either good (17), good - excellent (1; *Salix exigua*), or excellent (1; *Muhlenbergia asperifolia* plant association). Specific rankings for individual plant associations are included at the end of each plant association description (Appendix F).

Management Recommendations

The format of this discussion will cover aspects of plant association biodiversity where either direct management recommendations can be provided (based on our data) or inferred from programs initiated at similar areas. The focus will be on management actions intended to improve the condition of extant plant associations through promotion of desirable species and control of exotic species. Recommendations for each of the six recognized management areas and the Carson River corridor will be provided, with a brief summary of areas in need of continued research.

Habitat Condition Improvement

As previously stated, the 22 plant associations receiving a condition ranking of less than good were subject to human mediated disturbance (primarily livestock grazing) resulting in the presence of exotic species. Although disturbance at periodic intervals is beneficial to native plant productivity and quality of wetland and riparian habitats (Fredrickson and Taylor 1982, Kadlec and Smith 1989), the type of disturbance must be controlled to simulate natural disturbance patterns with specific, predetermined management objectives.

In Great Basin systems, water level manipulation is the most popular and inexpensive technique, however, mowing, discing, burning, and herbicide application are also accepted methods for accomplishing different habitat objectives (Kadlec and Smith 1984, Smith and Kadlec 1985, Smith and Kadlec 1989, Taylor 1989). The following sections will be used to discuss different management scenarios for promoting or controlling target vegetation and plant associations in the Lahontan Valley wetlands.

Promotion of Desirable Plant Associations

When a managed wetland complex is properly designed, water level manipulation to control both depth and water quality (salinity) is the most effective and inexpensive means to promote desirable vegetation (Kadlec and Smith 1989). Most species germinate and survive within a range of water salinity (confirmed from our results) which can be manipulated to simulate natural environmental conditions (Fredrickson and Taylor 1982, Kadlec and Smith 1989). For example, emergent species such as alkali bulrush (*Scirpus maritimus*) and submergent species like Sago pondweed (*Potamogeton pectinatus*) thrive under salinities around 18 mmhos/cm^3 (Smith and Kadlec 1986). Once this salinity level is realized through flushing, depths ranging between 45-60 cm can be attained to promote pondweed while shallower depths will promote bulrush. Lower salinity levels along with shallow depth can be used to enhance growth of *Phragmites australis*.

Timing of water release is also critical as some species are adapted to different salinity levels at different life history stages (Badger and Ungar 1989). Foxtail barley (*Hordeum jubatum*) can germinate when salt concentration is around 1.5%. However, the adult plant will not flower at this salinity level and concentrations must be lowered almost 4 times to maintain this species. Therefore, it may be practical to irrigate wet meadow habitats where this species is found to provide supplemental water and to reduce salinity levels; thus, promoting establishment of the historically described mixed meadow grass association.

Although moist-soil management (drawdown management) is not as effective in Great Basin environments (Smith and Kadlec 1989), it has been effective in areas where salinities can be kept low (< 8 mmhos/cm^3) and mud flats can be irrigated. At Klamath Basin NWR, controlled drawdown has been used to enhance production of annual seed producers such as smartweed (*Polygonum* sp.), and summer cypress (*Kochia scoparia*; Nelson 1954). Both can survive shallowly flooded conditions, but when perennially flooded for periods of > 1 year, emergent species will typically encroach. Both species are currently distributed only in irrigation canals in the Lahontan Valley.

In most regions of the country, life history information on extant species allows the manager to predict what associations might become established after initiation of a management scenario (van der Valk 1981). However, the cyclic nature of Great Basin wetlands (periodic drought) causes plants to respond to an environmental continuum (Smith and Kadlec 1989). Therefore, experimentation with drawdown dates and times must be monitored to determine which species are best adapted to drawdown dates within a given wetland complex.

Control of Undesirable Plant Associations

Controlled burning, mowing, and herbicide application are techniques that have been used successfully to control herbaceous and woody exotics (e.g. *Tamarix ramosissima*) while promoting native species (Smith and Kadlec 1985, Kadlec and Smith 1989, Taylor 1989). Herbaceous species often outcompete native annual and perennial species by shading germination substrate (Leck 1989). By burning or mowing the competing herbaceous vegetation at the approprite time and saturating the remaining mud flat, succession is set back and plant association structure is altered. This may be a viable alternative for improving the quality of plant associations by reducing abundance of exotic components.

Occasionally, plant associations considered desirable (*Typha* sp. and *Scirpus* sp.) can produce dense stands not conducive to wildlife utilization (Weller and Fredrickson 1974). In these cases, it is often practical to create artificial openings within stands of the association. Smith and Kadlec (1985) observed the effects of mowing and burning on 3 emergent species (*Scirpus maritimus*, *Scirpus acutus*, and *Typha* sp.) and 1 grass (*Distichlis spicata*). *Distichlis spicata* was controlled after burning by flooding the area to > 10 cm; however the emergent species required > 20 cm of flooding after burning or mowing (completely covering remnant shoots) as fires are generally not hot enough to kill belowground parts.

Salt cedar (*T. ramosissima*) requires more aggressive approaches, utilizing combinations of control techniques and multiple applications (Bean 1986). Most researchers agree that complete eradication is probably not economically feasible (Campbell 1966); however, smaller areas can be restored. July burning, followed by 2,4-D application 1 month post burn resulted in 99% mortality of the extant stand (Howard et al. 1983). September or October fires followed by herbicide application were ineffective. With mature stands, chainsawing and stump application of 0.5 to 1.0% 2,4-D resulted in high mortality. Other effective mechanical means include mowing of young stands followed by 2,4-D application, uprooting mature stands with tractor and chain, and root plowing following burn and herbicide application (Bean 1986). In all cases, multiple years of treatment are required for effective results.

More recently, biological controls have been added as a potential control mechanism. A leafhopper species (*Opsius stactagallus*) has shown positive results in controlling *Tamarix* (Gerling and Rugler 1976). This species is host specific and has been reported to cause moderate long-term damage. Several species are currently being monitored but most pilot studies have shown that since salt cedar is fairly unique among plants in life history requirements, insect species tend to damage only Tamarisk (Bean 1986).

Revegetation

Once control measures are advanced, it is important to initiate a revegetation effort to establish native species and provide competition for future salt cedar encroachment. On the Cibola NWR in California, salt cedar eradication was accomplished using a combination of burning and root slashing at 30 cm below the soil surface (Anderson and Ohmart 1982). Immediately following control, quailbush (*Atriplex lentiformis*) was reseeded. Quailbush germinates in the winter when salt cedar is dormant, thus allowing this shrub to become established prior to salt cedar germination.

If supplemental water is available, then it might be more beneficial to restore native riparian components such as cottonwood (*Populus fremontii*) and willow (*Salix* sp) using water level management. At the Bosque del Apache NWR

in west central New Mexico, salt cedar was initially controlled, and subimpoundments were created along the Rio Grande River flood plain (Taylor 1986). Cottonwood and willow poles were augered into the ground and irrigation of the subimpoundments coincided with seed dispersal of remnant mature cottonwood and willow. Salt cedar encroachment was slowed by producing dense cottonwood seed crops and thus, seedlings which competed favorably with germinating salt cedar.

For most native wetland species, supplemental planting is probably unwarranted (Kadlec and Smith 1989). Soil seed banks contain most species which have been established within a given wetland; provision of optimal conditions should be sufficient to promote the establishment of target species defined in management objectives. Exceptions may be longer-lived tree species such as *Populus fremontii* where supplemental plantings greatly increase restortion time frames.

Livestock Grazing

Continuous, growing season-long cattle grazing (practiced throughout the Lahontan Valley) has been shown to be detrimental to native plant vigor, especially in wetland or riparian habitats were water availability concentrates grazing effort (Barker et al. 1990, Cheney et al. 1993). Perennial native grass species (e.g. *Elymus triticoides*) tend to decrease in abundance as they are more palatable to cattle while short grass species (e.g. *Distichlis spicata*) increase in abundance (Archer and Smeins 1991). Ultimately, a shift from tall perennial native grasses to short grass and forb species can be attributed to heavy grazing pressure.

When used as a control mechanism with specific habitat objectives, specialized grazing systems can be used to modify the structure of dense stands of emergent vegetation (Kantrud 1986). High intensity short duration grazing has been used to trample openings in dense emergent associations (Kantrud 1986, Chabrek et al. 1989). Openings provide diversity by promoting germination of annual species. However, considering that grazing control is expensive and logistically impractical given the size of the Lahontan Valley, other management applications would be more compatible with current refuge objectives. Where feasible, livestock control could be gained by fencing smaller critical habitats, to eliminate or control the timing of grazing in known water bird nesting areas.

Management Area Recommendations

Carson River Corridor

Four plant associations were distributed exclusively along the upper Carson River corridor, including three tree (*Populus fremontii/Elymus triticoides*, *Salix exigua*, and *Salix laevigata*), and one transitional shrub (*Artemisia tridentata*). There are presently no controls on some activities which could jeopardize the productivity and quality of these associations, including livestock, agricultural, or firewood use. Land acquisition, exchanges, or easement agreements may be alternatives to explore.

Conversely, it may be possible to encourage establishment of these plant associations along the lower Carson River or Stillwater Slough, segments of which are currently under federal ownership (Stillwater Wildlife Management Area), by retaining instream flow throughout the growing season (providing available water and reducing salinity levels) and supplementing natural growth with artificial plantings. At present, salt cedar (*T. ramosissima*) is

abundant at these areas presenting the added challenge of removing this introduced exotic while promoting establishment of natural cottonwood/willow plant associations. Recommendations for this scenario are included in the revegetation section above.

Several other plant associations might benefit from this practice as well. By restoring or simulating natural riverine hydrology, seasonal or perennial wetlands may appear along the flood plain. For example, the *Phragmites australis* association has been observed along the Truckee River in isolated flood plain wetlands (Rob Bundy, pers. obs.). The *Lemna minor* association was sampled in freshwater habitats and has been observed within the upper Carson River channel. Restoration of instream flow reflecting the natural hydrologic regime could help create a complex of riverine associated wetlands and help promote establishment of many plant associations of concern.

Stillwater National Wildlife Refuge

Stillwater National Wildlife Refuge supports the only sampled occurrences of the *Phragmites australis* association. This association is currently found along the shores of Freeman Pond and Division Lake in saturated and seasonally flooded wetland sites. Preservation of current hydrology (and associated salinity levels) and control or elimination of grazing within these wetland areas should be sufficient to preserve this association.

Less is known about the other rare plant associations present on refuge property. The *Muhlenbergia asperifolia* grass association and the *Sarcobatus vermiculatus/Suaeda moquinii* and *Suaeda moquinii* shrub associations were typically distributed in natural depressions or along the upland break of both seasonal and perennial wetlands. Natural environmental patterns appear to be regulating their distribution. The *Populus fremontii* plant association was sampled along the channel of Stillwater Slough. We can only offer that recommendations provided for retaining and enhancing the *Populus fremontii/Elymus triticoides* plant association along the upper Carson River be extended to include these isolated occurrences.

Stillwater Wildlife Management Area/Indian Lakes

Three plant associations were sampled exclusively within the Indian Lakes area of the Stillwater Wildlife Management area: the *Atriplex lentiformis, Chrysothamnus nauseosus-Tetradymia tetrameres*, and *Eleocharis parishii* associations. The two transitional shrub associations are possibly present throughout the management area, but the wet meadow association, *Eleocharis parishii*, was sampled only within the channel of Vaughn Slough. Therefore, we recommend that the Vaughn slough area of the Wildlife Management Area remain under federal management unless several additional occurrences of the association are discovered in other management areas.

Fallon Paiute Shoshone Indian Reservation

Four rare plant associations were distributed in the Fallon Reservation: the *Elymus triticoides, Eleocharis macrostachya-Bacopa eisenii, Juncus balticus-Eleocharis macrostachya*, and *Scirpus acutus-Typha domingensis* associations. Among management areas, the *Elymus triticoides* association was sampled only on the Fallon Reservation. It was, however, sampled at 6 additional sites outside management areas, and *Elymus triticoides* is a component of the *Populus fremontii/Elymus triticoides* association. Most occurrences of this association that were outside management area boundaries occurred along the various irrigation reservoirs (S-Line in particular), where

grazing pressure is significant; grazing may reduce the quality of these occurrences (Archer and Smeins 1991). We recommend that if grazing is not eliminated, that it be controlled through critical waterfowl nesting and plant establishment periods, by fencing. Cooperation with the Fallon-Paiute tribe and the Truckee Carson Irrigation District (TCID) to control grazing on the Reservation and on irrigation reservoirs where the association occurs will be necessary to better protect the *Elymus triticoides* association.

Carson Lake and Pasture

Carson Lake contains the only documented occurrences of the *Bacopa eisenii* association. This association was distributed throughout wet meadow habitats in the northern section of the area, in shallowly flooded conditions. The association did not appear to tolerate total desiccation. Although located in other management areas or outside management area boundaries, the *Eleocharis macrostachya-Bacopa eisenii* and *Lemna minor* plant associations were represented in the same types of wetland environments. Therefore, wet meadow habitats where these associations are present should be maintained throughout the growing season. Present management appears to be sufficient to preserve these associations.

Areas Outside Management Area Boundaries

Two remaining rare plant associations were sampled exclusively in areas outside management area boundaries: the *Chara* sp. and *Equisetum laevigatum* associations. Only one occurrence of each was sampled within irrigation canals managed by the Truckee Carson Irrigation District. No recommendations can be offered to retain or restore these rare plant associations.

Historically Described Plant Associations not Sampled

Six plant associations that were previously described in the Lahontan Valley were not sampled during the 1993 and 1995 field seasons. These include:

Ceratophyllum demersum Association
Potamogeton nodosus Association
Sagittaria latifolia Association
Typha domingensis-Scirpus maritimus Association
Salicornea europaea Association
Mixed meadow grass Association

All of the diagnostic species for these associations were either sampled (*Potamogeton nodosus, Sagittaria* sp., *Typha domingensis, Scirpus maritimus, Salicornea europaea, Hordeum jubatum, Polypogon monspeliensis, Distichlis spicata*) or observed (*Ceratophyllum demersum*), yet none were abundant enough to be identified as a distinct association. Because this 2-year study was not intended to be a comprehensive inventory of all wetland areas, it is not surprising that some previously-documented associations were not sampled. Because the diagnostic species for these six associations are present, the potential for all historically documented associations to occur exists. By maintaining a diversity of wetland habitats, there is a greater likelihood for these associations to develop given the right set of environmental conditions. Additional inventory of wetland areas, including areas not sampled for this study and under different environmental conditions (sequences of droughts and wet periods) would undoubtedly add to the list of associations known to occur within the Lahontan Valley.

Plant Associations Dominated by Exotics

Of the 44 recently documented plant associations, 7 are dominated by exotic species while several native dominated associations contain exotics. The exotic associations represent 16% of all described associations and accounted for 12% of all sample sites. This degree of presence and dominance by exotic plant species indicates that the Lahontan Valley has experienced high levels of disturbance in the past. We recommend initiation of an exotic plant species eradication program in conjunction with restoration of native species where exotics dominate today.

Summary and Future Research Recommendations

In summary, the following recommendations have been offered to help protect and maintain wetland plant associations within the Lahontan Valley. These include:

1. Maintain or restore instream flow along the Carson River below Lahontan Reservoir (without increasing Truckee River diversions) that simulates, to the extent possible, an unaltered hydrologic regime.
2. As warranted in response to recommendation 1, above, restore riverine plant associations along the lower Carson River by eradicating salt cedar and using supplemental plantings.
3. Evaluate distribution of the *Eleocharis parishii* plant association in the Indian Lakes region of the Stillwater Wildlife Management Area and determine if this association occurs in alternate areas.
4. Cooperate with the Fallon-Paiute Shoshone Reservation and the Truckee Carson Irrigation District to help maintain the *Elymus triticoides* plant association by fencing control of grazing.
5. Recognize the occurrence of critical plant associations on all management areas and incorporate management actions to control exotic and promote native species.
6. As funding allows, conduct additional plant inventory work in areas not sampled during this study and under different environmental settings (e.g., drought versus wet periods).

In addition, three areas where future research efforts may be focused were identified. First, little is known about plant response to management scenarios. Factors such as substrate requirements, timing of water delivery, and responses to grazing pressure must be understood in order to develop informed management strategies. Recommending a comprehensive monitoring program for ongoing management practices would bring some of these responses to light and provide the framework for adaptive management. This information is required to develop successful management practices to promote or control target species and plant associations.

Second, relationships between aquatic invertebrates and plant associations are poorly documented. An introductory effort was conducted in 1995 (Bundy 1996) to identify aquatic invertebrates common to the Lahontan Valley and form preliminary relationships between invertebrates and plants; however, this information is preliminary and needs to be followed with comprehensive studies.

Finally, we are only beginning to understand the relationships between plant associations and wildlife utilization. We must understand the life history strategies of wildlife utilizing the wetlands to determine the timing and abundance of specific wetland types and plant associations that they require. Through this effort, we can begin to understand the complex relationships among these various components, and better manage and preserve the diversity of life which exists among the Lahontan Valley wetlands.

ACKNOWLEDGEMENTS

Financial support for this study was provided by the USFWS Lahontan Valley Wetland Management Program and The Nature Conservancy, Ecosystem Research Program. Refuge personnel including Ron Anglin, Bob Flores, Bill Henry, Don and Anita DeLong, and Gary Shelhorn all provided insight into refuge operations and factors influencing wetland functions in Great Basin wetland complexes. Brooke Wallace of the Nature Conservancy provided the GIS expertise so necessary to a project of this complexity; her GIS maps and products ensured the success of the sampling design and displayed the results beautifully. Several other individuals also contributed to the success of this project. We would like to thank Jan Nachlinger, Lisa Engelking, Cathy Porter, Graham Chisholm, Maria Denzler, and Steve Hobbs of The Nature Conservancy, for providing technical support and editorial review; Jerry Tiehm and Belinda Love (UNR Herbarium) for their contributions in identification and verification of vegetative specimens collected; Norm Saake of the Nevada Dividion of Wildlife for his insight on Carson Lake; and the field teams in 1993 (Catherine Glass and Jackie Picciani) and 1995 (James "Ernie" Thompson, Ingrid Hogel, Judy Logback, and Jackie Picciani) for the extra effort expended to complete various tasks, vital to project completion. Special thanks go to Ernie Thompson for spending long hours sorting through and analyzing soil samples and to Jackie Picciani, for working on this project both years; all for "the love of the valley".

REFERENCES CITED

Anderson, B.W. and R.D. Ohmart. 1976. A vegetation management study for the enhancement of wildlife along the lower Colorado River. Center for Environmental Studies, Arizona State Univ., Tempe, AZ. Unpublished Paper.

Archer, S., and F.E. Smeins. 1991. Ecosystem level processes. Pages 109-131 In R.K. Heitschmidt and J.W. Stuth (eds.) Grazing Management: An Ecological Perspective. Timber Press, Portland, OR. 259pp.

Austin, M.P., and P.C. Heyligers. 1989. Vegetation survey design for conservation: gradsect sampling of forests in north-eastern New South Wales. Biological Conservation 50:13-32.

Badger, K.S. and I.A. Ungar. 1989. The effects of salinity and temperature on the germination of the inland halophyte *Hordeum jubatum*. Can. J. Bot. 67:1420-1425.

Bailey, V. 1898. Physiography, Nevada: Carson Lake Valley (Wadsworth, Ragtown and Stillwater). Handwritten notes. Smithsonian Institution Archives, Record Unit 7176, U.S. Fish and Wildlife Service, 1860-1961, Field Reports, Box 69, Folder 14, Washington, D.C. 3 pp.

Barber, M.J. 1976. Stillwater Management Area: Report of wildlife management study; monitoring program of wildlife habitat and associated use in the Truckee-Carson Irrigation District, Nevada. Progress Report Number 4 (1975). U.S. Department of Interior, Fish and Wildlife Service, Fallon, NV. 31 pp.

Barber, M.J. 1977. Stillwater Management Area: Report of wildlife management study; monitoring program of wildlife habitat and associated use in the Truckee-Carson Irrigation District, Nevada. Progress Report Number 5 (1976). U.S. Department of Interior, Fish and Wildlife Service, Fallon, NV. 31 pp.

Barker, W.T., K.K. Sedivec, T.A. Messmer, K.F. Higgins, and D.R. Hertel. 1990. Effects of specialized grazing systems on waterfowl production in southcentral North Dakota. Trans. N. Am. Wildl. and Nat. Resour. Conf. 55:462-474.

Bean, C. 1986. Element Stewardship Abstract for *Tamarix ramosissima* - salt cedar. The Nature Conservancy. 19pp.

Belbin, L. 1990. PATN: Pattern Analysis Package. Division of Wildlife and Ecology, CSIRO, Australia.

Billings, W.D. 1945. The plant associations of the Carson Desert Region, western Nevada. Butler University Botanical Studies 7:89-123

Bourgeron, P.S., and L.D. Engelking, editors. 1994. A Preliminary Vegetation Classification of the Western United States. The Nature Conservancy, Western Heritage Task Force, Boulder, CO.

Bourgeron, P.S., H.C. Humphries, and M.E. Jensen. 1994. General sampling design considerations for landscape evaluation. Pages 109-120 In M.E. Jensen and P.S. Bourgeron, editors. Volume II: Ecosystem Management: Principles and Applications. Pacific Northwest Research Station, Portland, OR, USDA Forest Service General Technical Report PNW-GTR-318.

Bourgeron, P.S., DeVelice, R.L., Engelking, L.D., Jones, G., and E. Muldavin. 1991. WHTF site and community survey manual. Version 91C. Unpublished manual prepared by Western Heritage Task Force, The Nature Conservancy, Boulder Co.24pp.

Bourgeron, P.S., Engelking, L.D., Humphries, H.C., Muldavin, E. and W.H. Moir. 1995. Assessing the conservation value of the Gray Ranch: Rarity, diversity, and representativeness. Desert Plants 11:1-67.

Bundy, R.M. 1996. Invertebrates resources in the Lahontan Valley wetlands. Report prepared for the USFWS Stillwater NWR.

Campbell, C.J. 1966. Periodic mowings suppress tamarisk growth and increase forage for browsing. U.S. For. Serv. Research Note. RM 76. 4pp.

Chabrek, R.H., T. Joanen, and S.L. Paulus. 1989. Southern coastal marshes and lakes. Pages 249-277 In L.M. Smith, R.L. Pederson, and R.M. Kaminski (eds.) Habitat Management for Migrating and Wintering Waterfowl in North America. Texas Tech Univ. Press, Lubbock, TX.

Cheney, E., W. Elmore, and W.S. Platts. 1993. Managing change: livestock grazing in western riparian areas. N.W. Resourc. Info. Center. 31pp.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Service, Biological Services Program, FWS/OBS-79/31.

Department of the Navy. 1990. Geothermal development, Naval Air Station Fallon. Volume I, programmatic environmental impact statement. Geothermal Program Office, unpublished report, on file at Naval Air Station, Fallon, NV. 213 pp.

DeQuille, D. (W. Wright). 1963. Washoe Rambles. Westernlore Press, Los Angeles. CA.

DeVelice, R.L., G.J. Daumiller, P.S. Bourgeron, and J.O. Jarvie. 1993. Bioenvironmental representativeness of nature preserves: assessment using a combination of GIS and a rule-based model. Pages 51-58. Proceedings of the First Biennial Scientific Conference on the greater Yellowstone ecosystem, September 1992. National Park Service, Mammoth, WY.

Dobrowski J.P., M.M. Caldwell and J.H. Richards. 1991. Basin hydrology and plant root systems. In: Plant Biology of the Basin and Range. Osmond, C.B., L.F. Pitelka, and G.M. Hidy (eds). Ecological Studies Analysis and Synthesis Volume 80. Springer-Verlag.

Donohue, B.L. 1993. Preliminary descriptions of wetland plant communities of Lahontan Valley, western Nevada. U.S. Fish and Wildlife Service, Stillwater National Wildlife Refuge, Fallon, NV.

____ and J.V. Baumgartner. 1995. An ecological classification of plant associations in the Lahontan Valley, Nevada. Report prepared for the USWS Stillwater NWR. 39pp. plus appendices.

Ehleringer, J.R. 1984. Intraspecific competitive effects on water relations, growth and reproduction in Encelia farinosa. Oecologia 63:153-158.

Federal Interagency Report. 1989. Wetlands Identification. Government Institutes, Inc. Rockville, MD.

Fredrickson, L.H. and T.S. Taylor. 1982. Management of seasonally flooded impoundments for wildlife. U.S. Fish Wildl. Serv., Resour. Pub. 148. 29pp.

Freeman, D.C., L.G. Klikoff, and K.T. Harper. 1976. Differential resource utilization by the sexes of dioecious plants. Science 193:597-599.

Fremont, J.C. 1845. In: Spence M.L. and D. Jackson (eds) The Expeditions of John Charles Fremont, Volume 2, Supplement, proceedings of the court-martial. 1973. University of Illinois Press, Urbanna, IL.

Gerdes, G.L. 1986. Carson Lake, submerged aquatic plant survey, Fallon, Nevada. U.S. Fish and Wildlife Service, unpublished report on file at Stillwater National Wildlife Refuge, Fallon, NV. 13 pp.

Gerling, D. and J. Rugler. 1976. Natural enemies and the prospects of biological control of *Tamarix* sp. Proc. IV International Symp. on Biol. Control of Weeds.

Giles, L.W. 1953. Loss of cattail and bulrush in the Stillwater Marsh outside the Nutgrass unit. Special report, U.S. Department of the Interior, Fish and Wildlife Service, Fallon, NV. 7 pp.

Gillison, A.N., and K.R.W. Brewer. 1985. The use of gradient directed transects or gradsects in natural resource survey. Journal of Environmental Management 20:103-127.

Howard, S.W., A.E. Dirar, J.O. Evans, and F.D. Prorenza. 1983. The use of herbicides and/or fire to control salt cedar (*Tamarix*). Proc. West. Soc. Weed Sci. 36:65-72.

Jackson J.A. and D.T. Patten. 1988. Plant-soil-water relationships in Las Vegas wash. United States Department of the Interior, Bureau of Reclamation. REC-ERC-88-4.

Kadlec, J.A. and L.M. Smith. 1989. The Great Basin Marshes. Pages 451-474 In L.M. Smith, R.L. Pederson, and R.M. Kaminski (eds.) Habitat Management For Migrating and Wintering Waterfowl in North America. Texas Tech Univ. Press, Lubbock, TX.

_____ and _____. 1984. Marsh plant establishment on newly flooded salt flats. Wildl.Soc. Bull. 12:388-394.

Kantrud, H.A. 1986. Effects of vegetation manipulation on breeding waterfowl on prairie wetlands - a literature review. U.S. Fish Wildl. Tech. Rep. 3. 15pp.

Leck, M.A. 1989. Wetland seed banks. Pages 283-305 In M.A. Leck, V.T. Parker, and R.L. Simpson (eds.) Ecology of Soil Seed Banks. Academic Press Inc. San Diego, CA. 444pp.

Macklin, R., E.D. Stetson, and H.R. Leach. 1960. Wildlife and fishery use made of drainage waters in Nevada. Unpublished paper, on file at Stillwater National Wildlife Refuge, Fallon, NV. 5 pp. + 2 tables.

Manning, M. 1990. Northern region riparian, aquatic, and wetland sampling procedure guide. USDA Forest Service, Region I. Draft.

Marshall, D.B. 1949. Stillwater Wildlife Management Area, Churchill County, Nevada: A biological investigation of the Stillwater Wildlife Management Area, June 7, 1949 to September 16, 1949. U.S. Department of the Interior, Fish and Wildlife Service, Fallon, NV. 50 pp. + maps.

_____. 1952. Habitat types of the Stillwater Marsh and their value to nesting ducks with reference to future management. U.S. Department of Interior, Fish and Wildlife Service, Fallon, NV.

Mitsch W.J. and J.G. Gosselink. 1992. Wetlands. Van Nostrand Reinhold Company, New York.

Monroe, E.B. 1867. Plate map of Carson Lake. On File at Stillwater National Wildlife Refuge, Fallon, NV. 1 plate.

Nachlinger, J. 1993. Stillwater Marsh and Lahontan Valley wetlands literature review. The Nature Conservancy, Reno, NV.

Nelson, N.F. 1954. Factors in the development and restoration of waterfowl habitat at Ogden Bay Refuge, Weber County, Utah. Utah Div. Fish and Game Pub., Salt Lake City, Utah. 87pp.

Osugi, C.T. 1973. Stillwater Wildlife Management Area: Report of wildlife management study; Monitoring program of wildlife habitat and associated use in the Truckee-Carson Irrigation District, Nevada. Progress Report No. 1 (1972). U.S. Department of Interior, Fish and Wildlife Service, Fallon, NV. 45 pp. + 6 maps.

_____. 1974. Stillwater Wildlife Management Area: Report of wildlife management study; Monitoring program of wildlife habitat and associated use in the Truckee-Carson Irrigation District, Nevada. Progress Report No. 2 (1973). U.S. Department of Interior, Fish and Wildlife Service, Fallon, NV. 49 pp. + 6 maps.

Osugi, C.T., and M.J. Barber. 1976. Stillwater Wildlife Management Area: Report of wildlife management study; Monitoring program of wildlife habitat and associated use in the Truckee-Carson Irrigation District, Nevada. Progress Report No. 3 (1974). U.S. Department of Interior, Fish and Wildlife Service, Fallon, NV. 29 pp.

Padgett, W.G. 1990. Riparian community type classification for the Humboldt and Toiyabe National Forests, Nevada and eastern California. USDA Forest Service, Intermountain Region. Draft.

Reid, M.S., and P.S. Bourgeron. 1993. Vegetation survey design for conservation: gradient directed transects of riparian communities in northwestern Colorado. Unpublished report prepared for The Nature Conservancy, Western Heritage Task Force, Boulder, CO.

Simpson, J.H. 1876. Report of explorations across the Great Basin of the Territory of Utah for a direct wagon-route from Camp Floyd to Genoa, in Carson Valley, 1859. U.S. Army, Engineer Department, Washington, D.C. Reprinted by the University of Nevada Press, Reno NV, 1983.

Smith, L.M. and J.A. Kadlec. 1985. Comparisons of prescribed burning and cutting of Utah marsh plants. Great Basin Nat. 45:462-466.

_____ and _____. 1986. Habitat management for wildlife in marshes of Great Salt Lake. Trans. N. Am. Wildl. and Nat. Resour. Conf. 51:222-231.

Smith, S.D. and R.S. Nowak. 1990. Ecophysiology of plants in the Intermountain lowlands. In: Osmond, C.B., Pitelka, L.F. and G.M. Hidy (eds), Plant Biology of the Basin and Range. Ecological Studies Analysis and Synthesis. Volume 80.

Snyder, C.T. 1962. A hydrologic classification of valleys in the Great Basin, western United States. Bulletin of the International Association of Scientific Hydrology 7:53-59.

Soil Conservation Service. 1975. Soil Survey Fallon-Fernley Area, Nevada. Parts of Churchill, Lyon, Storrey and Washoe Counties. U.S. Department of Agriculture and U.S. Department of Interior.

Sperry, C.C. 1929. Report on Carson Sink (Churchill Co,.) Nevada: Its duck food resources and value as a federal migratory bird refuge site. Unpublished report, Smithsonian Institute Archives, Washington, D.C. 3 pp. + maps.

Sutherland, D.E. 1957. Estimated water requirements, Stillwater Wildlife Management Area. Unpublished paper, on file at Stillwater National Wildlife Refuge. Fallon, NV.

Taylor, J.P. 1989. Marsh and water management plan: Bosque del Apache NWR. USFWS internal report. 22pp.

ter Braak, C.J.F. 1987. CANOCO—a FORTRAN program for community ordination by [partial] [detrended] [canonical] correspondence analysis, principal components analysis and redundancy analysis. Version 2.1. ITI-TNO, Wageningen, The Netherlands.

ter Braak, C.J.F. 1990. Update notes: CANOCO version 3.10. Agricultural Mathematics Group, Wageningen, The Netherlands.

Thien, S.J. 1979. Determining soil texture classes using the "feel method". Journal Agronomy Education.

U.S. Fish and Wildlife Service. 1986. The effects of federal programs on wetlands in Nevada. Unpublished report, U.S. Fish and Wildlife Service, Great Basin Complex, Reno, NV. 46 pp.

van der Valk, A.G. 1981. Succession in wetlands: a Gleasonion approach. Ecology 62:688-696.

Young, F.J., III. 1992. Spatial variability within soil survey map units. M.S. Thesis. Univ. of Missouri, Columbia. 200pp.

Young J.A., R.A Evans, B.A. Roundy, and J.A. Brown. 1986. Dynamic landforms and plant communities in a pluvial lake basin. Great Basin Naturalist 46:1-21.

Table 1: Bioenvironments in the Lahontan Valley by wetland type [**form** (riverine, lacustrine, palustrine); **hydrologic source** (natural, altered); **hydrologic periodicity** (ephemeral, perennial)] and soil series.

Wetland Symbol	Wetland Description	Soil[1] Symbol	Soil Series Description
LAe	Lacustrine Altered ephemeral	**A1**	Alluvial
LAp	Lacustrine Altered perennial	**A2**	Appian
LNe	Lacustrine Natural ephemeral	**B1**	Badland
LNp	Lacustrine Natural perennial	**B2**	Bango-Stubble
		B3	Biddleman
PAe	Palustrine Altered ephemeral	**B4**	Bunejug
PAp	Palustrine Altered perennial	**C1**	Carcity
PNe	Palustrine Natural ephemeral	**C2**	Carson
PNp	Palustrine Natural perennial	**C3**	Carson-Stillwater
		C4	Churchill-Playa
RA	Riverine Altered	**D1**	Dia
RN	Riverine Natural	**D2**	Dithod
		D3	Dune
		E1	East Fork
		E2	Erber
		F1	Fallon
		F2	Fernley
		H1	Hooten-Bango
		L1	Lahontan
		L2	Lake Bottom
		M1	Marsh
		P1	Parran
		P2	Pellic
		P3	Playa
		R1	Ragtown
		R2	River Bottom
		S1	Sagouspe
		S2	Soda Lake
		S3	Stillwater
		S4	Swingler
		S5	Swope
		T1	Tipperary
		W1	Weishaupt

[1] Soil symbol may stand for several phases of a particular series (e.g. A2 = Appian but includes Appian sandy loam, wet; Appian sandy loam, clay substratum; and Appian fine sandy loam).

Table 2: Distribution of 14,200 grid points among 178 bioenvironments actually occurring and percent areal representation of each wetland type.

Soil Series	Wetland Cell Type									
	LAe	LAp	LNe	LNp	PAe	PAp	PNe	PNp	RA	RN
Alluvial	-----	-----	-----	-----	-----	-----	1	-----	1	37
Appian	-----	14	84	6	19	5	133	51	82	29
Badland	-----	-----	3	-----	-----	-----	1	1	3	-----
Bango-stumble	-----	-----	-----	-----	-----	-----	1	1	1	2
Biddleman	-----	-----	-----	-----	-----	-----	2	-----	3	-----
Bunjug	-----	2	-----	-----	14	2	39	14	36	12
Carcity	-----	-----	-----	-----	-----	-----	1	-----	6	-----
Carson	-----	-----	-----	-----	9	1	18	8	72	6
Carson-Stillwter	4	26	21	-----	76	44	47	12	52	-----
Churchill-Playa	-----	2	2	-----	1	-----	1	1	3	-----
Dia	-----	-----	-----	-----	6	4	22	25	108	34
Dithod	-----	-----	-----	-----	-----	-----	2	3	8	5
Dune	-----	-----	178	5	2	-----	2	1	-----	3
East Fork	-----	-----	-----	-----	2	-----	12	5	29	7
Erber	-----	1	-----	-----	38	7	72	10	28	2
Fallon	-----	-----	-----	-----	4	2	3	11	24	-----
Fernley	-----	-----	-----	-----	2	1	5	2	35	6
Hooten-Bango	-----	-----	-----	-----	-----	-----	5	-----	-----	-----
Lahontan	54	-----	-----	-----	370	67	31	-----	20	2
Lake Bottom	39	604	771	31	141	50	50	17	4	13
Marsh	162	312	17	-----	394	446	85	36	15	1
Parran	3	6	20	-----	4	-----	22	-----	18	17
Pellic	-----	-----	10	-----	160	3	53	17	4	2
Playa	44	25	7,127	-----	49	-----	38	-----	74	19
Ragtown	-----	1	-----	-----	3	-----	6	-----	7	5
River Bottom	-----	-----	-----	-----	-----	-----	1	-----	-----	2
Sagouape	-----	1	-----	-----	8	1	11	6	48	8
Soda Lake	-----	-----	-----	4	-----	-----	28	1	13	1
Stillwater	-----	-----	-----	-----	3	5	26	11	26	1
Swingler	-----	-----	-----	-----	-----	-----	1	-----	1	-----
Swope	-----	-----	-----	-----	1	-----	2	-----	4	-----
Tipperary	3	58	168	5	41	3	282	73	97	40
Weishaupt	-----	-----	-----	-----	-----	-----	-----	-----	14	-----
TOTAL: 14,200	309	1,052	8,401	51	1,347	641	1003	306	836	254
% OF TOTAL: 100.0	2.2	7.4	59.1	0.4	9.5	4.5	7.1	2.1	5.9	1.8

Table 3: Information collected for different sampling formats incorporated in the 1995 survey[1].

INFORMATION TYPE	PLOT	POINT
SITE		
Bioenvironment	+	+
Date	+	+
Elevation	+	+
GPS Location	+	+
Quad Map	+	+
Directions	+	+
Site Description	+	+
VEGETATION		
Plant Community Occurrence	+	+
Species Occurrence	+	+
Species Canopy Cover	+	+
Dominant Life Form	+	+
Life Form Canopy Coverpy cover	+	-
Life Form Height	+	-
INVERTEBRATES (If standing water depth > 5 cm)		
Family Occurrence	+	+
Count by Family	+	+
Water pH	+	+
Water Electrical Conductivity	+	+
GEOLOGY		
Parent Material	+	+
Landform	+	+
Plot Position	+	+
SOIL FEATURES		
Soil Taxon	+	+
pH	+	+
Electrical Conductivity	+	+
Sodium Adsorption Ratio	+	-
Soil Pit	+	-
Horizonization	+	-
Texture	+	-
Structure	+	-
Color	+	-
Fragments	+	-
Redoximorphic Features	+	-
HYDROLOGY		
Distance From Water	+	+
Surface Water % Cover	+	+

[1] + = data collected, - = data not collected.

Water Depth	+	+

TABLE 3 (cont.)

INFORMATION TYPE	PLOT	POINT
GROUND COVER		
% Bare Soil	+	+
% Gravel	+	+
% Rock	+	+
% Litter	+	+
% Wood	+	+
% Moss	+	+
% Basal Vegetation	+	+
% Other (typically water)	+	+
Ground Cover Disturbance	+	+
Animal Use Evidence	+	+
SLOPE (If slope occurred)		
Slope %	+	+
Slope Shape	+	+
Slope Length	+	+
Horizon Angle	+	+
Aspect	+	+
RIPARIAN FEATURES [If riverine altered (RA) or natural (RN)]		
Bankful Channel Width	+	+
Channel Entrenchment	+	+
Bankful Channel Depth	+	+
Valley Floor Gradient	+	+
Floodplain Width	+	+
Channel Bed Material	+	+
CONSERVATION RANKINGS		
Quality	+	-
Condition	+	-
Viability	+	-
Defensibility	+	-
Rank	+	-
Threats	+	-
Management	+	-
Protection	+	-

Table 4: Allocation of 1,012 sample sites based on 10 wetland types and 33 soil series for combined 1993 and 1995 sampling efforts. Number in parentheses represents alloted grid points while the second number is the actual samples collected.

Soil Series	Wetland Cell Type									
	LAe	LAp	LNe	LNp	PAe	PAp	PNe	PNp	RA	RN
Alluvial	-----	-----	-----	-----	-----	-----	(16) 1	-----	(1) 1	(3) 3
Appian	-----	(2) 1	(9) 10	(1) 2	(2) 3	(1) 0	(16) 18	(8) 9	(9) 9	(3) 3
Badland	-----	-----	(1) 1	-----	-----	-----	(1) 1	-----	(1) 1	(1) 1
Bango-stubble	-----	-----	-----	-----	-----	-----	-----	-----	(1) 1	-----
Biddleman	-----	-----	-----	-----	-----	-----	(1) 1	-----	(1) 1	-----
Bunjug	-----	(1) 1	-----	-----	(2) 3	(1) 1	(3) 2	(2) 2	(4) 3	(2) 2
Carcity	-----	-----	-----	-----	-----	-----	(1) 1	-----	(1) 0	-----
Carson	-----	(1) 1	-----	-----	(1) 2	(1) 1	(2) 1	(1) 1	(8) 8	(1) 2
Carson-Stillwtr	(1) 1	(2) 3	(2) 2	-----	(7) 5	(4) 5	(5) 4	(2) 2	(5) 4	-----
Churchill-Playa	-----	(1) 2	(1) 2	-----	(1) 1	-----	(1) 1	(1) 1	(1) 1	-----
Dia	-----	-----	-----	-----	(1) 1	(1) 1	(2) 3	(3) 5	(12) 9	(1) 4
Dithod	-----	-----	-----	-----	-----	-----	(2) 2	(1) 3	(1) 1	(1) 1
Dune	-----	-----	(20) 21	(2) 1	(1) 1	-----	(1) 1	(1) 1	-----	(1) 1
East Fork	-----	-----	-----	-----	(1) 1	-----	(2) 2	(1) 1	(2) 1	(1) 1
Erber	-----	(1) 1	-----	-----	(4) 8	(1) 1	(8) 4	(2) 3	(2) 3	(1) 1
Fallon	-----	-----	-----	-----	(1) 1	(1) 1	(1) 1	(2) 1	(2) 1	-----
Fernley	-----	-----	-----	-----	(1) 1	(1) 1	(1) 1	(1) 1	(4) 4	(1) 2
Hooten-Bango	-----	-----	-----	-----	-----	-----	(1) 1	-----	-----	-----
Lahontan	(4) 7	-----	-----	-----	(39) 40	(6) 6	(3) 3	-----	(2) 1	(1) 1
Lake Bottom	(60) 42	(60) 46	(90) 52	(7) 7	(4) 6	(4) 6	(5) 10	(2) 2	(1) 1	(2) 2
Marsh	(15) 18	(31) 26	(2) 1	-----	(42) 26	(40) 33	(10) 6	(3) 6	(1) 2	(1) 2
Parran	(1) 1	(1) 1	(1) 1	-----	(1) 0	-----	(2) 1	-----	(1) 2	(2) 2
Pellic	-----	-----	(1) 1	-----	(16) 16	(1) 1	(5) 5	(2) 2	(1) 1	(1) 0
Playa	(4) 5	(2) 2	(200) 158	(3) 2	(4) 4	-----	(3) 2	-----	(8) 7	(2) 2
Ragtown	-----	(1) 1	-----	-----	(1) 1	-----	(1) 1	-----	(1) 1	(1) 1
River Bottom	-----	-----	-----	-----	-----	-----	(1) 1	-----	-----	(1) 1
Sagouspe	-----	(1) 1	-----	-----	(1) 1	(1) 1	(2) 1	(1) 1	(5) 5	(1) 1
Soda Lake	-----	-----	-----	(1) 1	-----	-----	(2) 2	(1) 0	(1) 1	(1) 0
Stillwater	-----	-----	-----	-----	(1) 1	(1) 1	(1) 2	(2) 0	(2) 1	(1) 0
Swingler	-----	-----	-----	-----	-----	-----	(1) 0	-----	(1) 1	-----
Swope	-----	-----	-----	-----	(1) 1	-----	(1) 1	-----	(1) 1	-----
Tipperary	(1) 1	-----	(20) 4	(2) 3	(4) 4	(1) 1	(34) 24	(10) 13	(10) 9	(4) 3
Weishaupt	-----	-----	-----	-----	-----	-----	-----	-----	(1) 1	-----

Table 5. Currently present (in **bold**) and historically documented (marked with (H)) plant associations, in the Lahontan Valley. Native plant associations are marked with an (N) preceding association name while exotic dominated associations are marked with an (E).

1. Tree and Tall Shrub Communities: 5 Plant Associations

   E ***Elaeagnus angustifolia* Association**
   N ***Populus fremontii* Association (H)**
   N ***Populus fremontii/Elymus triticoides* Association**
   N ***Salix exigua* Association**
   N ***Salix laevigata* Association**

2. Wetland Shrub Communities: 5 Plant Associations

   N ***Allenrolfea occidentalis* Association (H)**
   N ***Sarcobatus vermiculatus* Association (H)**
   N ***Sarcobatus vermiculatus-Psorothamnus polydenius* Association**
   N ***Sarcobatus vermiculatus/Suaeda moquinii* Association**
   N ***Suaeda moquinii* Association**

3. Transitional (Upland) Shrub Communities: 3 associations

   N ***Artemisia tridentata* Association (H)**
   N ***Atriplex lentiformis* Association**
   N ***Chrysothamnus nauseosus-Tetradymia tetrameres* Association**

4. Tall Graminaceous (Emergent) Communities: 9 Plant Associations

   N ***Equisetum laevigata* Association**
   N ***Phragmites australis* Association (H)**
   N ***Scirpus acutus* Association (H)**
   N ***Typha domingensis-Scirpus acutus* Association**
   N ***Scirpus maritimus* Association (H)**
   N *Scirpus maritimus-Typha domingensis* Association (H)
   N ***Scirpus pungens* Association (H)**
   N ***Typha domingensis* Association (H)**
   N ***Typha latifolia* Association (H)**

5. Low Graminaceous (Wet Meadow) Communities: 5 Plant Associations

   N ***Eleocharis macrostachya* Association (H)**
   N ***Eleocharis macrostachya-Bacopa eisenii* Association**
   N ***Eleocharis parishii* Association**
   N ***Juncus balticus* Association (H)**
   N ***Juncus balticus-Eleocharis macrostachya* Association**

6. Grass Communities: 5 Plant Associations

   N ***Distichlis spicata* Association (H)**
   N ***Juncus balticus-Distichlis spicata* Association**
   N ***Elymus triticoides* Association (H)**
   N Mixed Meadow Grass Association (H)
      Distichlis spicata
      Hordeum jubatum
      Polypogon monspeliensis
   N ***Muhlenbergia asperifolia* Association**

Table 5 (cont.)

7. Submerged Aquatic Communities: 9 Plant Associations

N ***Bacopa eisenii* Association (H)**
N ***Chara sp.* Association (H)**
N ***Lemna minor* Association**
N ***Ruppia maritima* Association (H)**
N ***Potamogeton latifolia* Association**
N *Potamogeton nodosus* Association (H)
N ***Potamogeton pectinatus* Association (H)**
N *Sagittaria latifolia* Association (H)
N ***Zannichellia palustris* Association (H)**

8. Disturbed Herbaceous and Exotic Communities: 8 Plant Associations

E ***Bassia hyssopifolia* Association (H)**
N ***Bidens frondosa* Association**
E ***Chenopodium glaucum* Association**
E ***Kochia scoparia* Association**
E ***Lactuca serriola* Association**
N *Salicornia europaea* Association (H)
E ***Tamarix ramossisima* Association**
E ***Trifolium fragiferum* Association**

9. Agricultural and Unclassified Sites

***Medicago sativa* Agricultural Fields**
***Zea mays* Agricultural Fields**
No Vegetation
Unclassified Communities

Table 6: Distribution of plant associations in the Lahontan Valley organized by electrical conductivity and vegetative lifeform. Presented data are from 1995 samples only.

Plant Association	EC ± SD	Maximum	Minimum
Tree Communities			
Elaeagnus angustifolia	12.30 ± 15.0	22.9	1.7
Populus fremontii/ Elymus triticoides	9.70 ± 5.1	13.7	2.1
Salix laevigata	2.86 ± 1.1	4.2	1.3
Populus fremontii	2.09 ± 2.1	3.1	0.3
Salix exigua	0.85 ± 0.4	1.1	0.6
Shrub Communities			
Allenrolfea occidentalis	45.61 ± 35.2	127.0	22.2
Suaeda moquinii	33.83 ± 24.0	50.0	16.0
Sarcobatus vermiculatus- Suaeda moquinii	28.72 ± 12.1	37.3	1.3
Sarcobatus vermiculatus	15.60 ± 13.6	40.0	1.6
Sarcobatus vermiculatus- Psorothamnus polydenius	1.50 ± 0.1	1.6	1.4
Transitional (Upland) Shrub Communities			
Artemisia tridentata	12.80 ± n/a	12.8	12.8
Atriplex lentiformis	6.70 ± n/a	6.7	6.7
Chyrysothamnus nauseosus- Tetradymia tetrameres	1.15 ± 0.6	1.6	0.7
Low Graminaceous Communities			
Juncus balticus	7.19 ± 6.1	40.7	0.9
Juncus balticus- Eleocharis macrostachya	6.34 ± 5.5	21.5	1.0
Eleocharis macrostachya	5.03 ± 9.4	32.0	1.3
Eleocharis macrostachya- Bacopa eisenii	2.53 ± 0.6	2.7	1.6
Eleocharis parishii	2.30 ± n/a	2.3	2.3
Grass Communities			
Distichlis spicata	19.35 ± 19.4	83.0	1.2
Juncus balticus- Distichlis spicata	6.46 ± 6.2	32.0	0.6
Elymus triticoides	6.01 ± 3.3	15.7	0.6
Muhlenbergia asperifolia	4.75 ± 4.6	8.0	1.0
Disturbed Herbaceous and Exotic Communities			
Lactuca serriola	16.10 ± 11.1	29.0	7.0
Bassia hyssopifolia	13.50 ± 14.1	78.0	0.5
Tamarix ramossisima	8.40 ± 12.1	61.0	0.2
Bidens frondosa	6.50 ± n/a	6.5	6.5
Kochia scoparia	5.00 ± 5.9	18.0	1.1
Chenopodium glaucum	2.70 ± n/a	2.7	2.7
Trifolium fragiferum	1.86 ± 1.6	8.0	0.8

Table 6 (cont.)

Plant Association	EC ± SD	Maximum	Minimum
Emergent Communities			
Equisetum laevigatum	11.00 ± n/a	11.0	11.0
Scirpus pungens	7.23 ± 6.1	24.0	2.7
Typha latifolia	6.81 ± 6.0	16.8	0.8
Typha domingensis	6.64 ± 2.8	8.0	0.8
Scirpus maritimus	6.45 ± 2.2	10.1	3.4
Scirpus acutus	3.43 ± 3.1	9.0	0.9
Phragmites australis	3.28 ± 0.3	3.4	3.0
Scirpus acutus-Typha domingensis	2.55 ± 2.2	5.6	0.6
Aquatic Communities			
Ruppia maritima	13.51 ± 6.2	26.0	5.2
Potamogeton pectinatus	9.67 ± 4.6	13.0	3.3
Chara sp.	7.10 ± n/a	7.1	7.1
Potamogeton filiformis ssp. latifolia	6.71 ± 7.1	26.0	1.2
Zanichellia palustris	5.12 ± 3.2	10.0	1.6
Lemna minor	3.11 ± 3.2	7.0	1.4
Bacopa eisenii	2.77 ± 0.1	2.9	2.7
Unclassified Communities			
No Vegetation	51.28 ± 40.0	221.0	0.5
Unclassified	18.30 ± 10.1	38.0	0.4

Table 7: Distribution of plant associations in the Lahontan Valley organized by standing water depth (m) and vegetative lifeform. Data are from 1995 samples only.

Plant Association	Standing water depth ± SD	Maximum	Minimum
Tree Communities			
Salix exigua	0.64 ± 0.41	1.10	0.20
Salix laevigata	0.41 ± 0.55	0.90	0.00
Elaeagnus angustifolia	0.23 ± 0.12	0.40	0.00
Populus fremontii	0.00 ± 0.00	0.00	0.00
Populus fremontii/ Elymus triticoides	0.00 ± 0.00	0.00	0.00
Shrub Communities			
Allenrolfea occidentalis	0.01 ± 0.05	0.10	0.00
Sarcobatus vermiculatus	0.01 ± 0.02	0.10	0.00
Sarcobatus vermiculatus- Psorothamnus polydenius	0.00 ± 0.00	0.00	0.00
Sarcobatus vermiculatus- Suaeda moquinii	0.00 ± 0.00	0.00	0.00
Suaeda moquinii	0.00 ± 0.00	0.00	0.00
Transitional (Upland) Shrub Communities			
Atriplex lentiformis	0.00 ± 0.00	0.00	0.00
Artemisia tridentata	0.00 ± 0.00	0.00	0.00
Chyrysothamnus nauseosus- Tetradymia tetrameres	0.00 ± 0.00	0.00	0.00
Low Graminaceous Communities			
Eleocharis macrostachya- Bacopa eisenii	0.13 ± 0.04	0.15	0.10
Eleocharis macrostachya	0.11 ± 0.10	0.30	0.00
Juncus balticus	0.10 ± 0.16	0.50	0.00
Juncus balticus- Eleocharis macrostachya	0.08 ± 0.11	0.15	0.00
Eleocharis parishii	0.00 ± 0.0	0.00	0.00
Grass Communities			
Distichlis spicata	0.02 ± 0.07	0.25	0.00
Juncus balticus- Distichlis spicata	0.01 ± 0.02	0.05	0.00
Muhlenbergia asperifolia	0.00 ± 0.00	0.00	0.00
Elymus triticoides	0.00 ± 0.00	0.00	0.00
Disturbed Herbaceous and Exotic Communities			
Tamarix ramossisima	0.24 ± 0.37	1.50	0.00
Bassia hyssopifolia	0.01 ± 0.05	0.20	0.00
Lactuca serriola	0.00 ± 0.00	0.00	0.00
Trifolium fragiferum	0.00 ± 0.00	0.00	0.00
Chenopodium glaucum	0.00 ± 0.00	0.00	0.00
Kochia scoparia	0.00 ± 0.00	0.00	0.00
Bidens frondosa	0.00 ± 0.00	0.00	0.00

Table 7 (cont.)

Plant Association	Standing water depth ± SD	Maximum	Minimum
Emergent Communities			
Equisetum laevigatum	0.40 ± 0.00	0.40	0.40
Scirpus pungens	0.28 ± 0.31	0.70	0.00
Scirpus acutus	0.19 ± 0.13	0.50	0.00
Phragmites australis	0.17 ± 0.29	0.50	0.00
Typha latifolia	0.16 ± 0.13	0.45	0.00
Typha domingensis	0.16 ± 0.16	0.40	0.00
Scirpus acutus-Typha domingensis	0.16 ± 0.14	0.30	0.00
Scirpus maritimus	0.10 ± 0.17	0.60	0.00
Aquatic Communities			
Ruppia maritima	0.64 ± 0.67	2.00	0.10
Potamogeton filiformis ssp. *latifolia*	0.44 ± 0.22	1.00	0.10
Potamogeton pectinatus	0.42 ± 0.24	0.60	0.15
Chara sp.	0.35 ± 0.00	0.35	0.35
Zanichellia palustris	0.32 ± 0.40	1.00	0.05
Lemna minor	0.25 ± 0.00	0.25	0.25
Bacopa eisenii	0.12 ± 0.03	0.15	0.10
Unclassified Communities			
No Vegetation	0.03 ± 0.21	1.70	0.00
Unclassified	0.02 ± 0.07	0.30	0.00

Table 8: Distribution of plant associations sampled on management areas[1] within the Lahontan Valley[2].

Plant Association	SNWR	SWMA	FNWR	CLAKE	CCLUB	FIR	OUT
TREES							
Elaeagnus angustifolia	--	--	--	--	--	--	2
Populus fremontii	1	1	--	--	--	--	2
Populus fremontii/ Elymus triticoides	--	--	--	--	--	--	5
Salix exigua	--	--	--	--	--	--	6
Salix laevigata	--	--	--	--	--	--	5
SHRUBS							
Allenrolfea occidentalis	6	--	--	7	--	--	--
Sarcobatus vermiculatus	2	2	--	5	--	--	19
Sarcobatus vermiculatus- Psorothamnus polydenius	--	--	--	--	--	--	2
Sarcobatus vermiculatus- Suaeda moquinii	1	--	--	--	--	--	4
Suaeda moquinii	3	1	--	--	--	--	1
TRANSITIONAL (UPLAND) SHRUBS							
Artemisia tridentata	--	--	--	--	--	--	1
Atriplex lentiformis	--	1	--	--	--	--	--
Chrysothamnus nauseosus- Tetradymia tetrameres	--	2	--	--	--	--	--
EMERGENTS							
Equisetum laeviagata	--	--	--	--	--	--	1
Phragmites australis	3	--	--	--	--	--	--
Scirpus acutus	8	1	--	4	--	--	9
Scirpus maritimus	28	--	--	7	--	--	2
Scirpus pungens	--	3	1	1	--	--	10
Typha domingensis	9	--	--	11	--	3	7
Typha domingensis- Scirpus acutus	--	1	--	--	1	1	1
Typha latifolia	12	--	--	2	--	--	11
LOW GRAMINOIDS (wet meadow)							
Eleocharis macrostachya	3	4	--	13	1	2	4
Eleocharis macrostachya- Bacopa eisenii	--	1	--	2	--	1	--
Eleocharis parishii	--	1	--	--	--	--	--
Juncus balticus	3	5	--	10	1	1	8
Juncus balticus- Eleocharis macrostachya	--	1	--	2	--	1	3
GRASSES							
Distichlis spicata	32	13	5	60	2	--	25
Elymus triticoides	--	--	--	--	--	1	6
Juncus balticus- Distichlis spicata	--	9	--	7	3	8	8
Muhlenbergia asperifolia	1	--	--	--	--	--	1
DISTURBED HERBACEOUS AND EXOTICS							
Bassia hyssopifolia	18	5	5	11	--	--	8
Various exotics	3	--	--	--	--	--	11
Tamarix ramosissima	2	11	--	--	--	--	23
Trifolium fragiferum	--	4	--	7	--	3	1
AQUATICS							
Bacopa eisenii	--	--	--	3	--	--	--
Chara sp.	--	--	--	--	--	--	1
Lemna minor	--	--	--	1	--	--	1
Potamogeton filiformis	10	1	--	--	--	--	1
Potamogeton pectinatus	3	3	1	4	--	--	1
Ruppia maritima	6	--	--	6	--	--	6
Zanichellia palustris	3	1	--	3	--	--	2

1. SNWR - Stilwater National Wildlife Refuge, SWMA - Stillwater Wildlife Management Area, FNWR - Fallon National Wildlife Refuge, CLAKE - Carson Lake and Pasture, CCLUB - Canvasback Gun Club, FIR - Fallon Paiute-Shoshone Indin Reservation, OUT - outside and managed area.

2. Bold = Historically described plant association.

Table 9: Distribution of plant associations sampled among 247 sample sites at the Stillwater National Wildlife Refuge.

Plant Association	Historical Community	N		% of total	
TREES					
Populus fremontii	Yes	1	1	0.01	1
SHRUBS					
Allenrolfea occidentalis	Yes	6		0.02	
Sarcobatus vermiculatus	Yes	2		0.01	
Sarcobatus vermiculatus-Suaeda moquinii	No	1	12	0.01	5
Suaeda moquinii	No	3		0.01	
EMERGENTS					
Phragmites australis	Yes	3		0.01	
Scirpus acutus	Yes	8		0.03	
Scirpus maritimus	Yes	28	60	0.11	24
Typha domingensis	Yes	9		0.04	
Typha latifolia	Yes	12		0.05	
LOW GRAMINOIDS (wet meadow)					
Eleocharis macrostachya	No	3	6	0.01	
Juncus balticus	Yes	3		0.01	2
GRASSES					
Distichlis spicata	Yes	32	33	0.13	
Muhlenbergia asperifolia	No	1	155	0.01	14
DISTURBED HERBACEOUS AND EXOTICS					
Bassia hyssopifolia	Yes	18	25	0.07	
Various exotics	No	1	21	0.01	9
Tamarix ramosissima	No	2		0.01	
AQUATICS					
Potamogeton filiformis	No	10		0.04	
Potamogeton pectinatus	Yes	3	22	0.01	8
Ruppia maritima	Yes	6		0.02	
Zanichellia palustris	Yes	3		0.01	
UNCLASSIFIED[1]		99		0.37	

[1] Much of the sampling effort on the refuge was conducted near big water where no vegetation existed. Percentages listed may be an unfair representation of what exists on the refuge.

Table 10: Distribution of plant associations sampled among 92 sample sites at the Stillwater Wildlife Management Area.[1]

Plant Association	Historical	N	% of total	
TREES				
Populus fremontii	Yes	1	0.01	
SHRUBS				
Sarcobatus vermiculatus	Yes	2	0.02	
Suaeda moquinii	No	1	0.01	
TRANSITIONAL SHRUBS				
Atriplex lentiformis	No	1	0.01	
Chrysothamnus nauseosus-Tetradymia tetrameres	No	2	0.02	
EMERGENTS				
Scirpus acutus	Yes	1	0.01	
Scirpus pungens	Yes	3	0.03	
Typha domingensis-Scirpus acutus	Yes	1	0.01	
LOW GRAMINOIDS (wet meadow)				
Eleocharis macrostachya	No	4	0.04	
Eleocharis macrostachya-Bacopa eisenii	No	1	0.01	
Eleocharis parishii	No	1	0.01	7%
Juncus balticus	Yes	5	0.05	
Juncus balticus-Eleocharis macrostachya	No	1	0.01	
GRASSES				
Distichlis spicata	Yes	13	0.14	
Juncus balticus-Distichlis spicata	No	9	0.10	25%
DISTURBED HERBACEOUS AND EXOTICS				
Bassia hyssopifolia	Yes	5	0.05	
Tamarix ramosissima	No	11	0.12	21%
Trifolium fragiferum	No	4	0.04	
AQUATICS				
Potamogeton filiformis	No	1	0.01	
Potamogeton pectinatus	Yes	3	0.03	5%
Zanichellia palustris	Yes	1	0.01	
UNCLASSIFIED OR UNVEGETATED		21	0.23	

[1] These figures include the Indian Lakes Area.

Table 11: Distribution of plant associations among 187 sample sites at Carson Lake and Pasture.

Plant Association	Historical	N	% of total
SHRUBS			
Allenrolfea occidentalis	Yes	7	0.04
Sarcobatus vermiculatus	Yes	8	0.03
EMERGENTS			
Scirpus acutus	Yes	4	0.02
Scirpus maritimus	Yes	7	0.04
Scirpus pungens	Yes	1	0.01
Typha domingensis	Yes	11	0.06
Typha latifolia	Yes	2	0.01
LOW GRAMINOIDS (wet meadow)			
Eleocharis macrostachya	No	13	0.07
Eleocharis macrostachya-Bacopa eisenii	No	2	0.01
Juncus balticus	Yes	10	0.05
Juncus balticus-Eleocharis macrostachya	No	2	0.01
GRASSES			
Distichlis spicata	Yes	60	0.32
Juncus balticus-Distichlis spicata	No	7	0.04
DISTURBED HERBACEOUS AND EXOTICS			
Bassia hyssopifolia	Yes	11	0.06
Trifolium fragiferum	No	4	0.04
AQUATICS			
Bacopa eisenii	Yes	3	0.02
Lemna minor	No	1	0.01
Potamogeton pectinatus	Yes	4	0.02
Ruppia maritima	Yes	6	0.03
Zanichellia palustris	Yes	3	0.02
UNCLASSIFIED OR UNVEGETATED		19	0.11

Table 12: Distribution of plant associations sampled among 347 sample sites located outside any management unit.

Plant Association	Historical	N	% of total[1]
TREES			
Elaeagnus angustifolia	No	2	0.01
Populus fremontii	Yes	2	0.01
Populus fremontii/ Elymus triticoides	No	5	0.01
Salix exigua	No	6	0.02
Salix laevigata	No	5	0.01
SHRUBS			
Sarcobatus vermiculatus	Yes	19	0.05
Sarcobatus vermiculatus- Psorothamnus polydenius	No	2	0.01
Sarcobatus vermiculatus- Suaeda moquinii	No	4	0.01
Suaeda moquinii	No	1	0.01
TRANSITIONAL SHRUBS			
Artemisia tridentata	No	1	0.01
EMERGENTS			
Equisetum laeviagata	No	1	0.01
Scirpus acutus	Yes	8	0.03
Scirpus maritimus	Yes	2	0.01
Scirpus pungens	Yes	10	0.03
Typha domingensis	Yes	7	0.02
Typha domingensis- Scirpus acutus	Yes	1	0.01
Typha latifolia	Yes	11	0.03
LOW GRAMINOIDS (wet meadow)			
Eleocharis macrostachya	No	4	0.01
Juncus balticus	Yes	8	0.02
Juncus balticus- Eleocharis macrostachya	No	3	0.01
GRASSES			
Distichlis spicata	Yes	25	0.07
Elymus triticoides	Yes	6	0.02
Juncus balticus- Distichlis spicata	No	8	0.02
Muhlenbergia asperifolia	No	1	0.01
DISTURBED HERBACEOUS AND EXOTICS			
Bassia hyssopifolia	Yes	8	0.02
Various exotics	No	8	0.03
Tamarix ramosissima	No	23	0.07
Trifolium fragiferum	No	1	0.01
AQUATICS			
Chara sp.	Yes	1	0.01
Lemna minor	No	1	0.01
Potamogeton filiformis	No	1	0.01
Potamogeton pectinatus	Yes	1	0.01
Ruppia maritima	Yes	6	0.02
Zanichellia palustris	Yes	2	0.01
UNCLASSIFIED OR UNVEGETATED[2]		136	0.36

[1] The percentage of total does not equal 1.00 because 14 (0.06%) of samples were located in agricultural fields.

[2] Many of these sites were located on the Carson Sink and were unvegetated.

Table 13: Surface soil texture[1], soil pH, soil electrical conductivity, and sodium adsorption ratio ranges for 33 soil series sampled among Lahonton Valley Wetlands.

Series/Complex	Sand	Loam	Clay	Soil pH Max	Soil pH Min	Electrical conductivity Mean±SD	Electrical conductivity Max	Electrical conductivity Min	Sodium Adsorption Ratio Mean±SD	Sodium Adsorption Ratio Max	Sodium Adsorption Ratio Min
Alluvial	6	3	2	8.2	6.9	1.6±1.6	4.2	0.2	7.4±6.8	17.3	0.8
Appian	18	13	17	9.9	7.0	13.4±18.0	107.0	0.4	115.9±155.1	502.1	4.6
Badland	0	0	3	9.0	8.3	6.5±5.7	13.0	2.4	84.3±40.9	113.2	55.4
Bango\Stumble	1	1	1	7.8	7.6	8.3±6.3	12.8	1.1	10.9±5.1	14.5	7.3
Biddleman	0	1	2	8.4	7.9	2.4±2.3	5.1	0.9	12.0	n/a	
Bunejug	2	7	2	8.6	7.0	12.3±15.7	48.0	0.8	24.5±27.8	69.9	1.7
Carcity	0	0	2	8.5	7.2	11.7±11.7	21.6	1.8	8.0	n/a	
Carson	1	5	4	8.3	7.8	7.7±11.6	33.0	1.8	19.6±18.8	44.5	1.2
Carson/Stillwater	1	10	12	9.3	7.1	14.7±19.2	62.0	0.7	31.3±48.7	165.7	5.8
Churchill/Playa	1	6	1	9.6	7.2	13.0±18.0	42.0	0.6	2.2±0.5	2.5	1.8
Dia	7	9	3	8.9	6.3	2.9±3.1	11.8	0.3	22.8±27.0	82.8	1.7
Dithod	0	4	2	8.3	7.2	6.2±5.6	15.7	0.8	30.2±26.6	61.2	5.7
Dune	7	16	6	9.6	7.6	27.6±32.3	169.0	1.0	67.8±55.9	114.0	5.7
East Fork	3	4	0	10.0	6.9	4.3±4.8	11.8	0.8	52.6±123.1	331.5	0.9
Erber	5	1	3	8.6	6.6	4.1±6.8	22.2	0.8	17.1±19.2	55.3	1.6
Fallon	1	2	0	9.6	6.7	6.4±4.3	6.8	0.8	17.7	n/a	
Fernley	3	5	2	8.1	7.6	7.4±10.9	33.0	0.4	19.8±26.5	63.8	1.5
Hooten/Bango	0	0	1	8.9		54.0	n/a		n/a	n/a	
Lahontan	10	6	24	9.4	6.8	9.1±10.4	38.0	0.5	25.3±35.0	129.1	2.2

Series/Complex	Sand	Loam	Clay	Soil pH Max	Soil pH Min	Electrical conductivity Mean±SD	Electrical conductivity Max	Electrical conductivity Min	Sodium Adsorption Ratio Mean±SD	Sodium Adsorption Ratio Max	Sodium Adsorption Ratio Min
Lake Bottom	21	18	105	10.0	6.4	17.6±16.5	73.0	0.2	38.1±64.6	255.3	1.0
Marsh	4	30	104	9.5	6.8	12.6±13.4	80.0	0.4	39.1±37.1	134.0	1.9
Parran	0	4	4	8.7	7.6	12.5±13.2	40.0	2.4	93.6±127.5	309.3	5.5
Pelic	5	8	8	9.9	6.9	31.9±50.3	217.0	0.6	175.3±251.1	609.6	1.6
Playa	9	6	163	9.7	7.9	55.7±42.7	221.0	1.6	199.7±221.9	820.7	7.8
Ragtown	4	2	2	8.9	7.3	6.7±3.6	11.2	1.3	13.5	n/a	
River Bottom	1	0	0	7.6		1.4	n/a		n/a	n/a	
Sagouspe	3	4	1	9.0	6.4	5.7±7.1	21.5	0.8	9.2±11.0	21.5	0.8
Soda Lake	3	4	0	8.9	7.2	7.5±10.7	31.5	1.5	33.1±57.1	160.0	6.5
Stillwater	3	1	4	8.5	7.3	10.5±12.1	36.0	0.7	4.4±2.4	6.1	2.7
Swingler	0	0	1	8.7		6.7	n/a		n/a	n/a	
Swope	0	0	3	7.8	7.6	10.9±4.7	16.1	7.2	112.6	n/a	
Tipperary	34	16	24	9.6	6.9	18.2±23.0	97.0	0.3	138.9±336.7	1772.0	1.8
Weishaupt	0	1	0	7.2		7.9	n/a		26.1	n/a	

1. Number of sites sampled with either sand, loam, or clay surface soil texture.

Figure 1. Wetland types and managed areas within the Lahontan Valley

Wetland types for each grid point identified by the sampling design. For definitions refer to Table 1 and text.

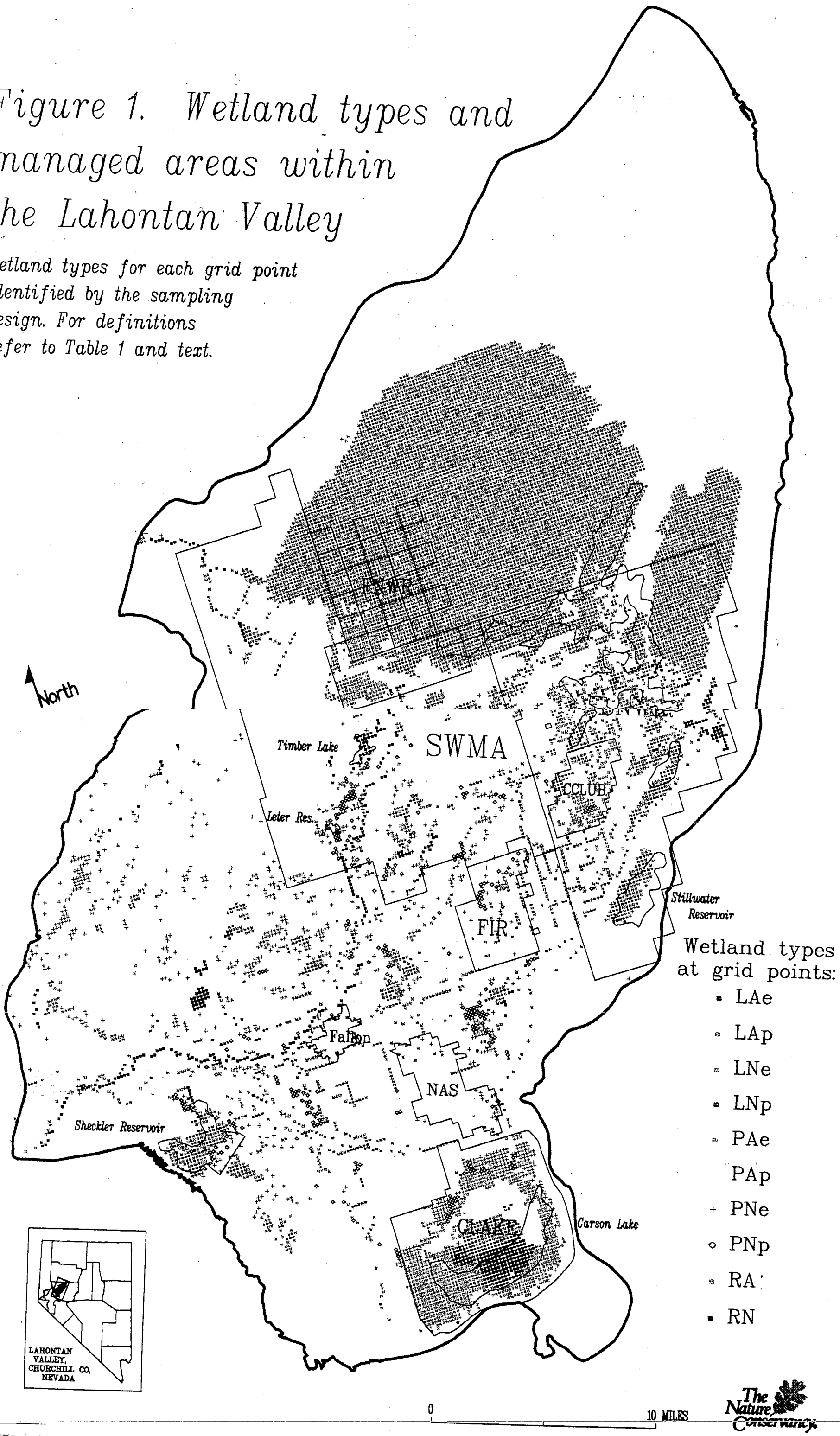


Figure 2a. Soil series and managed areas within the Lahontan Valley

Soil series (A1 through D1) for each grid point identified by the sampling design. For other soil series see Figures 2b and 2c. For definitions refer to Table 1 and text.

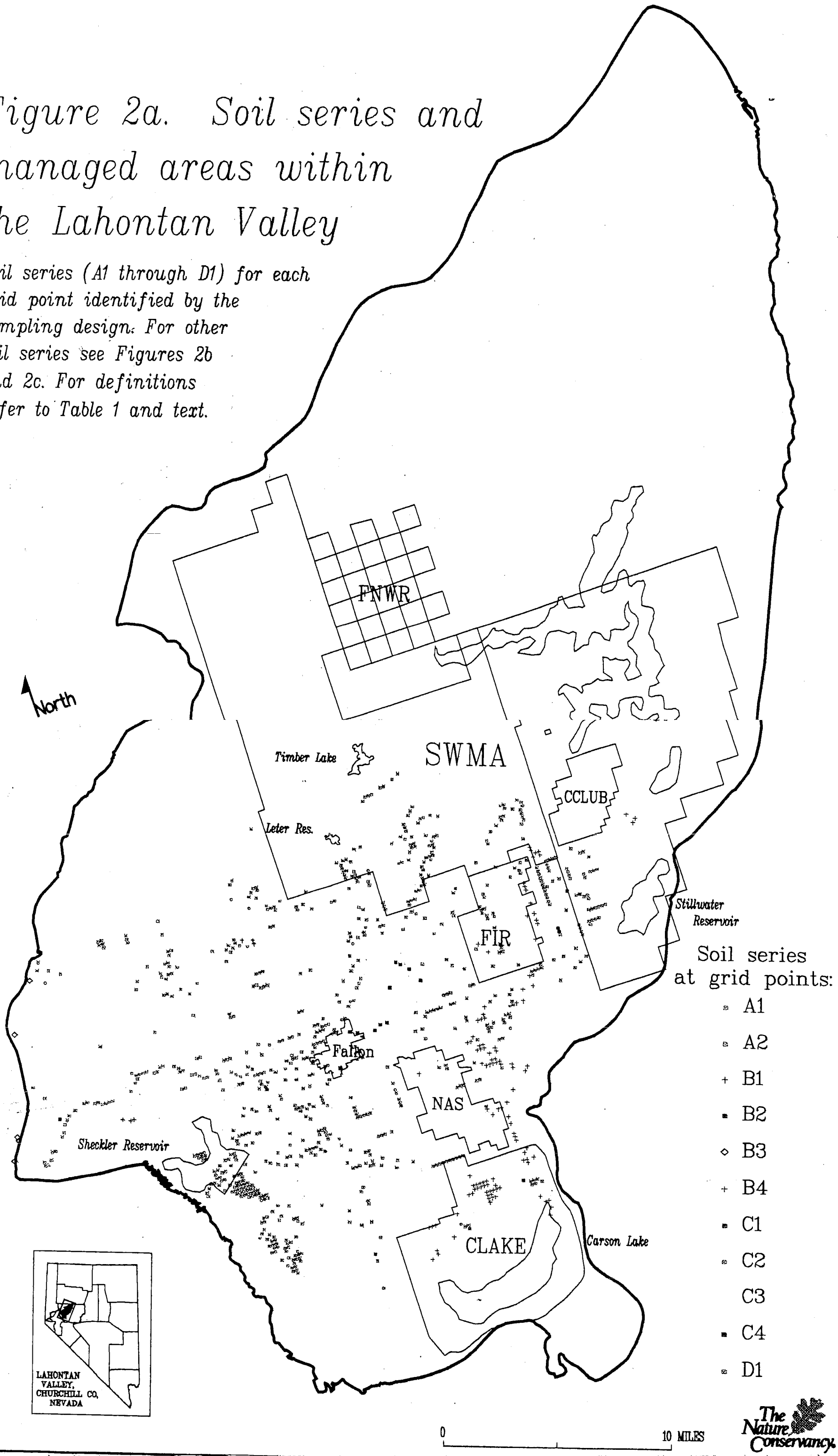


Figure 2b. Soil series and managed areas within the Lahontan Valley

Soil series (D2 through P1) for each grid point identified by the sampling design. For other soil series see Figures 2a and 2c. For definitions refer to Table 1 and text.

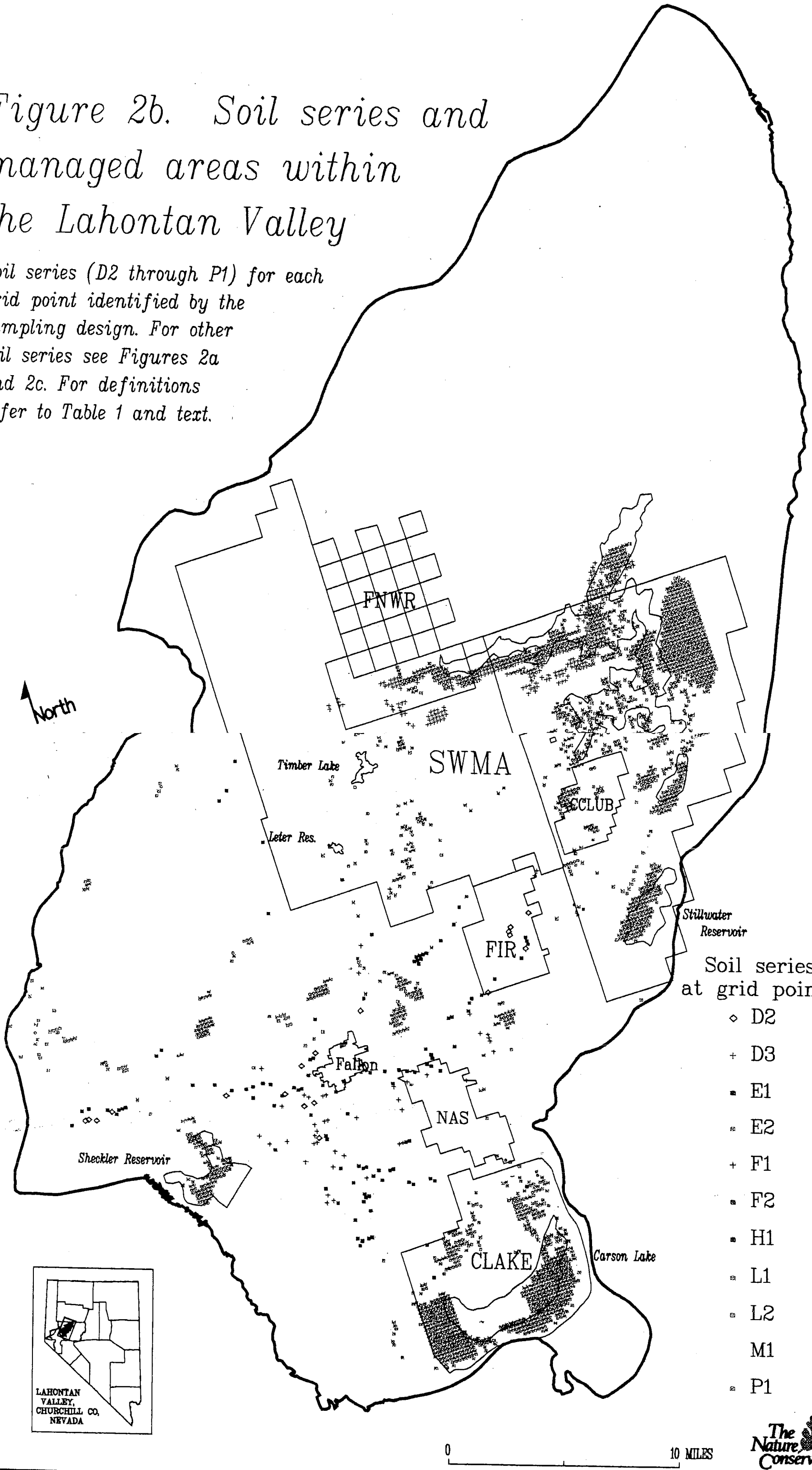


Figure 2c. Soil series and managed areas within the Lahontan Valley

Soil series (P2 through W1) for each grid point identified by the sampling design. For other soil series see Figures 2a and 2b. For definitions refer to Table 1 and text.

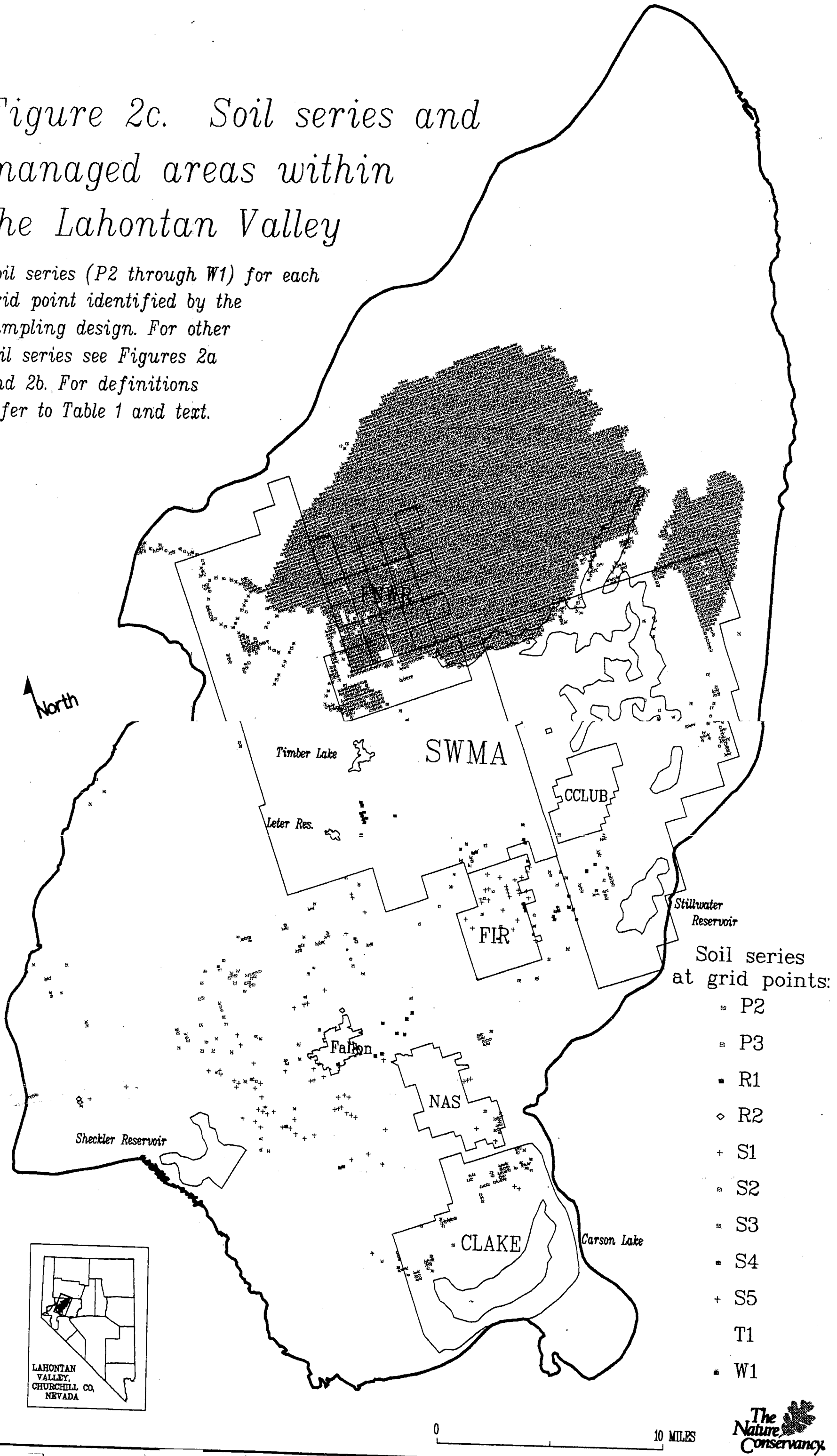
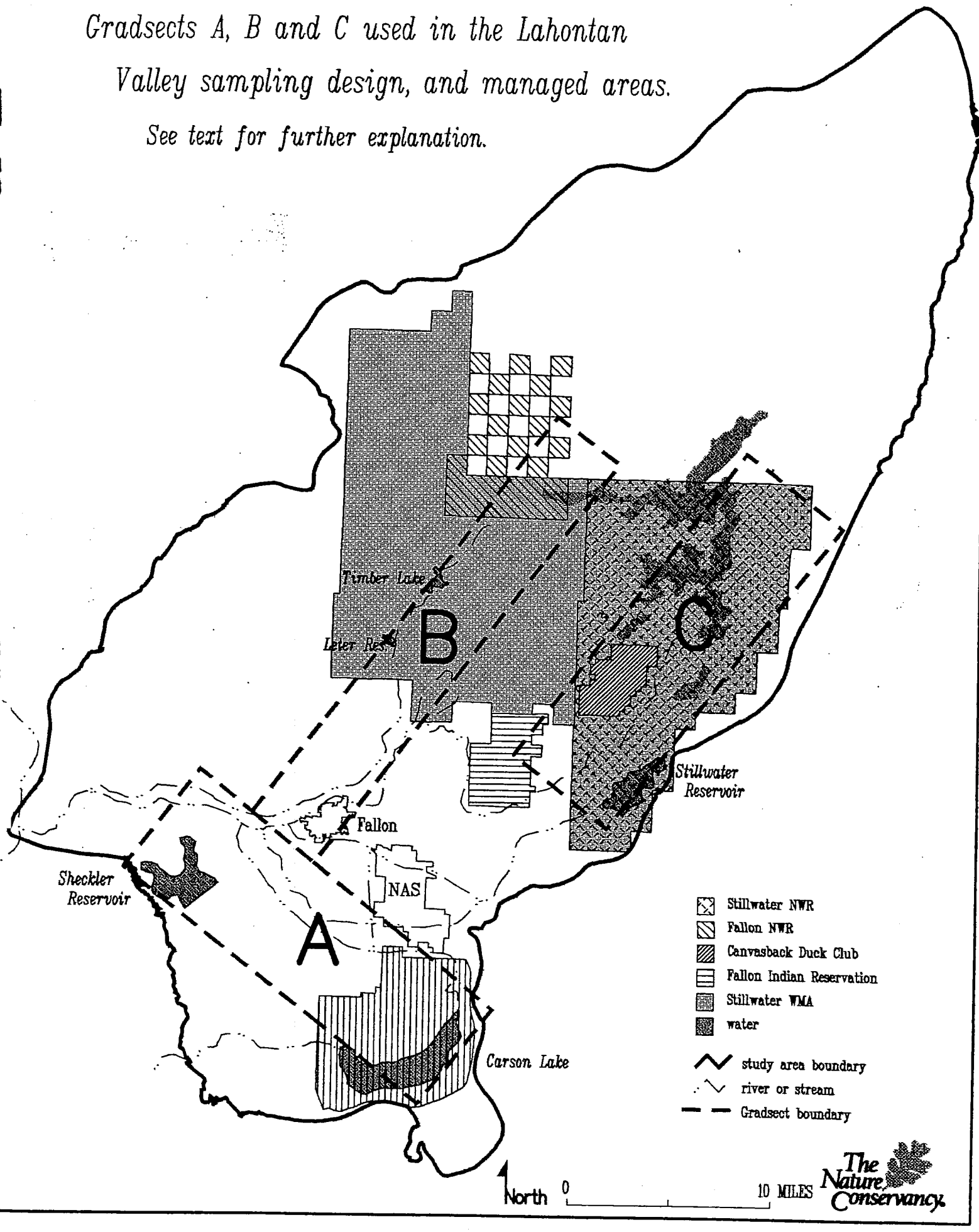


Figure 3:

Gradsects A, B and C used in the Lahontan Valley sampling design, and managed areas.

See text for further explanation.



Appendix A

Description of Soil Series of Lahontan Valley

Alluvial: Alluvial land consists of recently deposited, poorly drained sediment washed from soils derived from mixed rock and ranges widely in texture. It is very deep, stratified, and generally neutral in reaction. The texture of the surface changes frequently. Drainage is poor.

Appian: Consists of very deep, well-drained soils that formed in loamy alluvium over lacustrine sand of mixed origin. These soils are on smooth, low-lying terraces and alluvial terraces. Slopes are 0 to 2 percent. Elevation ranges from 1189 to 1280 meters. The surface is gray sandy loam about 8 cm thick, followed by a brown, friable plastic clay loam about 20 cm thick. It is underlain by light brownish gray, finely stratified sand about 25 cm thick. Beneath this is a light brownish-gray sand that is loose when dry or moist which extends to a depth of 150 cm. Permeability is moderately slow on the surface and very rapid in the substratum

Badland: Badland is on large and very large bands on gently to moderately steep shorelines of ancient Lake Lahontan. Areas of this kind are throughout the Lahontan Basin and consist of very strongly saline and alkali-affected lacustrine sediment. The areas have been severely eroded by gullying because of runoff received from surrounding uplands.

Bango: Consists of very deep, well-drained soils that formed in stratified lacustrine sediment. These soils are on smooth and very slightly dissected high lake terraces. Slopes are slightly convex and range from 0 to 4 percent. Elevation ranges from 1219 to 1280 m. The surface layer is light brownish-gray sandy loam about 10 cm thick. The next layer is pale brown, friable, slightly plastic loam about 10 cm thick. It is underlain by pale brown, very friable nonplastic fine sandy loam, that generally contains cobblestones and gravel-sized dendritic tufa in the upper part. Permeability is moderately slow.

Biddleman: Consists of very deep, well-drained soils that formed in thin mantles of gravelly and cobbly loam alluvium over old gravelly shorelines. The materials are derived from mixed rock and are on smooth lakeshore terraces. Slopes are 0 to 15 percent. Elevation ranges from 1280 to 1340 m. The surface layer is light brownish-gray gravelly sandy loam about 8 cm thick. The next layer is light brownish-gray heavy sandy loam about 5 cm thick and pale-brown, friable plastic gravelly clay loam, about 8 cm thick. It is underlain by light-gray, stratified, calcareous loamy sands that extend to a depth of 150 cm. Permeability is moderately slow.

Bunjug: Consists of very deep, somewhat poorly drained soils that formed in sediment derived from mixed rock. These soils are on smooth flood plains with slopes of 0 to 2 percent. Elevation ranges from 1173 to 1204 m. The surface layer is dark gray clay loam about 18 cm thick. Below this layer is gray, plastic silty clay loam about 25 cm thick. It is underlain by stratified, mottled, pale-brown, pale-olive, and light brownish-gray sandy clay loam that extends to 150 cm. Permeability is moderate.

Carcity: Consists of very deep, somewhat poorly drained soils on smooth, almost flat flood plains and deltas. Slopes are 0 to 2 percent. They formed in clayey alluvium superimposed over sandy alluvium from mixed rock. Elevation ranges from 1158 to 1219 m. The surface layer is gray clay about 18 cm thick in the upper part. It is gray, grading to dark grayish-brown clay about 53 cm thick in the lower part. The underlying material is brown sand that is loose and nonplastic. Permeability is slow in the subsoil and very rapid in the substratum.

Carson: Consists of very deep soils that formed in sediment derived from mixed rock. They are on smooth flood plains and deltas. Slopes are 0 to 2 percent with elevation ranges of 1158 to 1219 m. The surface layer is gray clay that is very plastic, highly mottled, and extends to a depth of more than 150 cm. Permeability is very slow.

Carson-Stillwater Complex: Consists of nearly level soils that occur in large bands and small islands that are irregular in shape. The soils are on smooth flood plains and deltas. The complex is about 40% Carson clay that is wet and strongly saline, 40% Stillwater clay loam and 20% included soils. The Carson soils are on concave flood plains below the Stillwater soils. This complex is poorly drained.

Churchill-Playa Complex: This complex is in large bands on low lake terraces and in small basins and is about 40% Churchill gravelly sandy loam, 40% Playas and 20% included soils. The Churchill soils are on low lake terraces. The Playas occur as small basins and are usually on 0 to 4 percent slopes. Permeability is very low.

Dia: Consists of very deep. nearly level soils on smooth flood plains and low stream terraces. This soil formed in loamy alluvium superimposed over sandy alluvium, both of which are derived from mixed rock. Sloped are less than 2 percent. Elevations range from 1150 to 1219 m. The surface layer is grayish-brown loam about 12 cm thick and grayish-brown light silty clay loam about 18 cm thick. It is underlain by light brownish gray sandy loam, stratified with silty loam and silty clay loam about 43 cm thick underlain by pale-brown sand to a depth of 150 cm. Permeability is moderately slow in the upper part of the soil and very rapid in the substratum.

Dithod: Consists of very deep, somewhat poorly drained soils that formed in loamy alluvium derived from mixed rock. These soils are on smooth flood plains and low terraces. Slopes are 0 to 2 percent with elevation ranges of 1150 to 1219 m. The surface layer is grayish-brown loam about 40 cm thick. It is underlain by light brownish-gray, stratified fine sandy loam and very fine sandy loam about 35 cm thick, light brownish-gray loamy sand that extends to a depth of 150 cm. Permeability is moderate.

Dune Land: This is a complex that consists of about 40% dune, 40% playas and 20% included soils. They are unstabilized accumulations of loose sand, generally 6 to 7 m high. The Playas are between the dunes in the windswept, barren basins.

East Fork: Consists of very deep, somewhat poorly drained soils that formed in loamy alluvium derived from mixed rock. These soils are along smooth flood plains and terraces with slopes of 0 to 2 percent. Elevation ranges from 1150 to 1219 m. The surface layer is grayish-brown clay loam about 35 cm thick. It is underlain by grayish-brown, friable, plastic clay loam that extends to a depth of 150 cm. Permeability is moderately slow.

Erber: Consists of very deep, somewhat poorly drained soils that formed in sandy sediment derived from mixed rock. These soils are on smooth, almost flat flood plains and low terraces. Elevation ranges from 1150 to 1219 m. The surface layer is grayish-brown loam about 13 cm thick over dark gray silt loam about 20 cm thick. It is underlain by light brownish-gray, friable, slightly plastic silt loam about 8 cm thick and light-gray sand that extends to a depth of 150 cm. Permeability is generally rapid, but where the underlying material is clay, it can be very slow.

Fallon: Consists of very deep, somewhat poorly drained alluvial soils that formed in loamy alluvium derived from mixed rock. These soils are on smooth, low stream terraces and flood plains. Slopes are from 0 to 2 percent with elevation ranges of 1150 to 1219 m. The surface layer is light brownish gray fine sandy loam about 35 cm thick. Below this is about 25 cm of light brownish-gray sandy loam that grades to heavy sandy loam and about 20 cm of loamy coarse sand. This is underlain by light gray fine gravelly coarse sand about 40 cm thick. Permeability ranges from moderately rapid to moderately slow to very slow.

Fernley: Consists of nearly level somewhat poorly drained soils that formed in sandy alluvium derived from mixed rock. These soils are in narrow stringers, which are recent river channels on smooth flood plains and alluvial terraces. Slopes are 0 to 2 percent with elevational ranges of 1158 to 1310 m. The soil is grayish-brown sand that extends to a depth of 150 cm. Permeability is very rapid.

Hooten-Bango: This association is in very large, oval areas on lake terraces between and adjacent to low volcanic cones. It is about 50% Hooten very gravelly sand, 20% Bango sandy loam, 20% Tipperary fine sands and 10% included soils. Slopes vary from 0 to 4 percent. Permeability is moderately fast.

Lahontan: Consists of very deep, nearly level, somewhat poorly drained soils that formed from clayey alluvium derived from mixed rock. These soils are of major extent in slightly concave lake basins with slopes of 0 to 2 percent. Elevation ranges from 1158 to 1210 m. The surface layer is light brownish-gray clay about 25 cm thick. It is underlain by light brownish-gray, very plastic clay that extends to a depth of more than 150 cm. Permeability is very slow. They range from slightly or moderately saline-alkali to strongly saline-alkali.

Lake Bottom: Consists of very deep, fine sediments located on level terrain in depressional bottoms. Drainage is poor.

Marsh: Consists of concave, nearly level valley bottoms, oxbow lake bottoms, and slough channels that contain large areas of open water. Natural drainage is very poor. Internal drainage is very slow.

Parran: Consists of very deep, nearly level somewhat poorly drained soils that formed in clayey alluvium derived from mixed rock. These soils are on concave, low lake terraces and in basins. Slopes are 0 to 2 percent with elevation ranges of 1150 to 1220 m. The surface layer is light brownish-gray, salty silty clay about 13 cm thick. It is underlain by light-gray, salty silty clay about 33 cm thick and silty clay that extends to a depth of 150 cm.

Pellic: Consists of very deep, nearly level, very poorly drained soils that formed from sandy alluvium derived from mixed rock. These soils are on concave to flat flood plains, deltas, oxbows and in abandoned slough channels. Slopes are 0 to 2 percent. Elevation ranges from 1158 to 1250 m. The surface layer is light-gray sand about 30 cm thick. It is underlain either by a brownish-gray loamy fine sand and sandy loam about 25 cm thick or a clay layer that is up to 25 cm thick. It is underlain by a coarse sand that extends to a depth of 150 cm. Permeability is generally rapid but ranges to very slow where lake-laid clay or silty clay are present.

Playas: Occur in small and medium-sized, irregularly shaped areas and in a very large oval area in Carson Sink. They consist of nearly level basins of intermittent lakes that do not have surface outlets. They are mostly clay material than ranges from sand to clay are strongly alkaline to very strongly alkaline. Natural drainage is very poor.

Ragtown: Consists of very deep, moderately well drained soils that formed in loamy alluvium derived from mixed rock. These soils are on lake terraces. Slopes are 0 to 2 percent with elevation ranges of 1189 to 1220 m. The surface layer is light brownish-gray light sandy clay loam about 25 cm thick, It is underlain by light brownish-gray clay loam, light-gray heavy silty clay loam and silty clay that extends to a depth of more than 150 cm. Permeability is slow.

River Bottom: Consists of alluvium soils derived from mixed rock and located underneath the Carson River.

Sagouspe: Consists of very deep, nearly level, somewhat poorly drained soils that are formed in sandy alluvium. These soils are on smooth, low terraces. Slopes are 0 to 2 percent. Elevation ranges from 1189 to 1220 m. The surface layer is light brownish-gray loamy sand about 15 cm thick. It is underlain by light brownish-gray, very friable loamy sand and fine loamy sand about 58 cm thick. Below this layer in sequence, is light-gray, friable, slightly plastic silt loam about 13 cm thick; light-gray, loose, nonplastic stratified sand and coarse sand about 23 cm thick, and brownish-gray very friable stratified silt loam to a depth of about 150 cm. Permeability is rapid in the upper part of the soil profile and moderate in the lower layers.

Soda Lake: Consists of very deep, nearly level to strongly sloping, somewhat excessively drained soils that formed in sandy sediment. These soils are on and adjacent to convex, recent volcanic cones. Slopes are 0 to 15 percent. Elevation ranges from 1220 to 1280 m. The surface layer is light brownish-gray gravelly loam sand about 5 cm thick. The next layer is light brownish-gray, very friable gravelly loamy sand about 18 cm thick. It is underlain by light brownish-gray, very friable, stratified loamy fine sand, gravelly sand, fine sand, and very fine loamy sand to a depth of 150 cm. Permeability is rapid.

Stillwater: Consists of very deep, nearly level soils that formed in alluvium. They are located on slightly concave flood plains and terraces. Slopes are 0 to 2 percent. Elevation ranges from 1189 to 1220 m. The surface layer is gray and grayish-brown clay loam and silty clay loam about 38 cm thick. It is underlain by light brownish-gray, plastic silty clay loam and silty clay that extends to 150 cm. Permeability is moderately slow or slow.

Swingler: Consists of very deep, nearly level to gently sloping moderately well drained soils that formed in silty lacustrine sediment. The soils are on slightly concave to slightly convex terraces with slopes from 0 to 4 percent. Elevation is 1189 to 1220 m. The surface layer has a layer of light brownish-gray sandy loam about 48 cm thick over a light-gray silt loam to 150 cm. Permeability is moderately slow.

Swope: Consists of very deep, nearly level, somewhat poorly drained soils that formed in loamy alluvium over sandy alluvium on flood plains. Slopes are 0 to 2 percent at elevations of 1189 to 1220 m. The surface layer is gray clay loam about 18 cm thick over gray, firm, sticky and plastic silty clay loam to a depth of 150 cm. Permeability is moderately slow to very rapid over stratified sand in the lower profile.

Tipperary: Consists of nearly level to gently rolling, very deep, excessively drained soils formed in sandy alluvium from mixed rocks. These soils are on smooth, high terraces and partly stabilized sand dunes. Slopes are 0 to 15 percent. The surface is light-gray and light brownish-gray sand about 18 cm thick underlain by light brownish-gray and light-gray sand to a depth of 150 cm. Permeability is very rapid.

Weishaupt: Consists of very deep, nearly level, somewhat poorly drained soils that formed in clayey sediment and are on smooth flood plains and terraces. Slopes are 0 to 2 percent in elevations ranging from 1189 to 1220 m. The surface layer is a gray clay loam about 30 cm thick underlain with gray, firm very sticky and very plastic clay to a depth of 150 cm. Permeability is very slow.

Table A1: Order, subgroup, family, and selected characteristics of soil series encountered among Lahonton Valley Wetlands.

Series	Order	Subgroup	Family
Alluvial	Entisol	Unclassified	Variable
Appian	Aridisol	Typic Natrargids	fine-loamy over sandy, mixed, mesic
Badland	Aridisol	Unclassified	Coarse, mixed, mesic
Bango/ Stumble	Aridisol	Haplic Natrargids/ Typic torripsamments	fine-loamy, mixed, mesic
Biddleman	Aridisol	Typic Natrargids	fine-loamy over sandy, mixed, mesic
Bunejug	Mollisol	Fluvaquentic Haplaquoll	coarse-loamy, mixed, mesic
Carcity	Mollisol	Cumulic Haplaquoll	Clayey over sandy, montmorillonitic, mesic
Carson	Mollisol	Vertic Haplaquoll	Very-fine, montmorillonitic, mesic
Carson/ Stillwater	Mollisol	Vertic Haplaquoll/ Fluvaquentic Haplaquoll	Very-fine/fine, montmorillonitic mesic
Churchill/ Playa	Aridisol	Typic Natrargid	Fine, montmorillionitic, mesic
Dia	Mollisol	Fluvaquentic Haploxeroll	Fine loamy over sandy, mixed, mesic
Dithod	Mollisol	Fluvaquentic Haploxeroll	Fine, loamy, mixed, mesic
Dune	Aridisol	Unclassified	unconsolidated sand, mesic
East Fork	Mollisol	Fluvaquentic Haploxeroll	fine-loamy, mixed, mesic
Erber	Mollisol	Fluvaquentic Haplaquoll	Sandy, mixed, mesic
Fallon	Entisol	Aquic Xerofluvent	Coarse-loamy, mixed, nonacid, mesic
Fernley	Entisol	Aquic Xeropsamment	Mixed, mesic
Hooten/ Bango	Aridisol	Entic Durorthid/ Haplic Natrargid	fine-loamy/loamy-skeletal, mixed, mesic

Lahonton	Entisol	Aquic Xerofluvents	Fine, montmorillonitic, mesic
Lake Bottom	Entisol	Unclassified	Variable
Marsh	Unk	Unclassified	Variable
Parran	Aridisol	Typic Salorthids	fine, montmorillonitic, mesic
Pelic	Entisol	Typic Fluvaquent	Sandy, mixed, mesic
Playa	Unk	Unclassified	fine, mesic
Ragtown	Entisol	Typic Torriorthent	fine, montmorillonitic (calcareous), mesic
River Bottom	Entisol	Unclassified	Variable
Sagouspe	Entisol	Aquic Xerofluvent	Sandy, mixed, mesic
Soda Lake	Entisol	Typic Torriorthent	Sandy, mixed, mesic
Stillwater	Mollisol	Fluvaquentic Haplaquoll	fine, montmorillonitic (calcareous), mesic
Swingler	Entisol	Typic Torriorthent	fine-silty, mixed (calcareous), mesic
Swope	Mollisol	Fluvaquentic Haplaquoll	Fine loamy over sandy, mixed (calcareous), mesic
Tipperary	Entisol	Typic Torripsamment	Mixed, mesic
Weishaupt	Mollisol	Cumulic Haplaquoll	Fine loamy over clayey, mixed (calcareous), mesic

Appendix B

Survey Forms Utilized For An Ecological Classification of Lahonton Valley Wetlands.

FORM I. **BIOENVIRONMENT SURVEY FORM** WHTF

LAHONTAN VALLEY WETLANDS INVENTORY, 1995 06/15/95

IDENTIFICATION AND LOCATION **BIOE:** WET_____ SOIL_____

SAMPLED '93 __Y __N **GRID PT UTMS:** _____N _____W

SOURCECODE_____

LAT NORTH ___Deg ___Min ___Sec LONG WEST ___Deg ___Min ___Sec

SITENAME_____ STATE NV

MO DAY YEAR **EXAMINERS**

_____-_____-_____ _____

COUNTY:_____ **QUADNAME:** _____ QUADCODE: _____

_____ _____

____T/____R/_____SECTION(s)

____T/____R/_____SECTION(s)

Site Photo(s)_____

DIRECTIONS -->_____

ELEMENT OCCURRENCES List plant comms on site, if any, that key to those ID'd in 1993. Indicate level of confidence in your ID of the community(s) (Low, Medium, High); whether or not a spp list is taken.

Date:

Element Name	Confidence Level?	Spp list?	List #?

SITE DESCRIPTION/DESIGN Record information that will help confirm BIOE: presence of dikes, dams, canals, etc; obvious soils data; mosaic of vegetation; anything else requring comment.

SITE DESCRIPTION-->_____

TOPOGRAPHIC BASE MAP:

___yes___no 1. element locations and/or boundaries?

FORM II. COMMUNITY SURVEY FORM WHTF 05/30/95

LAHONTAN VALLEY WETLANDS INVENTORY

GENERAL PLOT DATA **MO**____ **DAY**___ **YEAR**____

IDENTIFICATION AND LOCATION **BIOE:**WET_____ SOIL_____ MANUAL 92B

GRID PT UTMS:_____N _____W **UNITS** __ft X m

PLOT NO._____

EXAMINER(s) _____

PNC_____ CT_____

SITE_____ **STATE** NV **COUNTY** CHURCHILL

PURP I **PREC** S **QUADNAME**_____

LAT NORTH ___Deg ___Min ___Sec LONG WEST ___Deg ___Min ___Sec

____**T**/____**R**/___**S**/___4S/___4/4

PLOT TYPES CMR **PLTRL**_____ **PLOT W**_____ **SURVEY** FYL

PHOTOS_____COMMUNITY SIZE (acres)_____

DIRECTIONS -->_____

CONSERVATION RANKING

QUAL ___ **Com:** _____

COND ___ **Com:** _____

VIAB ___ **Com:** _____

DEFN ___ **Com:** _____

RANK ___ **Com:** _____

THREATS_____

MGMT: _____

OWNERPROT **PROT:**_____

ENVIRONMENTAL FEATURES

DL_____ SOIL RPT CCSS_____ SOIL TAXON_____

PM_____ **LANDFORM**_____ **PLOT POS**_____ **ASP**_____

ELEVATION _____ **SLOPE %** _____ **SLP SHAPE**_____ SLP LENG_____

HORIZON ANGLE (%): **N**____ **E**____ **S**____ **W**____ EROS TYPE_____

GROUND COVER: ___**S+**___**G+**___**R+**___**L+**___**W+**___**M+**___**BV+**___**O** ~ = 100%

GROUND COVER DIST_____ ANIMAL USE EVIDENCE_____

DISTURBANCE HISTORY (type, intensity, frequency, season)--> _____

RIPARIAN FEATURES: **BNKFUL CHNL WIDTH**_____ **CHNL ENTRENCH**_____

SURFACE WATER_____ **BNKFUL CHNL DEPTH**_____ **DIST FROM H^2O**_____

VALLEY FLOOR GRADIENT_____ **FLDPLN WIDTH**_____

CHNL BED MATERIAL:____SLT+____SND+____GVL+____COB+____BLD = 100%

GENERAL SITE DESCRIPTION (landscape condition and adjacent ct's)

FORM III. OCULAR PLANT SPECIES DATA WHTF 06/15/95

LAHONTAN VALLEY WETLANDS INVENTORY, 1995 PltIDL_____

PLOT NO. _____ NO. SPECIES ____ PNC _____

BIOE: WET_____ SOIL_____

TREES Tot Cv____ MHt____
Tal Cv____ Med Cv____
Low Cv____ Grd Cv____ CC

T 1_____/_____ _____
T 2_____/_____ _____
T 3_____/_____ _____
T 4_____/_____ _____
T 5_____/_____ _____

SHRBS Tot Cv____ MHt____
Tal Cv____ Med Cv____
Low Cv____ Grd Cv____ CC

S 1_____/_____ _____
S 2_____/_____ _____
S 3_____/_____ _____
S 4_____/_____ _____
S 5_____/_____ _____
S 6_____/_____ _____
S 7_____/_____ _____
S 8_____/_____ _____
S 9_____/_____ _____
S10_____/_____ _____
S11_____/_____ _____
S12_____/_____ _____

GRAM Tot Cv____ MHt____
Med Cv____ Low Cv____
Grd Cv____ CC

G 1_____/_____ _____
G 2_____/_____ _____
G 3_____/_____ _____
G 4_____/_____ _____
G 5_____/_____ _____
G 6_____/_____ _____
G 7_____/_____ _____
G 8_____/_____ _____
G 9_____/_____ _____
G10_____/_____ _____
G11_____/_____ _____
G12_____/_____ _____

FRBS Tot Cv____ MHt____
Med Cv____ Low Cv____
Grd Cv____ CC

F 1_____/_____ _____
F 2_____/_____ _____
F 3_____/_____ _____
F 4_____/_____ _____
F 5_____/_____ _____
F 6_____/_____ _____
F 7_____/_____ _____
F 8_____/_____ _____
F 9_____/_____ _____
F10_____/_____ _____
F11_____/_____ _____
F12_____/_____ _____
F13_____/_____ _____
F14_____/_____ _____
F15_____/_____ _____
_____/_____ _____
_____/_____ _____

AQUATICS
A1_____/_____ _____
A2_____/_____ _____
A3_____/_____ _____
A4_____/_____ _____
A5_____/_____ _____
A6_____/_____ _____
A7_____/_____ _____
A8_____/_____ _____
_____/_____ _____
_____/_____ _____
_____/_____ _____

FERN Tot Cv___ MHt___ Med Cv___
Low Cv___ Grd Cv___
MOSS Tot Cv___ MHt___ Med Cv___
LICH Tot Cv___ CRYPGM Tot Cv___

TEXTURE SURFACE _____
ROOT ZONE _____
BELOW RZ _____

SALINITY
EC (ohms)_____ pH_____

FORM V. RECONNAISSANCE SOIL CHARACTERIZATION FORM

LAHONTAN VALLEY WETLANDS INVENTORY, 1995 WHTF 10/30/92

IDENTIFICATION

BIOE: WET____ SOIL____ GRID PT UTMS: _____N _____W

PLOT NO._____ MO____ DAY___ YEAR___ EST SOIL DEPTH_____

EXAMINER(s)_____

SOIL SUBGROUP_____

SOIL DESCRIPTION

ARE HORIZONS VISIBLE?: _____

LAYER 1 _____ DEPTH (cm) _____ to _____ TEXTURE_____

STRUC_____ COLOR W/D_____ FRAGS_____ EFFER_____

NOTES_____

LAYER 2 _____ DEPTH (cm) _____ to _____ TEXTURE_____

STRUC_____ COLOR W/D_____ FRAGS_____ EFFER_____

NOTES_____

LAYER 3 _____ DEPTH (cm) _____ to _____ TEXTURE_____

STRUC_____ COLOR W/D_____ FRAGS_____ EFFER_____

NOTES_____

LAYER 4 _____ DEPTH (cm) _____ to _____ TEXTURE_____

STRUC_____ COLOR W/D_____ FRAGS_____ EFFER_____

NOTES_____

LAYER 5 _____ DEPTH (cm) _____ to _____ TEXTURE_____

STRUC_____ COLOR W/D_____ FRAGS_____ EFFER_____

NOTES_____

GENERAL COMMENTS: _____

Appendix C: Parts 1 and 2

Statistical Analyses and Discussion of Results

Introduction

Three statistical analyses were performed on vegetation and environmental data collected during the 1993 and 1995 field seasons. These analyses were intended to:

1. Elucidate relationships among samples of wetland vegetation and to combine groups of floristically similar samples into plant associations using **agglomerative nonhierarchical clustering** techniques (PATN; Belbin 1990);

2. Determine environmental gradients related to plant association distributions using **direct gradient analysis** (CANOCO; ter Braak 1987, 1990, 1992); and

3. Determine which environmental variables best predicted the occurrence of individual species and plant associations using **generalized linear models** (GLIM; McCullagh and Nelder 1989).

These analyses resulted in the classification of plant associations currently present in the Lahontan Valley wetlands and identification of environmental gradients influencing plant association distribution. Specifics for each procedure are included in the following discussion.

Part 1: Classification and Direct Gradient Analyses

METHODS

Clustering Analysis of Plot-Level Samples

Nonhierarchical agglomerative clustering techniques (PATN; Belbin 1990) were utilized to develop a preliminary classification of the plant associations among the Lahontan Valley wetlands. Procedure ALOC (i.e. Allocation) is an agglomerative process which allocates vegetation samples to groups based upon a measure of similarity between samples. For this study, the Bray-Curtis measure (Belbin 1990) was chosen. The final result from ALOC is a set of clusters, each composed of samples which are similar in floristic composition and that can be used to help interpret and identify plant associations. Identification of clusters provides direct evidence for the variation in the data set, but less direct evidence for the underlying gradients possibly responsible for the variation. For this reason, clustering techniques are usually combined with direct gradient analyses.

The initial run of ALOC using the 264 vegetated plot-level samples (see methods and materials of main report) identified 51 clusters of samples comprised of 169 species. Well over 1/2 of the clusters were comprised of only 1 to 3 samples, and similar species composition was identified among several clusters. In order to explore patterns of broader scale floristic relationships among the samples an agglomerative hierarchical fusion procedure (FUSE) was carried out (Belbin 1990). In this procedure, the 51 clusters generated during the initial allocation were hierarchically grouped into successively fewer clusters at each level of the hierarchy; we selected a level that defined 12 clusters.

Direct Gradient Analysis of Plots

Canonical Correspondence Analysis (CCA) was used to investigate the variation in species composition, structure and environmental relationships

for wetland vegetation in the Lahontan Valley. These analyses were related to the ALOC results and utilized to determine important environmental gradients influencing plant association distributions. CCA is a multivariate direct gradient analysis technique which examines complex relationships among plants and the environment (ter Braak 1986). The data set analysed by CANOCO is composed of both the vegetation data for each sample and the environmental variables collected for that sample.

Ordination axes (representing the dominant environmental gradients), were extracted using forward selection of the 60 collected environmental variables (see Table 3). Variable selection was based on contribution to total data set variation. In all results summarized below, only statistically significant environmental variables are discussed, as tested by CANOCO during the analyses.

Analysis results were graphically displayed in ordination diagrams using program Canodraw (Smilauer 1992). Ordination scores for sample sites (plots), plant species, and environmental variables extracted in the first two ordination axes (the 2 axes which explain the most variance found in a data set) were plotted with Canodraw. In these ordination diagrams, the influence of continuous environmental variables is displayed by vectors (arrows) indicating the direction of maximum change of the specified variables (ter Braak 1987); vector lengths represent the degree of correlation between the variables and the axes. Squares are used to represent the centroid for each categorical environmental variable.

Canodraw ordination diagrams were used in conjunction with statistical evaluation of the analyses, provided by CANOCO, to interpret patterns of vegetation-environment relations. Since all species present in the data set cannot be displayed, Canodraw was used to limit which species are shown in the diagrams to those which had relatively strong influence on the analysis results. In all the figures presented here, the labels used for plant species consist of 6-letter acronyms comprised of the first 3 letters of each the genus and specific epithet (e.g. DISSPI for *Distichlis spicata*). Labels for environmental variables are short codes used in the data set, and are explained in the text as needed.

Interaction of ALOC Clustering and Direct Gradient Analyses

Data sets as large as this frequently are stratified into successively smaller data sets in order to better understand vegetation patterns related to increasingly finer-scaled gradients (e.g. Peet 1988, Allen and Peet 1990, Bourgeron *et al.* 1995). For the purposes of this study (e.g. to develop a plant association classification and to elucidate species- or community-environmental relations) it was necessary to divide the original dataset into smaller groups for further analyses. It is best to conduct such stratification by examining variation present within the entire data set rather than imposing an *a priori* stratification, such as wetland form. The clusters provided by ALOC represent floristically-based groupings of samples which can then be related to environmental gradients through the direct gradient analyses.

The direct gradient analyses followed a series of steps, repeated several times. At all steps, the results of the direct gradient analyses were compared to those of the clustering analyses. This procedure retained many of the floristic relationships found in the clusters, while directly relating those floristic patterns to environmental gradients.

A. Many successive CCAs were performed. After each, the statistical and graphical results from CANOCO were examined, and the distribution of samples in the ordination were compared to the clusters derived by ALOC and FUSE.

B. If a small number of plots were found to be strongly influencing the ordination results (graphically appearing as "outliers"), then the following questions were asked:

1) what ALOC cluster did these plots belong to?
2) are the plots, and the species occurring in them, related to one of the environmental variables?
3) are the floristic and environmental relations of those plots understood?

Figure C1-1 demonstrates such influential species and samples (upper right portion of diagram, where SALEXI, two soil series and samples are placed). These 2 samples dominated by *Salix exigua* were omitted from subsequent analyses.

C. Once these questions were answered, the plots (typically fewer than 5) would be omitted from the data set in all subsequent analyses. By removing such influential plots, possible relations between the other plots and the environmental variables can be revealed.

D. If no plots or species appeared to be strongly influencing the ordination results, and the results were both statistically and graphically interpretable, then 2 further questions were asked:

1) was the data set at a fine enough scale for useful interpretation of the vegetation-environment relationships?
2) or, was the data set still too large to have local scale patterns of vegetation-environment relations revealed?

E. If question 1 was answered yes, then the analysis stopped there, and the resulting patterns were compared to the clustering results to help refine the preliminary classification.

F. If question 2 was answered yes, then the data set was stratified into 2 smaller data sets, and the sequence of analyses followed steps A through D above, until another stratification was required, or a final, fine-scale result was achieved. Figure C1-2 demonstrates one of the stratifications necessary in the analyses. The samples related to the Playa soil series (PLAYA), and lacustrine (LAKE) sites were split into a separate data set from the others, and each smaller data set was analysed independently.

This iterative process resulted in stratification of the entire data set into four smaller data sets, named and discussed in the following text as shown here:

```
                    ENTIRE DATA SET
                     |             |
                     |             |
          GROUP A                GROUP B
           |     |                |     |
           |     |                |     |
Group A1  Group A2     Group B1   Group B2
```

There were many analyses performed wherein 1-5 plots were omitted between each analysis. The end product of this was a classification of the plots into 40 plant associations. Determination of the associations considered factors related to the physiognomic structure of the vegetation, as well as the floristic and environmental factors. For example, many plots with the grass *Elymus triticoides* were clustered together by ALOC & FUSE, and ordinated together. However, some of these plots are riparian woodlands, dominated by the tree *Populus fremontii*. In the final classification, both *Populus fremontii/Elymus triticoides* and *Elymus triticoides* plant associations were defined.

Clustering and Classification of Point-Level Samples

In order to complete the representativeness analysis (see methods and results of main report) it was necessary to assign the point-level vegetation samples to one of the plant associations defined by the analyses of the plot-level samples. Once the classification of plots was finalized, another clustering was performed. For this, the ALOC procedure was used, and the Bray-Curtis measure of similarity was again chosen. The difference from the initial clustering procedure was that the pre-defined classification of plots provided the clusters against which each point-level sample was compared. Most point samples were successfully assigned to one of the 40 associations defined by the plots. However, the presence of a few communities not found by the plot-level sampling was revealed. These were placed into plant associations based upon the ALOC clustering, but without accompanying direct gradient analysis.

RESULTS

Clustering Analysis

The initial run of ALOC identified 51 clusters of samples. Most of the clusters (31) contained fewer than four samples, one was composed of over 30 samples, and the remainder of the clusters ranged in size from 5 to 16 samples. The clustering followed 3 major patterns. First, clusters were composed of samples dominated by one or two species (meaning the average cover for each of those species was over 10%). This was particularly apparent where samples of the submerged aquatic and emergent graminoid communities were typically clustered together in fairly unique groups (e.g. a cluster of *Ruppia maritima* samples, another of *Zannichellia palustris* samples, another of *Scirpus maritimus*-dominated samples). Second, some clusters were composed of samples with very low abundance of any of the species present in them. For example, in addition to the cluster where *Z. palustris* was dominant (averaging 47% cover), another cluster contained one sample where *Z. palustris* and *Potamogeton pectinatus* each had only trace cover and no other species were present. The third major pattern was clusters of floristically diverse samples which had many species in common to them.

The FUSE clustering procedure resulted in 12 groups. One of these contained 148 samples, well over one-half of the entire data set. This large group was composed of 16 of the 51 ALOC clusters; many of these samples are wet meadow and low graminoid communities. The remaining samples followed similar clustering patterns as found in the 51 ALOC clusters: clusters of samples dominated by one or two species; clusters of samples with very low abundance of the species found in them; and larger, diverse clusters with some species in common. Many of the samples composed of shrub-dominated communities associated with dry playas clustered together, as did samples collected along irrigation ditches (riverine altered wetland type).

Direct Gradient Analysis: Entire Data Set

The results from the CCA analysis on the entire data set revealed several regionally important environmental gradients (Figure C1-3). The first CCA axis is positively correlated with ground cover by water (GRWTR), and lacustrine wetlands (LAKE). The second axis has strong negative correlations with channel width (CHWDTH), elevation (ELEV), and riverine (RIVER) wetlands; and strong positive correlations with ground cover by soil (GRSOIL) and electrical conductivity (EC). Wetland forms (riverine (RIVER), palustrine (PALUS) and LAKE)) were important variables for the entire data set, with

RIVER being negatively correlated with axis 2, LAKE positively with axis 1, and PALUS ordinating close to the origin. The year of sampling (YEAR) also was significantly correlated with both axes.

The distributions of plant species and communities within the Lahontan Valley can be related to the environmental gradients represented in Figure C1-3. The right side of the ordination diagram shows the most important species to include *Scirpus maritimus (SCIMAR)*, *Potamogeton pectinatus (POTPEC)*, *Zannichellia palustris (ZANPAL)*, and *Ruppia maritima (RUPMAR)*. These species occur in lacustrine wetlands with more surface of water. Several plots that ordinated together on the extreme positive end of Axis 1 proved to be comprised entirely of *Ruppia maritima*. These plots influenced the results of the ordination and correspond exactly to one of the ALOC clusters. These plots were considered to represent a *Ruppia maritima* plant association and were excluded from future analyses.

The bottom portion of the diagram is dominated by species and plots found at along riverine sites (RIVER) at higher elevations (ELEV) and on wider channels (CHWDTH). Species found here include the trees *Populus fremontii (POPFRE)*, *Salix laevigata (SALLAE)*, *Elaeagnus angustifolia (ELAANG)*, as well as *Elymus triticoides (LEYTRI)*, *Typha latifolia (TYPLAT)*, *Solidago occidentalis (SOLOCC)*, & *Salix exigua (SALEXI)*. The upper portion of the diagram is dominated by species associated with increasing bare ground (GRSOIL) and salinity (represented by EC), including *Distichlis spicata (DISSPI)*, *Sarcobatus vermiculatus (SARVER)*, *Bassia hyssopifolia (BASHYS)*, *Bacopa eisenii (BACEIS)*, *Suaeda moquinii (SUAMOQ)* and *Allenrolfea occidentalis (ALLOCC)*.

To further test the significance of the year of sampling, a Canonical Variate Analysis (CVA) utilizing a Monte Carlo permutation test was performed on the data set using year of collection as a covariable. The test is used to assess whether there are significant differences between classes, in this case year. The results were significant ($p = 0.01$), depicting either a between year sampling bias and/or between year environmental variation. Similarly, a Monte Carlo permutation test was run using the three wetland forms as covariables, and showed significant ($p = 0.01$) differences between wetland forms. These tests demonstrate that between years of sampling, and also between wetland forms, there are differences in the relationships of plant species to environmental variables, as represented in the data. Figures C1-4, C1-5, and C1-6 show the distribution of sample sites representing each of the wetland forms in the ordination space.

Stratification of the Entire Data Set

Following removal of the plots representing the *Ruppia maritima* plant association, the ordination results lead to the same interpretation as the results for all plots. The data set was still too large for intepretation of finer scale patterns, so it was necessary to stratify. The results from the clustering analyses (see discussion above) provided the basis for this first stratification.

Of the 12 clusters identified by FUSE, one contained approximately half of the plots. We asked the question of whether there were significant differences in the environmental relationships of these plots as compared to all the other plots grouped together. To answer this, each plot in the data set was assigned to one of the 2 groups (the large cluster identified by FUSE versus a group made up of the other 11 clusters). Then a Canonical Variate Analysis (CVA) was performed within CANOCO, using assignment to one or the other group as a covariable. A permutation test showed statistically significant differences ($p = 0.01$) in species-environment relations between the 2 groups. Therefore, the first stratification of the data set was to

divide it into the plots belonging to the large FUSE cluster (called Group A) and those belonging to the remaining 11 clusters (called Group B). Further CCA analyses were carried out on each of these 2 smaller data sets, utilizing the successive steps outlined in the methods. A further stratification was performed on each of the two groups, resulting in a final round of analyses on four small data sets.

Direct Gradient Analysis: Group A

Figure C1-2 shows the analysis results for Group A when the second stratification stage was reached. Figure C1-2 reveals a definite split between species and plots related to the playa soil series (PLAYA) and lacustrine LAKE sites (Group A1) and species/plots related to RIVER wetland type, Sagoupse (SAGSPE) or Dithod (DITHOD) soil series, or GRWTR (Group A2). This PLAYA/LAKE group is shown in the upper right portion of the diagram, and includes plots representing the disturbed herbaceous association *Bassia hyssoppifolia*, typically found on mud flats. Plots belonging to the shrub-dominated associations *Sarcobatus vermiculatus* and *Allenrolfea occidentalis* are also in this group. Many plots in Group A2 were from palustrine wetlands and included wet meadow associations dominated by graminoid species, such as *Juncus balticus, Hordeum jubatum, Distichlis spicata, Eleocharis macrostachya, E. parishii,* and *Scirpus pungens*. Therefore, the data set was split based on wetland form into Playa/Lake and Riverine/Palustrine data sets. Each data set was analyzed independently.

The final results of the Group A1 and Group A2 analyses are shown in Figures C1-7 and C1-8. For Group A1 (Figure C1-7), species and plots were distributed in relation to environmental gradients of: soils (playa (PLAYA) or Parran (PARRAN) soils, or sandy surface texture (SAND)); riverine (RIVER) versus lacustrine (LAKE) sites; and increasing surface water (GRWTR). For Group A2 (Figure C1-8), important variables included RIVER, GRWTR, and soil series (Dithod, Carson). An additional environmental variable proved important in relation to several plots; this variable represents a high level of ground cover disturbance (DIST3), where over 40% of ground cover has been removed (see upper center and left portion of Fig. C1-8). Species associated with this variable (but not all displayed) included *Malva leprosa, Polygonum argyrocoleon, P. arenastrum, Salsola tragus, Plantago lanceolata,* and *Echinochloa crusgalli*. Many of these plots were placed into a group of weedy, herbaceous and exotic dominated associations. Plots related to higher surface water (GRWTR) represented examples of the *Eleocharis macrostachya, Typha domingensis, & Bacopa eisenii* associations. The remaining plots were classified into a variety of graminoid dominated associations, as well as the disturbed herbaceous-dominated *Trifolium fragiferum* and shrub-dominated *Chrysothamnus nauseosus-Tetradymia tetrameres* associations.

Direct Gradient Analysis: Group B

Figure C1-9 shows the analysis results for Group B when the second stratification stage was reached. Significant environmental gradients revealed in this analysis include: increasing bare ground (GRSOIL), with associated dry, shrubby communities along axis 1; plots representing submerged aquatic and emergent graminoid associations related to increasing GRWTR and lacustrine sites in the upper left portion of the diagram; and sites with depositional erosion processes (DEPOS) in the lower left quadrant. Comparison of this distribution of samples with the FUSE clusters revealed that plots associated with DEPOS appear to be predominantly from fresh water, riverine sites belonging to the same FUSE cluster. Therefore, Group B was stratified into 2 smaller data sets: Group B1 composed of the plots which were clustered together by FUSE, and Group B2 composed of the remaining plots.

The first analysis for Group B1 showed two environmental variables (sodium adsorption ratio (SAR) and depositional erosion type (DEPOS)) exerting overwhelming influence on the resulting ordination space. Species and plots had ordination scores clustered around the origin. These two variables were considered to be important driving variables for the Group B1 data set, but their influence was too strong to allow other important vegetation-environment relations to be seen. Therefore, SAR and DEPOS were treated as covariables throughout the rest of the analysis for Group B1.

The final analysis results for Group B1 are shown in Figure C1-10. Axis 1 is negatively correlated with ground cover - gravel (GRGRVL), natural water sources (NAT-ART), and palustrine sites (PALUS) with lakebottom soil series (LKBOT), and positively correlated with loamy soil textures (LOAM) and the Sagoupse soil series (SAGPSE). Axis 2 has a strong positive correlation with GRWTR and alkalinity (pH), and secondarily with the Parran soil series (PARRAN). Species distributed along the GRWTR/pH gradient include *Scirpus acutus, S. pungens & Salix laevigata*. Some of those associated with the NAT-ART/PALUS/LKBOT variables included *Lemna minor & Sarcobatus vermiculatus*.

The final analysis results for Group B2 are shown in Figure C1-11, and several important environmental variables were revealed. These included increasing surface water (GRWTR), natural water source (NAT-ART), and distance from water (DISWTR). Three separate vegetation patterns were related to these results: 1) perennially flooded lacustrine sites with aquatic species related to surface water (GRWTR), such as *Scirpus acutus, S.maritimus, Potamogeton pectinatus & Typha domingensis* (the right-hand portion of the figure); 2) sites with predominantly natural water sources (lower left portion); and 3) sites and species found at increasing distance from surface water (upper left portion of figure), such as *Juncus balticus, Chrysothamnus nauseosus, Allenrolfea occidentalis, & Lactuca serriola*.

Final Classification Results

Results from the direct gradient analysis were used to refine the assignment of plots to a particular ALOC cluster. This process resulted in classification of plant assemblages based on floristic similarity and environmental relationships revealed by direct gradient analysis. Forty plant associations were defined by the interaction of the ALOC and FUSE clusterings and the direct gradient analyses. Table C1-1 presents the plant associations defined during the clustering and direct gradient analyses, and the most important environmental variables with which they were associated. Not all variables exposed by the gradient analysis are listed; in many instances a particular variable was associated with only one or two plots. This was most usually seen with soil series.

Additionally, most of the point-level samples were successfully assigned to one of the above 40 plant associations. Eight additional groupings were defined by the clustering of the point-level samples: four were placed into plant associations, two were defined as agricultural types, one was composed of sites supporting plant communities that could not be classified, and one represented sites that had no vegetation. Plant associations which were found only within the point-level samples are so noted in Table C1-1.

Part 2: Species and Association Modeling

METHODS

Predictive statistical models for selected plant species and plant associations were constructed by relating species or association occurrence to environment attributes collected on plots or points. The successful development of such models enables the prediction of biotic distributions in unsurveyed areas, provided that the appropriate environmental attributes are available. In addition, models provide information about the nature of the relationship between species or communities and the environment, i.e., which environmental attributes are significant predictors of biotic occurrence.

The classes of predictive statistical models known as generalized linear models (GLMs) have characteristics which make them particularly appropriate for use with ecological data, which may not meet all assumptions for traditional statistical techniques. GLMs contain a less restrictive set of assumptions than is found in traditional parametric regression (Nicholls 1989), including non-normal error functions and non-linear relationships between predictor variables (environmental attributes) and the expected responses (biotic occurrence).

GLMs were used to develop predictive relationships between species or community distributions and environmental attributes. The biotic response modeled was the presence or absence of a species or community on a plot or point. Quantitative models were constructed in two ways: (1) using plots for model development and points for model testing, and (2) using a set of plots and points for model development and the remaining plots and points for testing. The second step was implemented following lack of success with some models in the first step.

Our experience has shown that the best modeling results are obtained when the data set used in model development consists of equal numbers of presences and absences of a species or community. For this reason, in step 1, data sets consisted of all plots containing a species or community plus an approximately equal number of randomly selected plots lacking the species or community. Points provided data for step 1 model testing. For step 2, two-thirds of plots and points containing a species or community were used in model development along with an approximately equal number of randomly selected plots and points lacking the species or community. The remaining one-third of plots and points containing a species or community were combined with all other unused plots and points for step 2 model testing.

Species and communities were selected for model development from a list provided by USFWS staff and based on number of occurrences on plots and points. Our experience has indicated that models are most likely to be successful when a species or community is present on at least 30 plots or points. The species selected for step 1 were *Bassia hyssopifolia, Distichlis spicata, Juncus balticus, Sarcobatus vermiculatus,* and *Scirpus maritimus.* Plant associations included the *Distichlis spicata* association and the *Juncus balticus-Distichlis spicata* association. Larger sample sizes in step 2 permitted the addition of the species *Eleocharis macrostachya* and *Typha domingensis* and the following associations: *Bassia hyssopifolia* association, *Sarcobatus vermiculatus* alliance (composed of *Sarcobatus vermiculatus* association, *Sarcobatus vermiculatus-Psorothamnus polydenius* association, and *Sarcobatus vermiculatus/Suaeda moquinii* association), and *Scirpus maritimus* association.

The environmental attributes used in modeling were a subset of those variables common to plots and points. In order to have a manageable number of environmental variables for modeling, variables which were not associated with species distributions in CANOCO ordinations, such as plot shape, erosion type,

and disturbance history, were omitted from modeling. In addition, the 33 soil series were combined into 12 soil classes for modeling based on the texture and drainage characteristics of each series. A complete list of environmental attributes used as input for model development is given in Table C3-1.

Predictive models of species or association presence or absence were developed using a GLM formulation appropriate to binomial distributions. The model structure consists of a linear combination of environmental attributes linked to the predicted response by a (non-linear) logit function, which constrains predicted values to be between 0 (absence) and 1 (presence) (McCullagh and Nelder 1989, Nicholls 1989, Austin *et al.* 1990). Model parameters are chosen to minimize the discrepancy between observed and predicted responses using maximum likelihood estimation (Francis *et al.* 1993). Environmental attributes were entered into a model using a forward stepwise procedure in which at each step, an attribute was selected whose addition to the model produced the largest change in deviance. The change in deviance is approximately distributed as a chi-squared statistic (McCullagh and Nelder 1989). A 5% significance level was used as the criterion for adding an attribute.

Attributes were characterized as either continuous variables or factors (Table C3-1). Factors are variables whose values represented non-ordered categories, such as ephemeral and perennial classes for hydrologic periodicity. When factors are included in a model, a separate parameter is fit to each class in the factor. Continuous variables, such as elevation, could enter the model as either linear or linear plus quadratic terms. Interactions between attributes in the model were also tested for significance during the variable selection phase of model construction. When no significant variables remained for selection, continuous variables in the model were tested to determine whether higher order terms (e.g., quadratic or cubic) were necessary. Terms were added or removed according to the results of this analysis. After a model was developed, three regression diagnostic measures were applied to evaluate and improve the fit of the model to the data. Models were then tested by applying equations to points (step 1) or plots and points (step 2) not used in development.

Model predictions are probabilities of occurrence. The interpretation of the probability value for a given plot or point is that for a sample of sites with the same environmental attributes as the plot or point, a proportion corresponding to the probability would be expected to contain the species or community (Nicholls, 1989). In order to compare the predicted probability of occurrence with observed presence or absence on a plot or point, we converted probabilities of occurrence to presence or absence by designating 'presence' when a probability was greater than or equal to 0.50, and 'absence' when less than 0.50.

RESULTS AND DISCUSSION

Species Modeling

Step 1

When model equations developed for four species were applied to the plots used in their construction, all were adequate in predicting presence or absence (70-82% of plots correctly predicted) (Table C3-2).

When the equations were applied to the test data (points), three of four models (*Distichlis spicata, Eleocharis macrostachya,* and *Juncus balticus*) had adequate overall success in predicting species presence or absence (73-83% of points correctly predicted) (Table C3-3). However, examination of the

distribution of predictions among presence and absence reveals that two of these models (*E. macrostachya* and especially *J. balticus*) had low percentages of correct prediction of species presence on points (57 and 24% correct, respectively). A large percentage of points (76%) containing *J. balticus* were predicted not to have this species. The model for *Bassia hyssopifolia* accurately predicted presence for points on which the species was observed, but also predicted presence on a large percentage of points (78%) where the species was not observed, reducing the overall percent of correct predictions to 36%. Only the model for *D. spicata* adequately predicted both presence and absence.

A variety of environmental attributes were significant predictors of species occurrence on plots (Table C3-4). Three of four models included the variables wetland form and ground cover - litter.

Step 2

Models developed on plots and points for seven species successfully predicted occurrences when equations were applied to the data used to construct the models (75-89% of plots and points correctly predicted) (Table C3-5). Only the model for *Scirpus maritimus* had a high percentage of incorrect predictions of presence (42%) for plots and points on which the species was absent.

When the step 2 models were applied to the test data (plots and points not used in model development), all models had adequate overall success (63-84% of plots and points correctly predicted) (Table C3-6). However, models for *S. maritimus* and *Typha domingensis* produced low percentages of correct predictions of presence (55 and 54%, respectively) compared to absence (85 and 72%, respectively), reducing the usefulness of these models.

All 14 environmental attributes (Table C3-1) were significant predictors in at least one species model developed using plots and points (Table C3-7). Electrical conductivity was present in five of the seven models and ground cover - soil was found in four models. For step 2 models, the presence of *B. hyssopifolia* was associated with intermediate ground cover - soil, alkaline pH, and intermediate electrical conductivity. Presence of *D. spicata* was associated with palustrine or riverine wetlands, poorly drained loam soils, and high ground cover - soil. *E. macrostachya* presence was associated with palustrine and riverine wetlands, low electrical conductivity, and intermediate elevation. *J. balticus* presence was related to palustrine and riverine wetlands, low electrical conductivity, and low ground cover - water. The presence of *S. vermiculatus* was related to moderately drained clay-loam soils, intermediate ground cover - soil, and intermediate electrical conductivity.

Models developed using plots and points (step 2) were more effective than models developed on plots alone (step 1) for *B. hyssopifolia*, *E. macrostachya*, and *J. balticus* (Tables C3-3 and C3-6). Both models for *D. spicata* had approximately the same overall accuracy, but the step 1 model better predicted absence, while the step 2 model better predicted presence. Failure of models developed on plots to predict species distributions on points may be due to the incidental distribution of species over narrower ranges of environmental attributes on plots than over the more numerous points. This may also be reflected in the differences between the environmental attributes which were significant predictors of species distributions in step 1 and step 2 (Tables C3-4 and C3-7). In addition, differences in species' environmental responses were found between samples collected in 1993 and 1995 (Appendix C2). Since the majority of plots were collected in 1993 and all points were collected in 1995, year of sample may

have significantly effected step 1 modeling results. Lack of success could also occur if environmental attributes which are important determiners of species distributions were not included in the modeling effort.

Association Modeling

Step 1

Only two plant associations (*Distichlis spicata* association and *Juncus balticus-Distichlis spicata* association) had sufficient occurrences on plots to be considered for modeling, and in both cases, the number of presences was small (32 and 28, respectively). Both models were successful in predicting community distributions on the plots used to develop the models (83 and 100% of plots correctly predicted) (Table C3-8).

However, neither model was effective when equations were applied to the test data (points) (Table C3-9). Observed presence was correctly predicted (86%) by the *D. spicata* association model, but a large percentage of points (77%) on which the species did not occur were predicted to contain it. The reverse problem was found in the *J. balticus-D. spicata* association model, in which absence was correctly predicted but presence was not.

Lack of success for these models may be a result of differing characteristics of plots versus points (see above). In addition, for the *J. balticus-D. spicata* association model, overfitting to the data may have occurred as a consequence of a large number of environmental attributes (6) which were significant predictors (Table C3-10), resulting in a correspondingly large number of parameters (21) fitted to a relatively small data set (60 plots).

Step 2

All five association models for step 2 were highly successful when applied to the plots and points used to develop the equations (84-100% of plots and points correctly predicted) (Table C3-11). When applied to the test data, models were moderately successful (62-69% of plots and points correctly predicted) (Table C3-12). All models except that for *Bassia hyssopifolia* association had higher percentages of correct predictions of presences than absences.

Important environmental attributes for step 2 models included ground cover - soil (present in four out of five models), elevation (three models), and distance from water (three models) (Table C3-13). Occurrence of the *B. hyssopifolia* association was predicted to be most likely on intermediate ground cover - soil, intermediate electrical conductivity, and intermediate distance from water. Presence of the *D. spicata* association was related to intermediate ground cover - soil, natural water source, and poorly drained clay loam and loam soils. Presence of the *J. balticus-D. spicata* association was related to high ground cover - soil, intermediate ground cover - litter, and high ground cover - water. Occurrence of the *S. vermiculatus* alliance was associated with high elevation, intermediate ground cover - soil, and high distance from water. Occurrence of the *S. maritimus* association was related to alkaline pH, clay textured soils, and low elevation.

As in the species models, use of a data set composed of plots and points produced improved results for association models, in addition to allowing a greater number of plant associations to be analyzed. Differences between plots and points, as discussed above, are likely to be at least in part responsible for better results for association models in step 2 compared to step 1.

REFERENCES CITED

Allen, R.B. and R.K. Peet. 1990. Gradient analysis of forests of the Sangre de Cristo Range, Colorado. Canadian Journal of Botany 68:193-201.

Austin, M.P., A.O. Nicholls, and C.R. Margules. 1990. Measurement of the realized qualitative niche: environmental niches of five *Eucalyptus* species. Ecological Monographs 60:161-177.

Belbin, L. 1990. PATN: Pattern Analysis Package. Division of Wildlife and Ecology, CSIRO, Australia.

Bourgeron, P.S., L.D. Engelking, H.C. Humphries, E. Muldavin, and W.H. Moir. 1995. Assessing the conservation value of the Gray Ranch: Rarity, diversity, and representativeness. Desert Plants 11:1-67.

Francis, B., M. Green, and C. Payne, eds. 1993. The GLIM System: Release 4 Manual. Clarendon Press, Oxford.

McCullagh, P. and J.A. Nelder. 1989. Generalized Linear Models. Second Edition. Chapman and Hall, NY.

Nicholls, A.O. 1989. How to make biological surveys go further with generalized linear models. Biological Conservation 5:51-75.

Peet, R.K. 1988. Forests of the Rocky Mountains. Pages 64-101 in M.G. Barbour and W.D. Billings, eds., North American Terrestrial Vegetation. Cambridge University Press, Cambridge, NY.

Smilauer, P. 1992. CanoDraw User's Guide. Version 3.0. Microcomputer Power, Ithaca, NY. 118 pp.

ter Braak, C.J.F. 1987. CANOCO—a FORTRAN program for community ordination by [partial] [detrended] [canonical] correspondence analysis, principal components analysis and redundancy analysis. Version 2.1. ITI-TNO, Wageningen, The Netherlands.

ter Braak, C.J.F. 1990. Update notes: CANOCO version 3.10. Agricultural Mathematics Group, Wageningen, The Netherlands.

TABLE C1-1. Important environmental variables related to each plant association found in the Lahontan Valley wetlands. Variables were derived from results of Canonical Correspondence Analysis in CANOCO for plot-level samples. Associations or groups with only point-level samples are indicated.

	IMPORTANT ENVIRONMENTAL VARIABLES
1. TREE AND TALL SHRUB COMMUNITIES	
Elaeagnus angustifolia Association	Tentative Association
Populus fremontii Association	Riverine, natural, wider channels, high SAR
Populus fremontii/Elymus triticoides Association	Riverine & palustrine, low surface water, depositional erosion processes
Salix exigua Association	Riverine, natural, higher elevations
Salix laevigata Association	Riverine, natural, increasing channel widths & elevation, depositional erosion, moderate surface water, higher pH
2. SHRUB COMMUNITIES	
Allenrolfea occidentalis Association	Palustrine, altered, distant from water, high EC & bare soil
Sarcobatus vermiculatus Association	Palustrine & some lacustrine, natural, ephemeral, higher EC & bare soil
Sarcobatus vermiculatus-Psorothamnus polydenius Association	Palustrine, natural, ephemeral
Sarcobatus vermiculatus/Suaeda moquinii Association	Palustrine, natural, ephemeral distant from water, lower elevations, high EC & bare soil
Suaeda moquinii Association	Natural, ephemeral, low elevations, high EC & bare soil
3. TRANSITIONAL SHRUB COMMUNITIES	
Artemisia tridentata Association	Riverine, natural, low surface water
Atriplex lentiformis Association	Palustrine, low surface water
Chrysothamnus nauseosus-Tetradymia tetrameres Association	Palustrine, natural, ephemeral

TABLE C1-1 (cont)

	IMPORTANT ENVIRONMENTAL VARIABLES
4. TALL GRAMINACEOUS (EMERGENT) COMMUNITIES	
Equisetum laevigata Association	Tentative Association
Phragmites australis Association	Lacustrine, altered, perennial, with low surface water
Scirpus acutus Association	All wetland forms, moderate surface water, depositional erosion processes, Carson soils, some clay soil textures
Scirpus acutus-Typha domingensis Association	Palustrine, perennial, depositional erosion processes, perennial, some clay soil textures
Scirpus maritimus Association	Lacustrine, some palustrine, altered, high surface water
Scirpus pungens Association	Palustrine, natural, both perennial & ephemeral, Parran soils, surface water variable
Typha domingensis Association	Palustrine, perennial, generally high surface water
Typha latifolia Association	Riverine, both natural & altered, depositional erosion processes
5. LOW GRAMINACEOUS (WET MEADOW) COMMUNITIES	
Eleocharis macrostachya Association	Palustrine, moderate but variable surface water, mostly natural
Eleocharis macrostachya-Bacopa eisenii Association	Palustrine, high surface water
Eleocharis parishii Association	Riverine, natural, higher bare soil & distance from water
Juncus balticus Association	Palustrine, some riverine, both altered and natural, surface water moderate
Juncus balticus-Eleocharis macrostachya Association	Palustrine, natural, perennial, moderate surface water

TABLE C1-1 (cont)

		IMPORTANT ENVIRONMENTAL VARIABLES
6.	**GRASS COMMUNITIES**	
	Distichlis spicata Association	Palustrine, some ephemeral lacustrine, low surface water, disturbed sites, playas
	Elymus triticoides Association	Riverine & palustrine, low surface water, depositional erosion, sand & loam soil textures, low pH
	Juncus balticus-Distichlis spicata Association	Palustrine, both altered and natural, both perennial & ephemeral, low surface water, disturbed sites, Parran, Swope, Dia, Marsh & Lakebottom soils, sand soil textures
	Muhlenbergia asperifolia Association	Low surface water, sandy soil textures
7.	**SUBMERGED AQUATIC COMMUNITIES**	
	Bacopa eisenii Association	Palustrine, altered, Lahontan soils
	Chara sp. Association	Tentative Association
	Lemna minor Association	Palustrine, perennial, low SAR
	Potamogeton latifolia Association	Riverine
	Potamogeton pectinatus Association	Riverine and lacustrine, mostly high surface water
	Ruppia maritima Association	Lacustrine, natural, perennial, high surface water, Lakebottom soils
	Zannichellia palustris Association	Lacustrine & riverine, altered, high surface water

TABLE C1-1 (cont)

		IMPORTANT ENVIRONMENTAL VARIABLES
8.	**DISTURBED HERBACEOUS OR EXOTIC-DOMINATED COMMUNITIES**	
	Bassia hyssopifolia Association	Lacustrine, some palustrine, altered, playas, distant from water, surface water moderate
	Bidens frondosa Association	Tentative Association
	Chenopodium glaucum Association	Riverine, altered, Carson soil
	Kochia scoparia Association	Riverine, altered, moderate to high surface water, high pH, depositional erosion processes
	Lactuca serriola Association	Palustrine & lacustrine, ephemeral, distant from water
	Tamarix ramossisima Association	Lacustrine & palustrine, surface water variable
	Trifolium fragiferum Association	Palustrine, both natural and altered, surface water low to moderate, disturbed sites
9.	**AGRICULTURAL AND UNCLASSIFIED COMMUNITIES**	
	Medicago sativa Agricultural Fields	Point-level samples only
	Zea mays Agricultural Fields	Point-level samples only
	No Vegetation	Point-level samples only
	Unclassified Communities	Point-level samples only

Table C2-1. Environmental attributes included in species and community modeling.

FACTORS	CLASSES
Wetland form	riverine lacustrine palustrine
Water source	natural artificial
Hydrologic periodicity	perennial ephemeral
Soil class	clay, poorly drained clay loam, poorly drained clay loam, moderately drained loam, poorly drained loam, moderately drained sand, well drained sand, moderately drained sand loam, well drained sand loam, poorly drained sand loam, moderately drained variable surface, poorly drained variable surface, moderately drained
Soil texture	sand loam clay
CONTINUOUS VARIABLES:	
Ground cover by soil (%)	
Ground cover by litter (%)	
Ground cover by water (%)	
Elevation	
Channel width	
Channel depth	
Distance from water	
pH	
Electrical conductivity	

Table C2-2. Comparison of observed and predicted species presence or absence on plots used to develop species models.

Bassia hyssopifolia Number of plots correctly predicted = 117 (70%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	57 (70%)	24 (30%)	81
OBSERVED PRESENT	25 (29%)	60 (71%)	85
TOTAL	82	84	166

Distichlis spicata Number of plots correctly predicted = 178 (72%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	74 (67%)	37 (33%)	111
OBSERVED PRESENT	31 (23%)	104 (77%)	135
TOTAL	105	141	246

Eleocharis macrostachya Number of plots correctly predicted = 82 (79%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	37 (73%)	14 (27%)	51
OBSERVED PRESENT	8 (15%)	45 (85%)	53
TOTAL	45	59	575

Juncus balticus Number of plots correctly predicted = 182 (82%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	89 (80%)	22 (20%)	111
OBSERVED PRESENT	19 (17%)	93 (83%)	112
TOTAL	108	115	223

Table C2-3. Comparison of observed and predicted species presence or absence on points for species models developed on plots.

Bassia hyssopifolia Number of points correctly predicted = 206 (36%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	98 (22%)	349 (78%)	447
OBSERVED PRESENT	20 (16%)	108 (84%)	128
TOTAL	118	457	575

Distichlis spicata Number of points correctly predicted = 448 (78%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	332 (82%)	74 (18%)	406
OBSERVED PRESENT	53 (31%)	116 (69%)	169
TOTAL	385	190	575

Eleocharis macrostachya Number of points correctly predicted = 480 (83%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	459 (85%)	79 (15%)	538
OBSERVED PRESENT	16 (43%)	21 (57%)	37
TOTAL	475	100	575

Juncus balticus Number of points correctly predicted = 417 (73%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	376 (93%)	30 (7%)	406
OBSERVED PRESENT	128 (76%)	41 (24%)	169
TOTAL	504	71	575

Table C2-4. Environmental attributes which were significant predictors in species models based on plots.

Bassia hyssopifolia 18% of variance in data explained by model	
SIGNIFICANT PREDICTORS IN ORDER OF IMPORTANCE (TERMS IN MODEL):	
Ground cover by soil	(linear)
Elevation	(linear + quadratic)
Hydrologic periodicity	(factor)
INTERACTION TERM: Hydrologic periodicity X Elevation	
Distichlis spicata 33% of variance in data explained by model	
SIGNIFICANT PREDICTORS IN ORDER OF IMPORTANCE (TERMS IN MODEL):	
Ground cover by soil	(linear + quadratic)
Ground cover by litter	(linear + quadratic)
Wetland form	(factor)
pH	(linear)
Elevation	(linear)
Soil class	(factor)
INTERACTION TERM: Elevation X Ground cover by litter	
Eleocharis macrostachya 45% of variance in data explained by model	
SIGNIFICANT PREDICTORS IN ORDER OF IMPORTANCE (TERMS IN MODEL):	
Ground cover by litter	(linear)
pH	(linear)
Wetland form	(factor)
Channel depth	(linear)
Electrical conductivity	(linear)
NO INTERACTION TERMS	
Juncus balticus 46% of variance in data explained by model	
SIGNIFICANT PREDICTORS IN ORDER OF IMPORTANCE (TERMS IN MODEL):	
Wetland form	(factor)
Electrical conductivity	(linear)
Soil class	(factor)
Ground cover by litter	(linear + quadratic)
NO INTERACTION TERMS	

Table C2-5. Comparison of observed and predicted species presence or absence for plots and points used in generating predictive equations.

Bassia hyssopifolia Number of plots and points correctly predicted = 190 (75%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	94 (77%)	28 (23%)	122
OBSERVED PRESENT	35 (27%)	96 (73%)	131
TOTAL	129	124	253

Distichlis spicata Number of plots and points correctly predicted = 285 (84%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	96 (74%)	34 (26%)	130
OBSERVED PRESENT	22 (10%)	189 (90%)	211
TOTAL	118	223	341

Eleocharis macrostachya Number of plots and points correctly predicted = 103 (87%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	47 (82%)	10 (18%)	57
OBSERVED PRESENT	6 (10%)	56 (90%)	62
TOTAL	53	66	119

Juncus balticus Number of plots and points correctly predicted = 177 (88%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	77 (84%)	15 (16%)	92
OBSERVED PRESENT	10 (9%)	100 (91%)	110
TOTAL	87	115	202

Sarcobatus vermiculatus Number of plots and points correctly predicted = 96 (89%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	48 (89%)	6 (11%)	54
OBSERVED PRESENT	6 (11%)	48 (89%)	54
TOTAL	54	54	108

Scirpus maritimus Number of plots and points correctly predicted = 65 (75%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	25 (58%)	18 (42%)	43
OBSERVED PRESENT	4 (9%)	40 (91%)	44
TOTAL	29	58	87

Typha domingensis Number of plots and points correctly predicted = 86 (84%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	41 (80%)	10 (20%)	51
OBSERVED PRESENT	6 (12%)	45 (88%)	51
TOTAL	47	55	102

Table C2-6. Comparison of observed and predicted species presence or absence for plots and points not used in generating predictive equations.

Bassia hyssopifolia Number of plots and points correctly predicted = 374 (66%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	317 (65%)	170 (35%)	487
OBSERVED PRESENT	25 (30%)	57 (70%)	82
TOTAL	342	227	569

Distichlis spicata Number of plots and points correctly predicted = 344 (72%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	261 (67%)	127 (33%)	388
OBSERVED PRESENT	10 (11%)	83 (89%)	93
TOTAL	271	210	481

Eleocharis macrostachya Number of plots and points correctly predicted = 493 (70%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	467 (69%)	208 (31%)	675
OBSERVED PRESENT	2 (7%)	26 (93%)	28
TOTAL	469	234	703

Juncus balticus Number of plots and points correctly predicted = 519 (84%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	482 (86%)	77 (14%)	559
OBSERVED PRESENT	24 (39%)	37 (61%)	61
TOTAL	506	114	620

Sarcobatus vermiculatus Number of plots and points correctly predicted = 451 (63%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	431 (63%)	252 (37%)	683
OBSERVED PRESENT	11 (35%)	20 (65%)	31
TOTAL	442	272	714

Scirpus maritimus Number of plots and points correctly predicted = 616 (84%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	604 (85%)	109 (15%)	713
OBSERVED PRESENT	10 (45%)	12 (55%)	22
TOTAL	614	121	735

Typha domingensis Number of plots and points correctly predicted = 514 (71%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	499 (72%)	193 (28%)	692
OBSERVED PRESENT	13 (46%)	15 (54%)	28
TOTAL	512	208	720

Table C2-7. Environmental attributes which were significant predictors in species models based on plots and points.

Bassia hyssopifolia 22% of variance in data explained by model	
SIGNIFICANT PREDICTORS IN ORDER OF IMPORTANCE (TERMS IN MODEL):	
Ground cover by soil	(linear + quadratic + cubic)
pH	(linear)
Electrical conductivity	(linear + quadratic)
Ground cover by litter	(linear + quadratic + cubic)
INTERACTION TERM: pH X Electrical conductivity	
Distichlis spicata 49% of variance in data explained by model	
SIGNIFICANT PREDICTORS IN ORDER OF IMPORTANCE (TERMS IN MODEL):	
Wetland form	(factor)
Soil class	(factor)
Ground cover by soil	(linear)
Distance from water	(linear)
Elevation	(linear)
Ground cover by water	(linear)
INTERACTION TERMS: Ground cover by soil X Distance from water Distance from water X Elevation	
Eleocharis macrostachya 61% of variance in data explained by model	
SIGNIFICANT PREDICTORS IN ORDER OF IMPORTANCE (TERMS IN MODEL):	
Wetland form	(factor)
Electrical conductivity	(linear + quadratic)
Elevation	(linear + quadratic)
Ground cover by water	(linear + quadratic)
Channel width	(linear + quadratic + cubic)
NO INTERACTION TERMS	
Juncus balticus 57% of variance in data explained by model	
SIGNIFICANT PREDICTORS IN ORDER OF IMPORTANCE (TERMS IN MODEL):	
Wetland form	(factor)
Electrical conductivity	(linear)
Ground cover by water	(linear)
Ground cover by soil	(linear)
Elevation	(linear + quadratic)
NO INTERACTION TERMS	

Sarcobatus vermiculatus 61% of variance in data explained by model	
SIGNIFICANT PREDICTORS IN ORDER OF IMPORTANCE (TERMS IN MODEL):	
Soil class	(factor)
Ground cover by soil	(linear + quadratic)
Electrical conductivity	(linear + quadratic)
Ground cover by litter	(linear + quadratic)
Hydrologic periodicity	(factor)
INTERACTION TERM: Soil class X Electrical conductivity	
Scirpus maritimus 33% of variance in data explained by model	
SIGNIFICANT PREDICTORS IN ORDER OF IMPORTANCE (TERMS IN MODEL):	
Water source	(factor)
Hydrologic periodicity	(factor)
NO INTERACTION TERMS	
Typha domingensis 48% of variance in data explained by model	
SIGNIFICANT PREDICTORS IN ORDER OF IMPORTANCE (TERMS IN MODEL):	
Electrical conductivity	(linear)
Ground cover by water	(linear + quadratic + cubic)
Channel depth	(linear)
Soil texture	(factor)
Distance from water	(linear + quadratic)
NO INTERACTION TERMS	

Table C2-8. Comparison of observed and predicted community presence or absence on plots used to develop community models.

***Distichlis spicata* association** Number of plots correctly predicted = 50 (83%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	28 (100%)	0 (0%)	28
OBSERVED PRESENT	10 (31%)	22 (69%)	32
TOTAL	38	22	50

***Juncus balticus* - *Distichlis spicata* association** Number of plots correctly predicted = 60 (100%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	32 (100%)	0 (0%)	32
OBSERVED PRESENT	0 (0%)	28 (100%)	28
TOTAL	32	28	60

Table C2-9. Comparison of observed and predicted community presence or absence on points for community models developed on plots.

***Distichlis spicata* association** Number of points correctly predicted = 174 (30%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	114 (23%)	391 (77%)	505
OBSERVED PRESENT	10 (14%)	60 (86%)	70
TOTAL	124	451	575

***Juncus balticus* - *Distichlis spicata* association** Number of points correctly predicted = 451 (78%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	451 (79%)	118 (21%)	569
OBSERVED PRESENT	6 (100%)	0 (0%)	6
TOTAL	457	118	575

Table C2-10. Environmental attributes which were significant predictors in community models based on plots.

***Distichlis spicata* association** 27% of variance in data explained by model	
SIGNIFICANT PREDICTORS IN ORDER OF IMPORTANCE (TERMS IN MODEL):	
Ground cover by soil	(linear)
Water source	(factor)
NO INTERACTION TERMS	
***Juncus balticus* - *Distichlis spicata* association** 100% of variance in data explained by model	
SIGNIFICANT PREDICTORS IN ORDER OF IMPORTANCE (TERMS IN MODEL):	
Ground cover by soil	(linear + quadratic)
Elevation	(linear)
Soil class	(factor)
pH	(linear + quadratic)
Hydrologic periodicity	(factor)
Wetland form	(factor)
NO INTERACTION TERMS	

Table C2-11. Comparison of observed and predicted community presence or absence for plots and points used in generating predictive equations.

***Bassia hyssopifolia* association** Number of plots and points correctly predicted = 55 (95%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	27 (96%)	1 (4%)	28
OBSERVED PRESENT	2 (7%)	28 (93%)	30
TOTAL	29	29	58

***Distichlis spicata* association** Number of plots and points correctly predicted = 103 (84%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	47 (82%)	10 (18%)	57
OBSERVED PRESENT	10 (15%)	56 (85%)	66
TOTAL	57	66	123

***Juncus balticus* – *Distichlis spicata* association** Number of plots and points correctly predicted = 40 (100%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	17 (100%)	0 (0%)	17
OBSERVED PRESENT	0 (0%)	23 (100%)	23
TOTAL	17	23	40

***Sarcobatus vermiculatus* alliance** Number of plots and points correctly predicted = 43 (88%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	23 (88%)	3 (12%)	26
OBSERVED PRESENT	3 (13%)	20 (87%)	23
TOTAL	26	23	49

***Scirpus maritimus* association** Number of plots and points correctly predicted = 48 (96%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	22 (96%)	1 (4%)	23
OBSERVED PRESENT	1 (4%)	26 (96%)	27
TOTAL	23	27	50

Table C2-12. Comparison of observed and predicted community presence or absence for plots and points not used in generating predictive equations.

***Bassia hyssopifolia* association** Number of plots and points correctly predicted = 475 (62%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	466 (62%)	283 (38%)	749
OBSERVED PRESENT	6 (40%)	9 (60%)	15
TOTAL	472	292	764

***Distichlis spicata* association** Number of plots and points correctly predicted = 469 (67%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	443 (67%)	220 (33%)	663
OBSERVED PRESENT	10 (28%)	26 (72%)	36
TOTAL	453	246	699

***Juncus balticus* - *Distichlis spicata* association** Number of plots and points correctly predicted = 523 (67%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	513 (67%)	258 (33%)	771
OBSERVED PRESENT	1 (9%)	10 (91%)	11
TOTAL	514	268	782

***Sarcobatus vermiculatus* alliance** Number of plots and points correctly predicted = 533 (69%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	526 (69%)	238 (31%)	764
OBSERVED PRESENT	2 (22%)	7 (78%)	9
TOTAL	528	245	773

***Scirpus maritimus* association** Number of plots and points correctly predicted = 490 (63%)			
	PREDICTED ABSENT	PREDICTED PRESENT	TOTAL
OBSERVED ABSENT	482 (63%)	280 (37%)	762
OBSERVED PRESENT	2 (20%)	8 (80%)	10
TOTAL	484	288	772

Table C2-13. Environmental attributes which were significant predictors in community models based on plots and points.

Bassia hyssopifolia association 89% of variance in data explained by model	
SIGNIFICANT PREDICTORS IN ORDER OF IMPORTANCE (TERMS IN MODEL):	
Ground cover by soil	(linear + quadratic)
Electrical conductivity	(linear + quadratic)
Distance from water	(linear + quadratic)
Ground cover by water	(linear + quadratic)
Elevation	(linear)
INTERACTION TERM: Ground cover by soil X Electrical conductivity	
Distichlis spicata association 57% of variance in data explained by model	
SIGNIFICANT PREDICTORS IN ORDER OF IMPORTANCE (TERMS IN MODEL):	
Ground cover by soil	(linear + quadratic)
Water source	(factor)
Soil class	(factor)
INTERACTION TERM: Water source X Soil class	
Juncus balticus – Distichlis spicata assocation 100% of variance in data explained by model	
SIGNIFICANT PREDICTORS IN ORDER OF IMPORTANCE (TERMS IN MODEL):	
Ground cover by soil	(linear)
Ground cover by litter	(linear + quadratic)
Ground cover by water	(linear)
NO INTERACTION TERMS	
Sarcobatus vermiculatus alliance 84% of variance in data explained by model	
SIGNIFICANT PREDICTORS IN ORDER OF IMPORTANCE (TERMS IN MODEL):	
Elevation	(linear)
Ground cover by soil	(linear + quadratic + cubic)
Distance from water	(linear + quadratic)
pH	(linear + quadratic + cubic)
NO INTERACTION TERMS	
Scirpus maritimus association 100% of variance in data explained by model	
SIGNIFICANT PREDICTORS IN ORDER OF IMPORTANCE (TERMS IN MODEL):	
pH	(linear)
Soil texture	(factor)
Elevation	(linear)
INTERACTION TERM: Soil texture X pH	

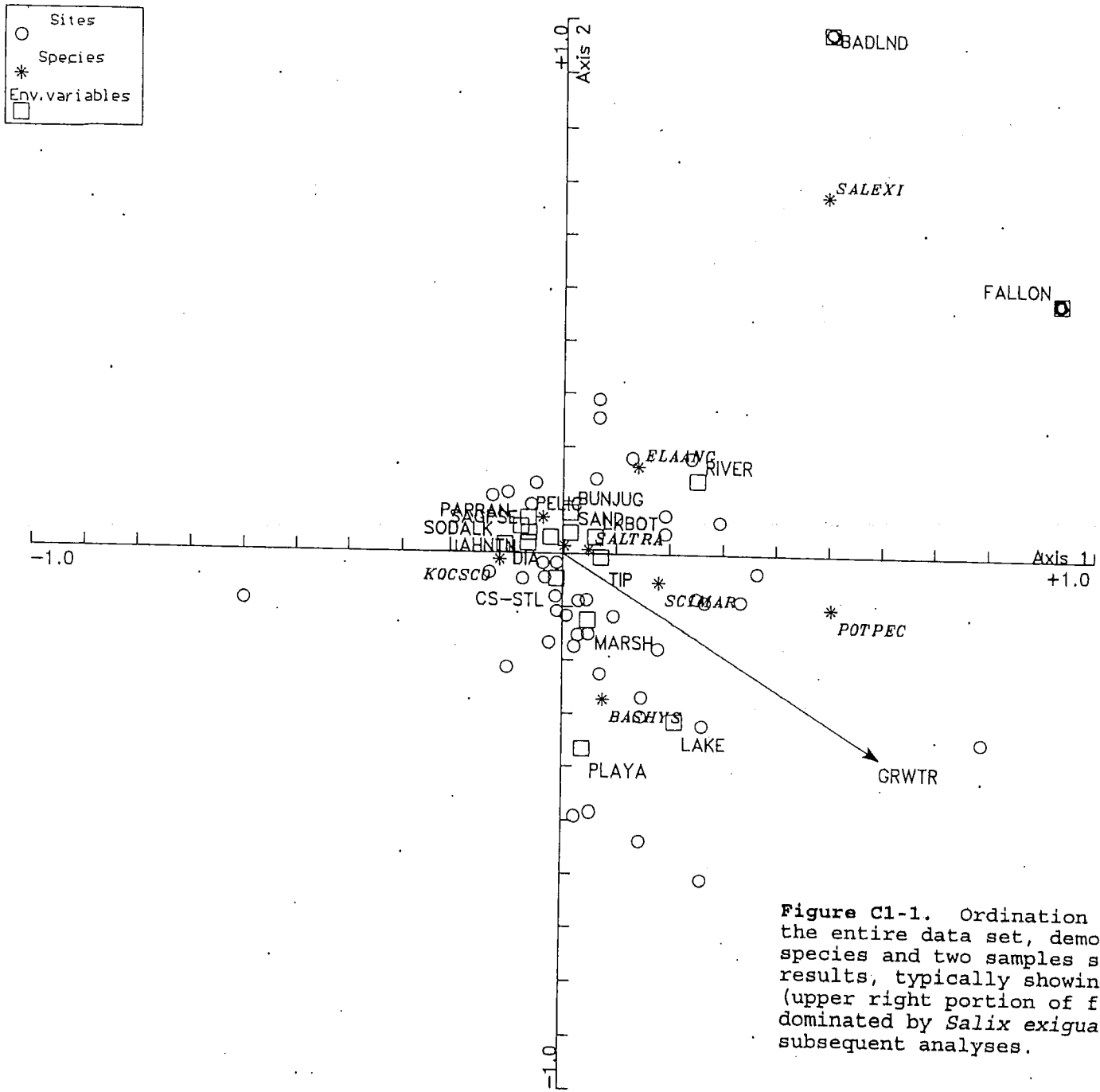


Figure C1-1. Ordination (Axes 1 and 2) of Group A of the entire data set, demonstrating a result where a species and two samples strongly influence the results, typically showing as "outliers" in a figure (upper right portion of figure). The 2 samples here, dominated by *Salix exigua*, were omitted from subsequent analyses.

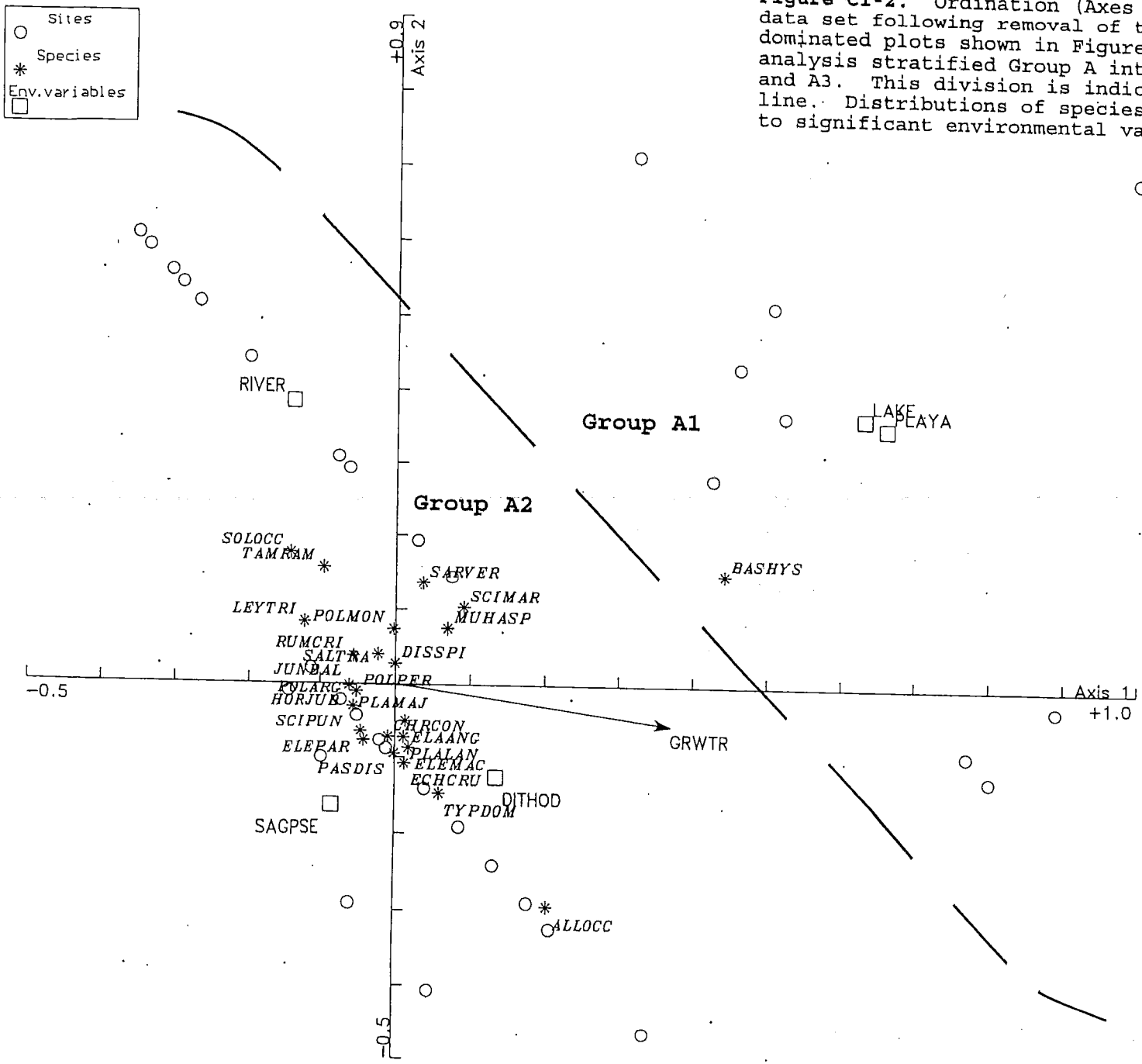


Figure C1-2. Ordination (Axes 1 and 2) of the Group A data set following removal of the *Salix exigua*-dominated plots shown in Figure C1-1. The next analysis stratified Group A into the smaller Groups A2 and A3. This division is indicated by the dashed line. Distributions of species and plots in relation to significant environmental variables are also shown.

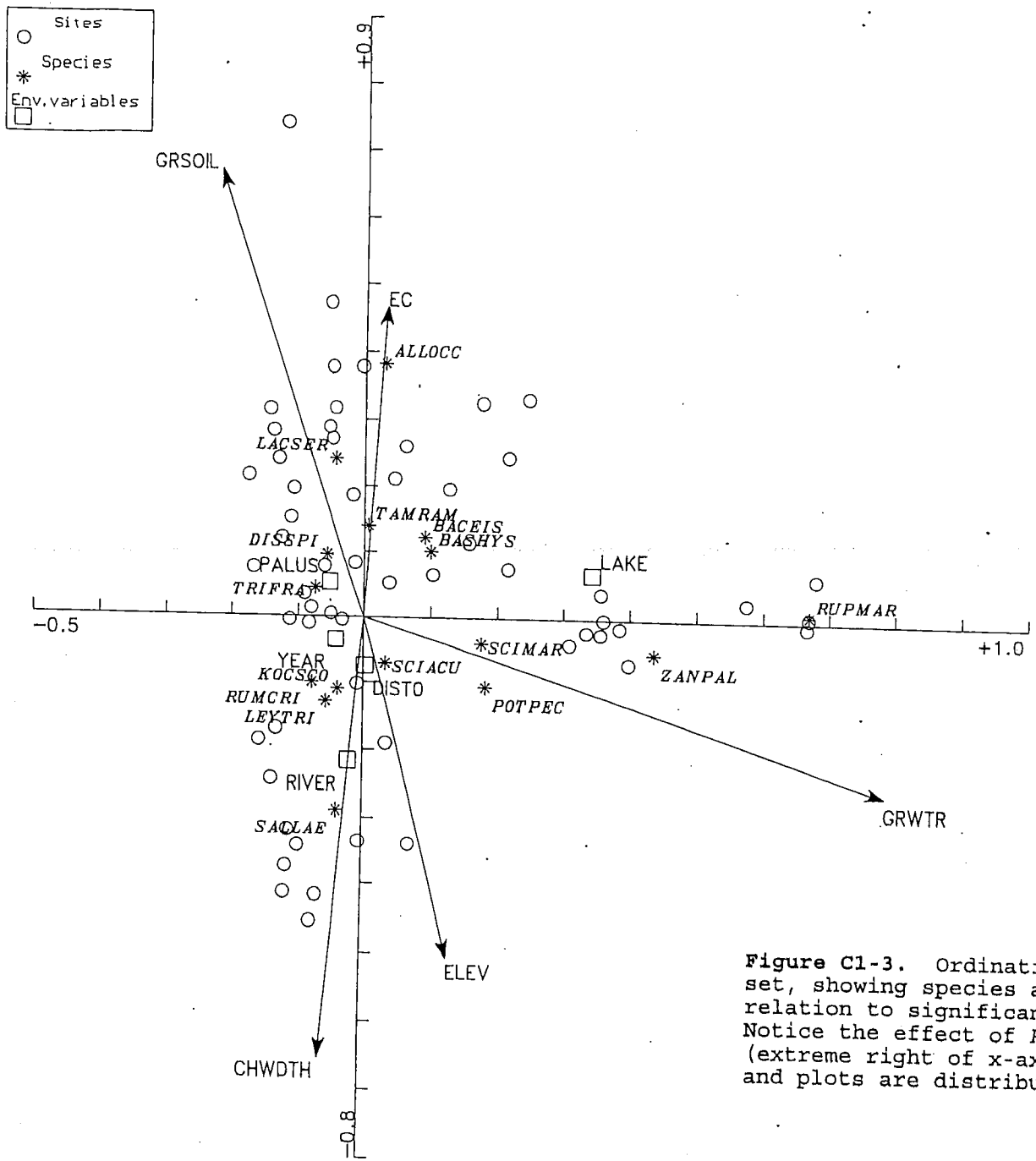


Figure C1-3. Ordination (Axes 1 and 2) of entire data set, showing species and plot distributions in relation to significant environmental variables. Notice the effect of *Ruppia maritima*-dominated plots (extreme right of x-axis), wherein most other species and plots are distributed along the y-axis.

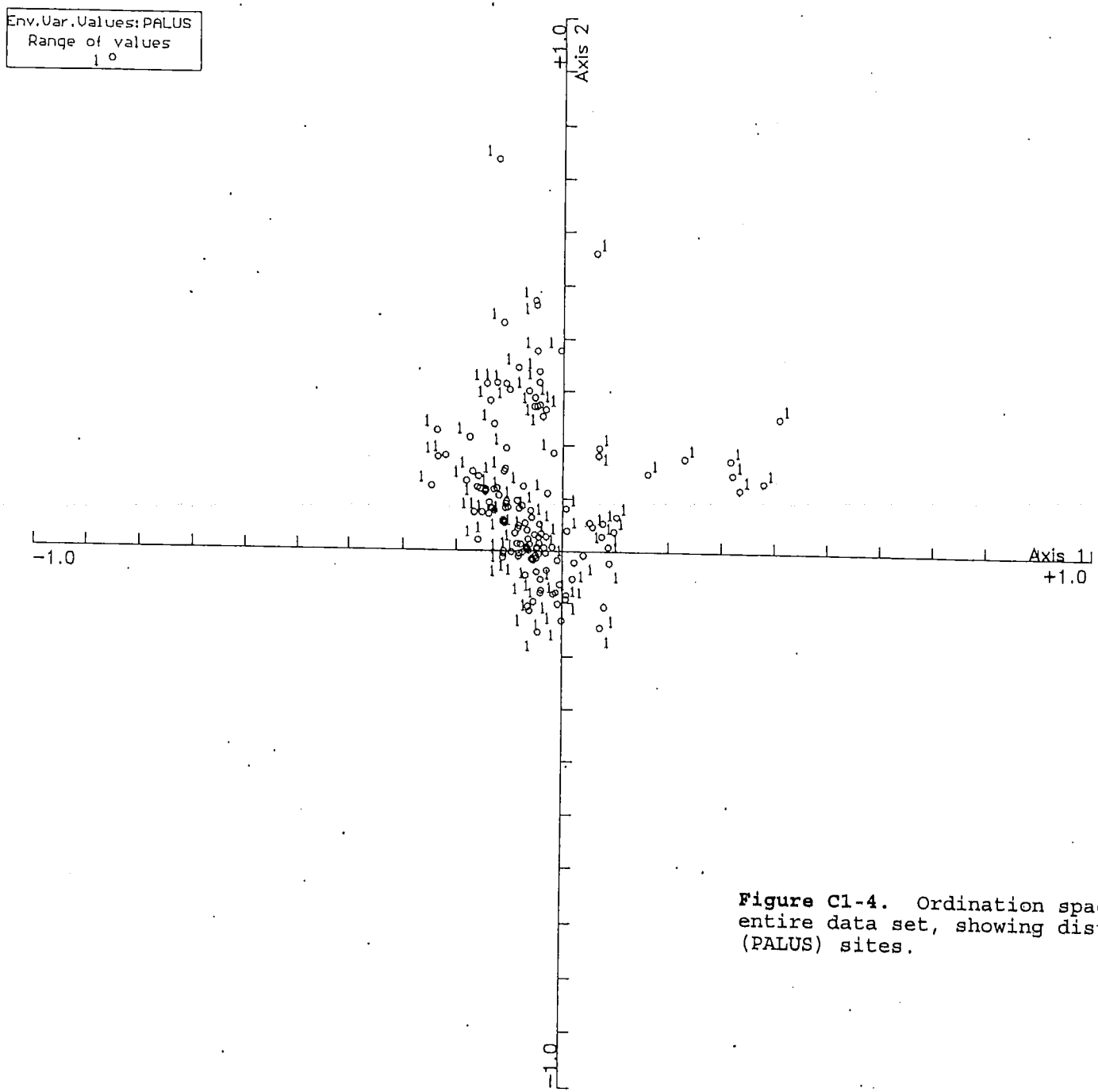


Figure C1-4. Ordination space (Axes 1 and 2) of entire data set, showing distribution of palustrine (PALUS) sites.

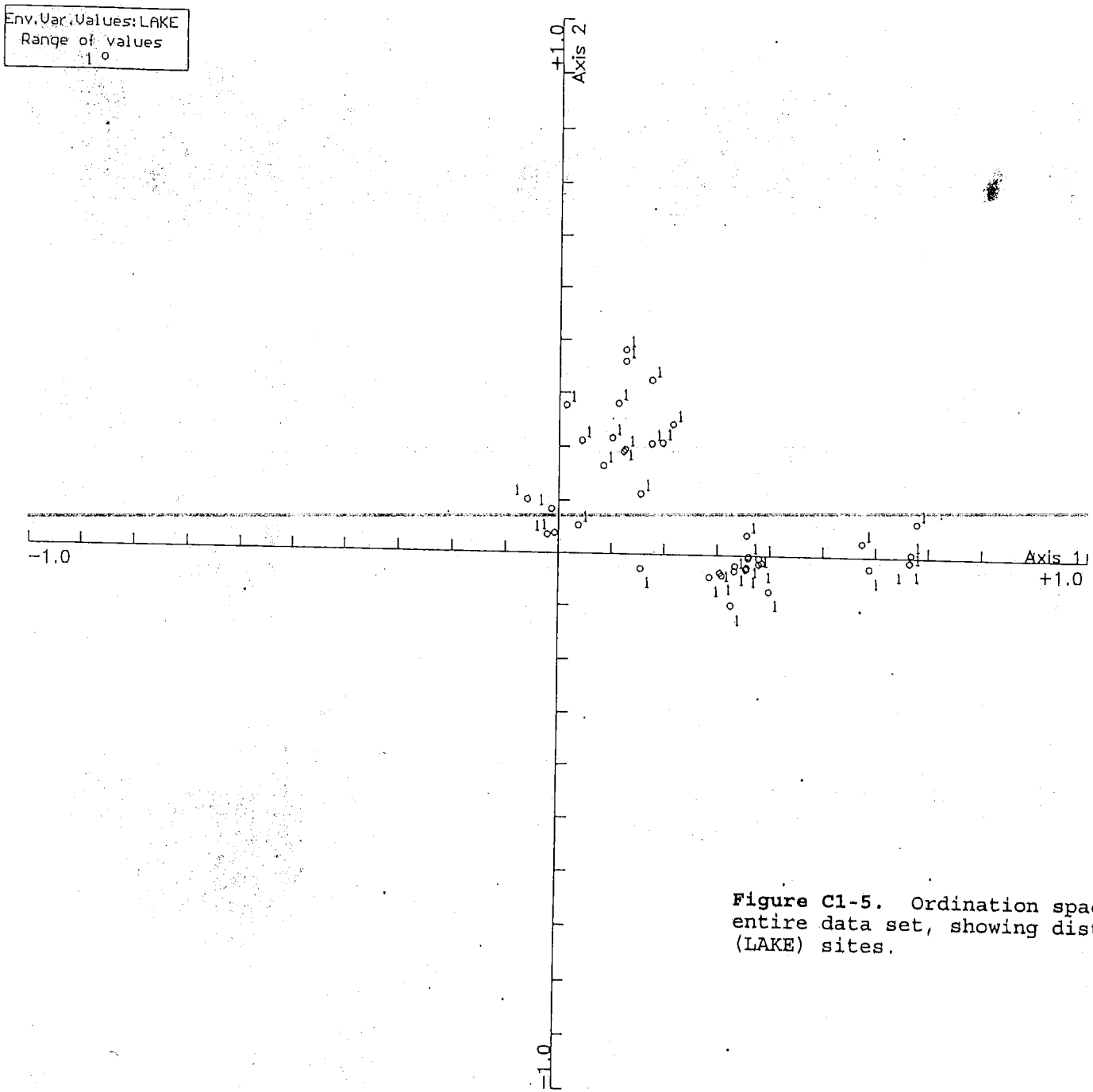


Figure C1-5. Ordination space (Axes 1 and 2) of entire data set, showing distribution of lacustrine (LAKE) sites.

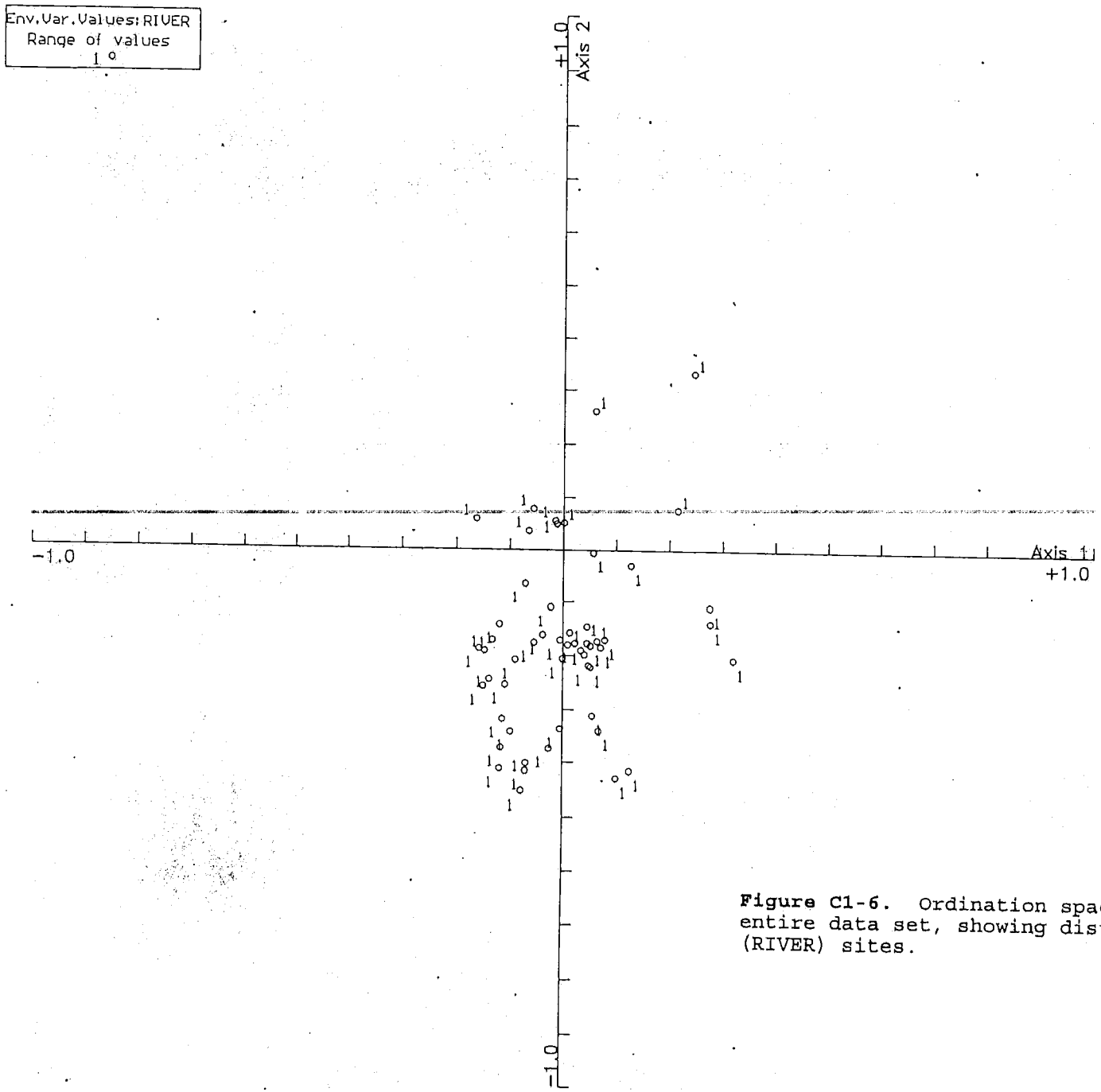


Figure C1-6. Ordination space (Axes 1 and 2) of entire data set, showing distribution of riverine (RIVER) sites.

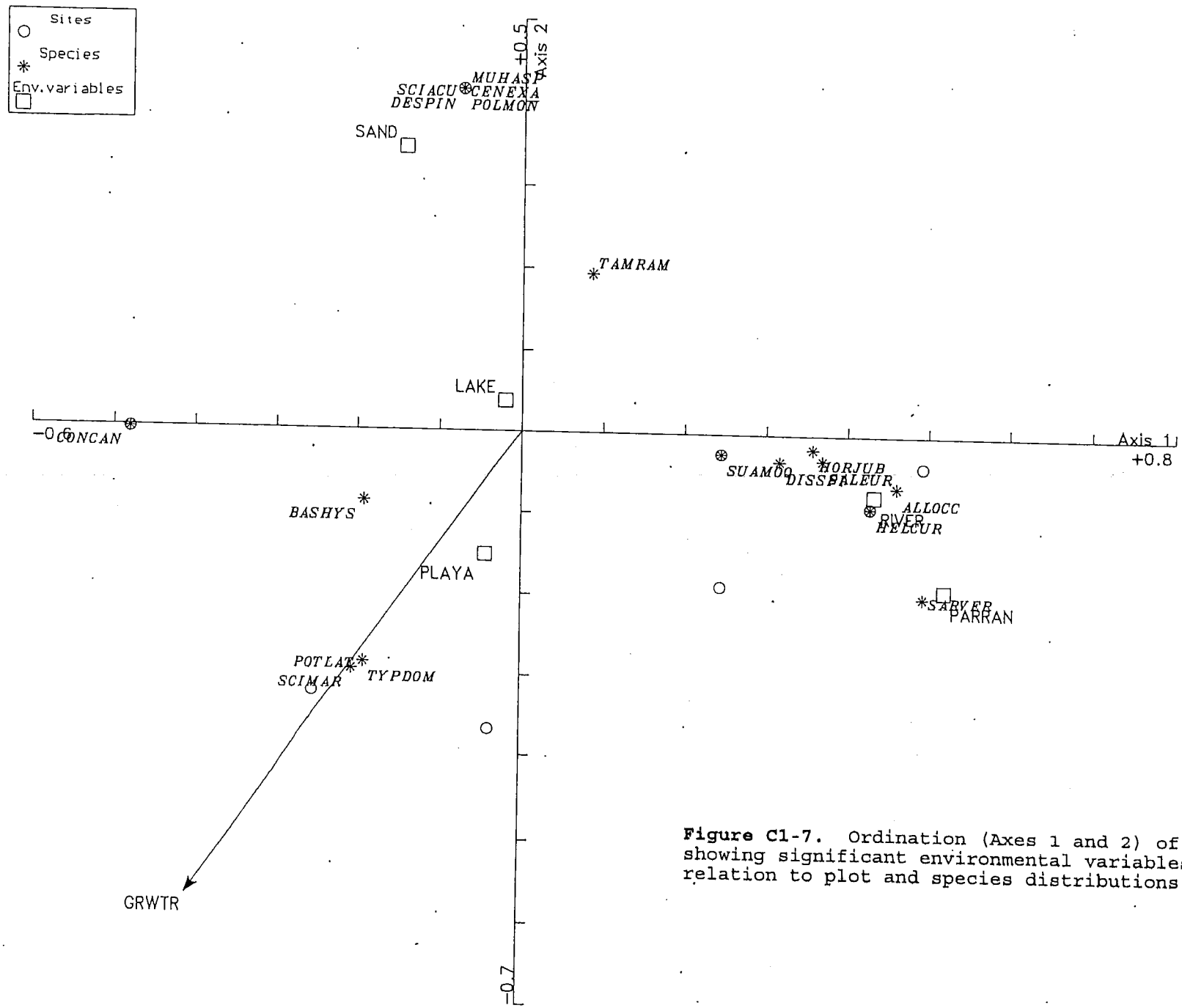


Figure C1-7. Ordination (Axes 1 and 2) of Group A1, showing significant environmental variables in relation to plot and species distributions.

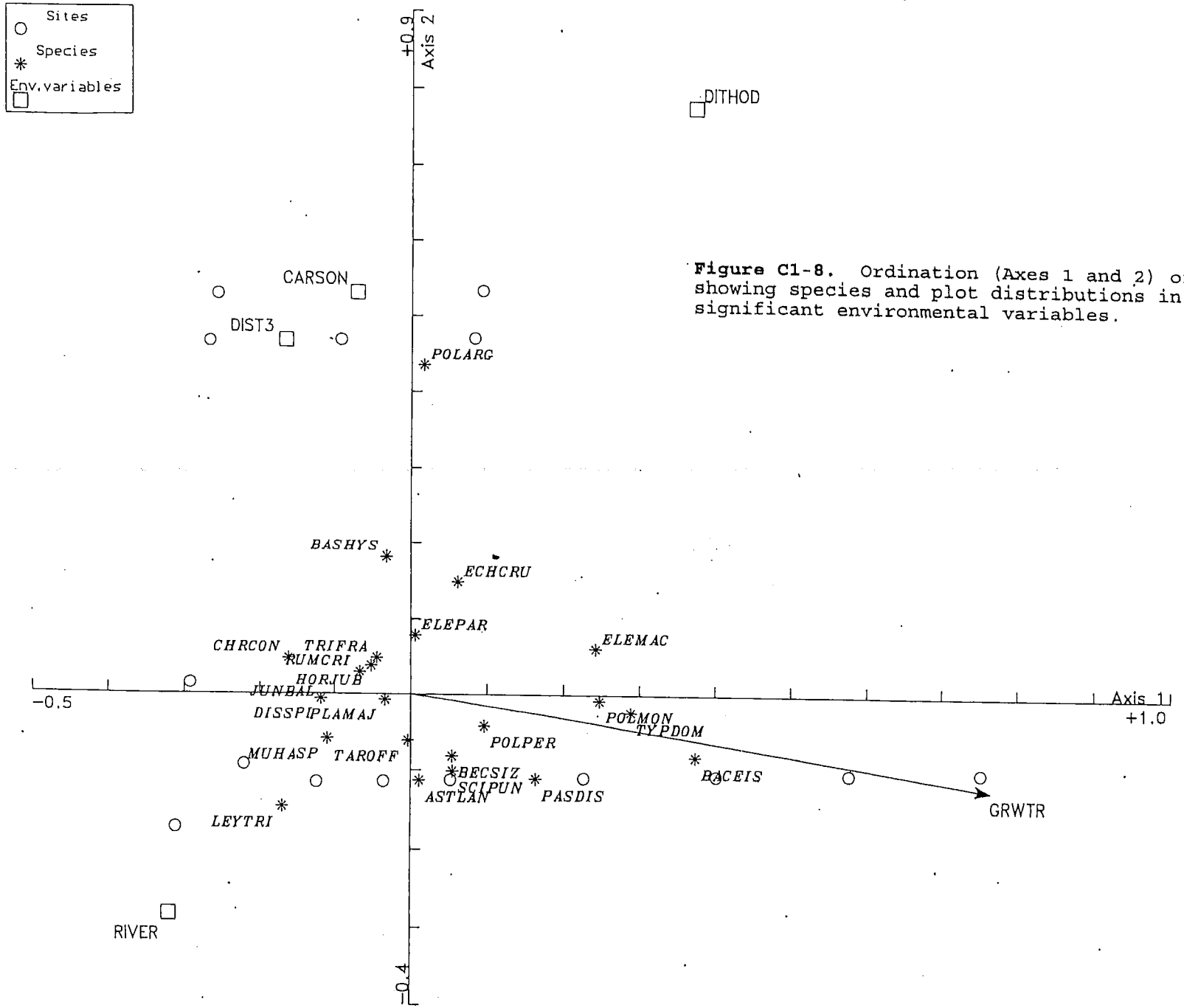


Figure C1-8. Ordination (Axes 1 and 2) of Group A2, showing species and plot distributions in relation to significant environmental variables.

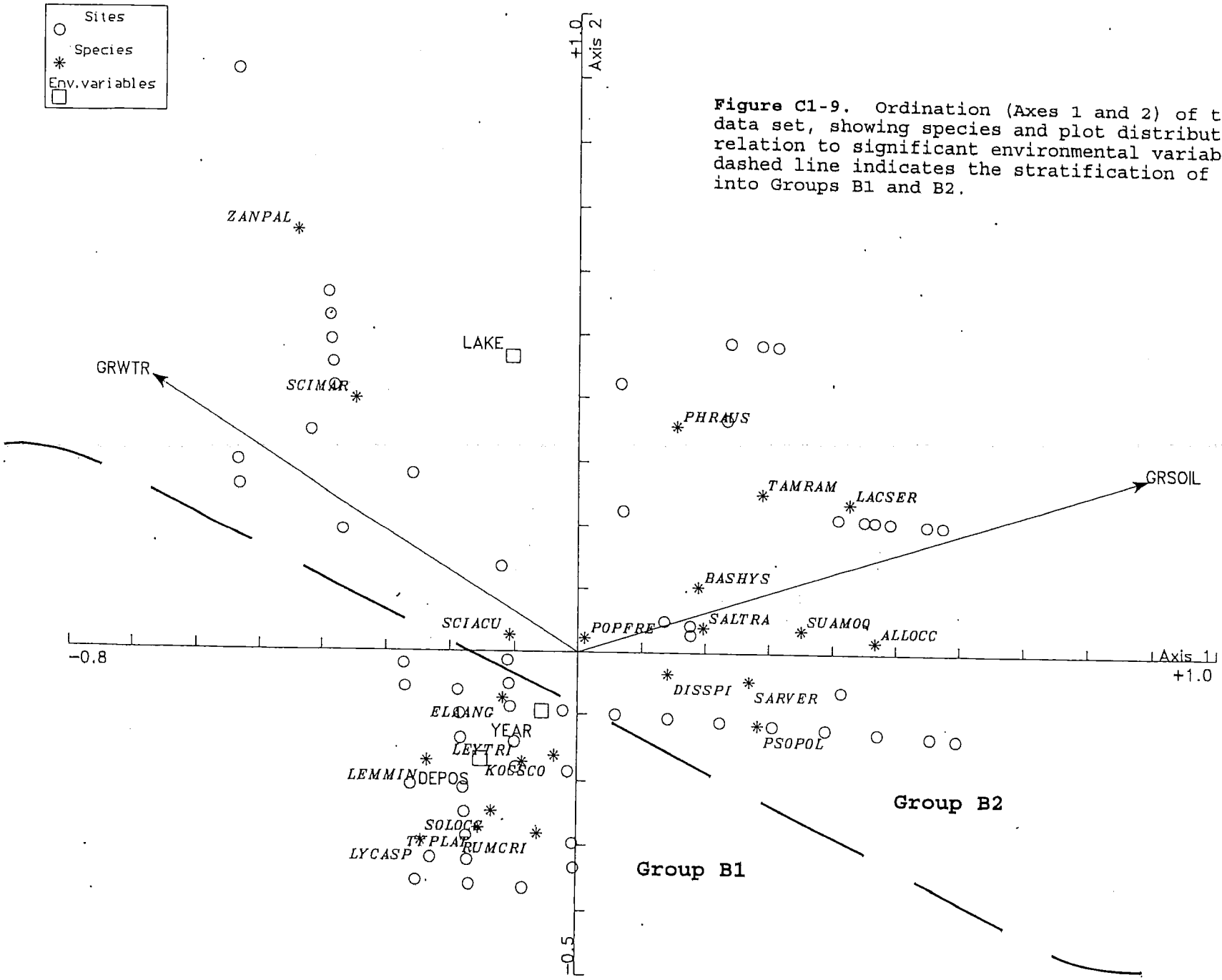


Figure C1-9. Ordination (Axes 1 and 2) of the Group B data set, showing species and plot distributions in relation to significant environmental variables. The dashed line indicates the stratification of Group B into Groups B1 and B2.

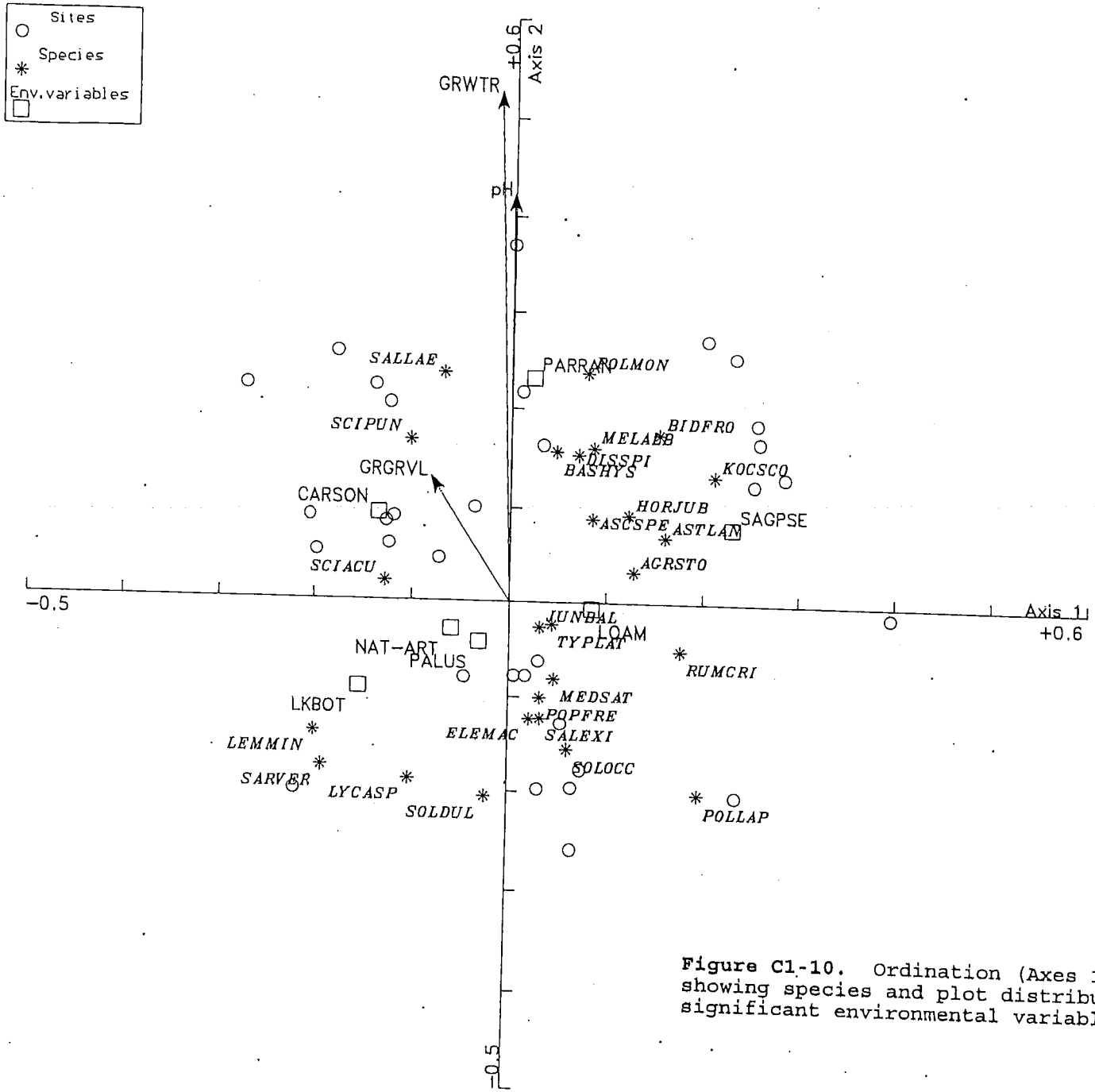


Figure C1-10. Ordination (Axes 1 and 2) of Group B1, showing species and plot distributions in relation to significant environmental variables.

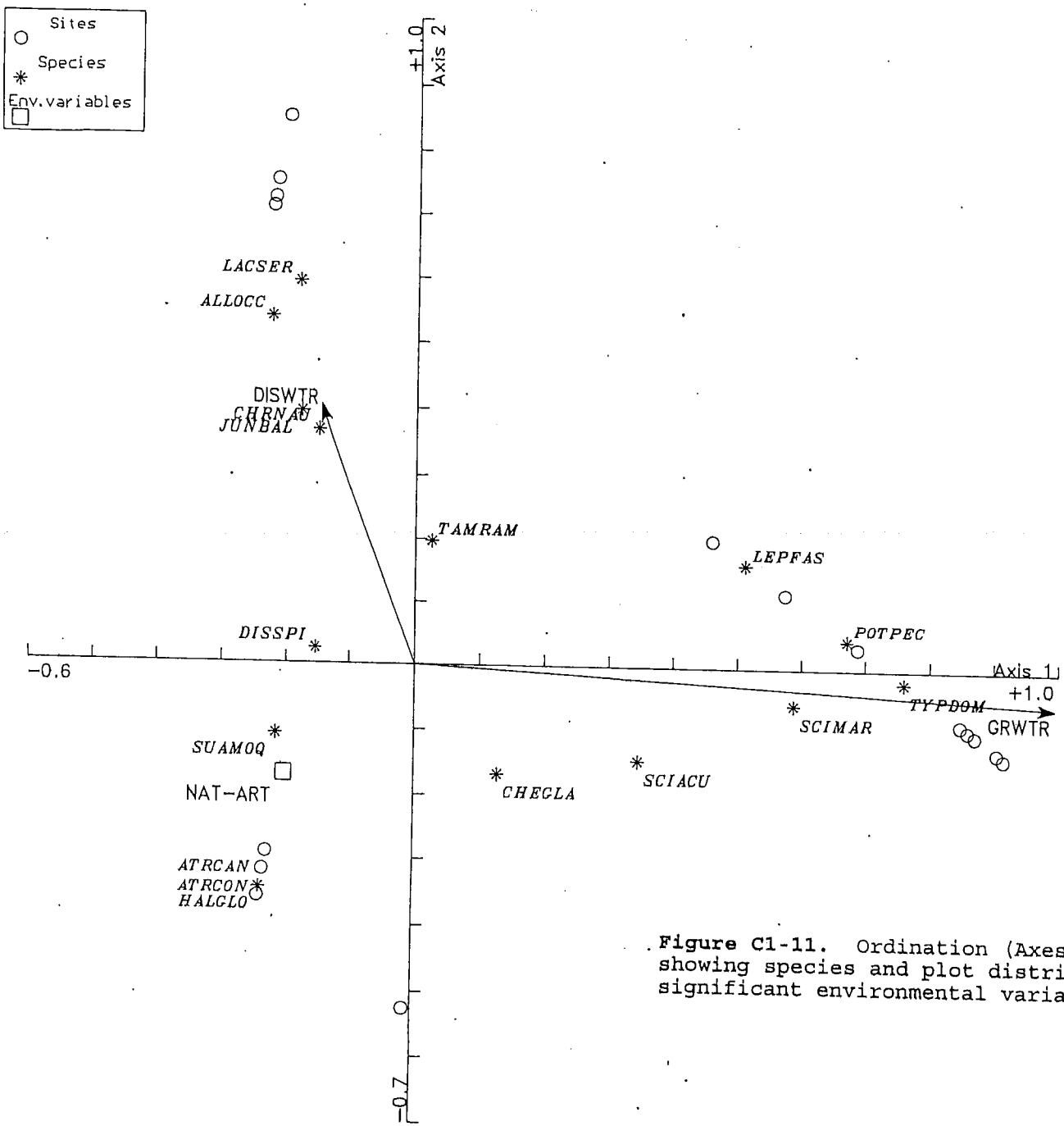


Figure C1-11. Ordination (Axes 1 and 2) of Group B2, showing species and plot distributions in relation to significant environmental variables.

Appendix D

List of all plant species family, common name, and wetland indicator status for the Lahontan Valley wetland inventory. Nomenclature follows Hickman (1993).

Genus and species	Family	Common Name	Wetland Status[1]
Trees			
Elaeagnus angustifolius	Elaeagnaceae	Russian olive	FAC
Populus fremontii	Salicaceae	Fremont cottonwood	FACW
Salix exigua	Salicaceae	Sandbar willow	OBL
Salix laevigata	Salicaceae	Red willow	NI
Tamarix ramosissima	Tamaricaceae	Saltcedar	FACW
Ulmus pumila	Ulmaceae	Siberian elm	NI
Shrubs			
Allenrolfea occidentalis	Chenopodiaceae	Iodine bush	FACW
Artemisia spinescens	Asteraceae	Bud-sage	NI
Artemisia tridentata var. tridentata	Asteraceae	Big sagebrush	NI
Atriplex canescens	Chenopodiaceae	Fourwing saltbush	NI
Atriplex confertifolia	Chenopodiaceae	Shadscale	NI
Atriplex lentiformis ssp. torreyi	Chenopodiaceae	Torrey's saltbush	FAC-
Chrysothamnus nauseosus ssp. consimilis	Asteraceae		NI
Chrysothamnus nauseosus var. oreophalus	Asteraceae	Rubber rabbitbrush	NI
Chrysothamnus viscidiflorus	Asteraceae	Stickyleaf rabbitbrush	NI
Grayia spinosa	Chenopodiaceae	Hop-sage	NI
Lycium shockleyi	Solanaceae	Wolfberry	NI
Psorothamnus polydenius	Fabaceae	Dotted dalea	NI
Rosa woodsii var. ultramontana	Rosaceae	Woods rose	FAC-
Sarcobatus vermiculatus	Chenopodiaceae	Greasewood	FACU
Suaeda moquinii	Chenopodiaceae	Torrey's seepweed	FAC+
Tetradymia glabrata	Asteraceae	Smooth horsebrush	NI
Tetradymia spinosa	Asteraceae	Spiney horsebrush	NI
Tetradymia tetrameres	Asteraceae	Dune-horsebrush	NI
Grasses			
Achnatherum hymenoides	Poaceae	Indian ricegrass	NI
Acroptilon repens	Poaceae		NI
Agropyron elongatum	Poaceae	Tall wheatgrass	NI
Agrostis stolonifera	Poaceae	Creeping bentgrass	FACW
Beckmania sizigachne	Poaceae	American sloughgrass	OBL
Bromus tectorum	Poaceae	Cheatgrass	NI
Bromus willenowii	Poaceae	Rescue grass	NI
Crypsis schoenoides	Poaceae	Swamp timothy	FACW
Distichlis spicata	Poaceae	Inland saltgrass	FAC+
Echinochloa crusgalli	Poaceae	Barnyard grass	FACW
Elymus triticoides	Poaceae	Creeping wildrye	FAC+
Eragrostis orcuttiana	Poaceae	Orcutt lovegrass	NI
Eremopyrum triticeum	Poaceae	Annual wheatgrass	NI
Festuca pratensis	Poaceae	Meadow fescue	FACU
Hordeum brachyantherum	Poaceae	Meadow barley	FACW-
Hordeum jubatum	Poaceae	Foxtail barley	FAC
Leptochloa fascicularis	Poaceae	Bearded sprangletop	OBL
Muhlenbergia asperifolia	Poaceae	Alkali muhly	FACW+
Paspalum distichum	Poaceae	Knot grass	OBL
Poa pratensis	Poaceae	Kentucky bluegrass	FACU
Polypogon monspeliensis	Poaceae	Rabbitfoot grass	FACW+
Puccinellia distans	Poaceae	European alkali grass	OBL
Puccinellia nuttalliana	Poaceae	Nuttall's alkali grass	OBL
Setaria viridis	Poaceae	Green bristlegrass	NI
Sporobolus pulvinatus	Poaceae	Six-weeks dropseed	NI

Genus and species	Family	Common Name	Wetland Status
Low Graminaceous			
Carex anthrostachya	Cyperaceae	Slender-beak sedge	FAC
Carex lanuginosa	Cyperaceae	Wooly sedge	OBL
Carex vulpinoidea	Cyperaceae	Foxtail sedge	OBL
Eleocharis palustris	Cyperaceae	Creeping spikerush	OBL
Eleocharis parishii	Cyperaceae	Parish's spikerush	OBL
Juncus articulatus	Juncaceae	Jointed rush	OBL
Juncus balticus	Juncaceae	Baltic rush	FACW
Juncus torreyi	Juncaceae	Torrey's rush	FACW+
Triglochin concinna	Juncaginaceae	Seaside arrow grass	OBL
Triglochin maritima	Juncaginaceae	Utah arrow grass	OBL
Emergents			
Equisetum arvense	Equisetaceae	Common horsetail	FAC+
Equisetum laevigatum	Equisetaceae	Smooth scouring rush	FACW
Phragmites australis	Poaceae	Common reed	FACW+
Scirpus acutus ssp. occidentalis	Cyperaceae	Hardstem bulrush	OBL
Scirpus americanus	Cyperaceae	Olney threesquare	OBL
Scirpus maritimus	Cyperaceae	Alkali bulrush	OBL
Scirpus nevadensis	Cyperaceae	Nevada bulrush	OBL
Scirpus pungens	Cyperaceae	Common threesquare	OBL
Typha domingensis	Typhaceae	Southern cattail	OBL
Typha latifolia	Typhaceae	Broad-leaf cattail	OBL
Forbs			
Alisma gramineum	Alismataceae	Narrow leaf water plaintain	OBL
Ambrosia acanthicarpa	Asteraceae		NI
Artemisia douglasiana	Asteraceae	Douglas' wormweed	FAC
Artemisia dracunculus	Asteraceae	Tarragon	NI
Artemisia ludoviciana	Asteraceae	Silver wormwood	FACU
Asclepias fascicularis	Asclepiadaceae	Narrow-leaf milkweed	FAC-
Asclepias speciosa	Asclepiadaceae	Showy milkweed	FACW
Asparagus acanthicarpa ssp. officianalis	Liliaceae	Garden asparagus-fern	FACU
Aster frondosus	Asteraceae	Leafy aster	OBL
Aster lanceolatus ssp. hesperius	Asteraceae	Western lined aster	OBL
Astragalus spp.	Fabaceae	Milkvetch	NI
Atriplex argentea	Chenopodiaceae	Silverscale saltbush	FAC
Atriplex heterosperma	Chenopodiaceae	Two scale orache	NI
Atriplex patula	Chenopodiaceae	Spear saltbush	FACW
Atriplex phyllostegia	Chenopodiaceae	Arrow saltbush	FACW
Atriplex subspicata	Chenopodiaceae		NI
Atriplex truncata	Chenopodiaceae	Wedgescale	FAC
Bassia hyssopifolia	Chenopodiaceae	Five-horn smother weed	FACW
Berula erecta	Apiaceae	Cutleaf water parsnip	OBL
Bidens frondosa	Asteraceae	Devil's beggar-ticks	FACW
Camissonia claviformis ssp. integrior	Onagraceae	Clavate fruit primrose	NI
Cardaria pubescens	Brassicaceae	Whitetop	NI
Castilleja exilis	Scrophulariaceae	Small flower indian paintbrush	OBL
Castilleja minor ssp. minor	Scrophulariaceae		FAC
Centaurea repens	Asteraceae	Russian knapweed	NI
Centaurium exaltatum	Gentianaceae	Great basin centaury	FACW
Chamaesyce ocellata ssp. areicola	Euphorbiaceae	Valley spurge	FACW

Genus and species	Family	Common Name	Wetland Status
Forbs (cont.)			
Chenopodium album	Chenopodiaceae	Lamb's quarters	FACU
Chenopodium foliosum	Chenopodiaceae	Leafy goosefoot	NI
Chenopodium glaucum ssp. salinum	Chenopodiaceae	Oakleaf goosefoot	FACW
Chenopodium rubrum var. rubrum	Chenopodiaceae	Red goosefoot	OBL
Chenopodium strictum var. glaucophyllum	Chenopodiaceae		NI
Cichorium intybus	Asteraceae	Common chickory	NI
Circium mohavensis	Asteraceae	Mojave thistle	FACU
Cirsium vulgare	Asteraceae	Bull-thistle	FAC
Cleome sparsifolium	Capparaceae	Few leaf cleome	NI
Convolvulus arvensis	Convulvulaceae	Field bindweed	NI
Conyza canadensis	Asteraceae	Horseweed	FAC
Cressa truxillensis	Convulvulaceae	Alkali weed	FACW
Cryptantha circumcissa	Boraginaceae	Cushion cryptantha	NI
Descurania pinnata	Brassicaceae	Tansy mustard	NI
Epilobium ciliatum ssp. ciliatum	Onagraceae	Hairy willow herb	FAC
Eriastrum sparsiflorum	Polemoniaceae	Great basin eriastrum	NI
Eriogonum deflexum	Polygonaceae	Flat-topped buchwheat	NI
Eriogonum maculatum	Polygonaceae	Spotted buckwheat	NI
Erodium cicutarium	Geraniaceae	Redstem filaree	NI
Euthamia occidentalis	Asteraceae	Westrn fragrant goldenrod	OBL
Galium trifidum var. pacificum	Rubiaceae	Small bedstraw	OBL
Gnapthalium luteo-album	Asteraceae	Weedy cudweed	FACW
Grindelia squarrosa	Asteraceae	Curly-cup gumweed	FACU
Halogeton glomeratus	Chenopodiaceae	Halogeton	NI
Helianthus annuus	Asteraceae	Common sunflower	FACU
Heliotropium curassavicum	Boraginaceae	Seaside heliotrope	OBL
Iva axillaris ssp. robustior	Asteraceae	Poverty weed	FACW
Kochia scoparia	Chenopodiaceae	Mexican summer-cress	FAC
Lactuca serriola	Asteraceae	Prickly lettuce	FACU
Lepidium latifolium	Brassicaceae	Broad-leaf peppergrass	FAC
Lepidium perfoliatum	Brassicaceae	Clasping peppergrass	FACU
Lesquerella tennella	Brassicaceae	Bladderpod	NI
Lotus tenuis	Fabaceae	Slender birds-foot trefoil	NI
Lupinus sp.	Fabaceae	Sand lupine	NI
Lycopus asper	Lamiaceae	Western water-horehound	OBL
Malva neglecta	Malvaceae	Common mallow	NI
Malvella leprosa	Malvaceae	Alkali mallow	FAC
Malvella sp.	Malvaceae		NI
Melilotus alba	Fabaceae	Sweet clover	FACU
Mentha arvensis	Lamiaceae	Field mint	FACW
Mimulus guttatus	Scrophulariaceae	Yellow monkey-flower	OBL
Mirabilis alipes	Nyctaginaceae	Four-o'clock	NI
Nicotiana acuminata var. multiflora	Solanaceae	Many flower tobacco	NI
Oenothera elata ssp. hookeri	Onagraceae	Hooker,s evening primrose	FACW
Opuntia pulchella	Cactaceae	Sand cholla	NI
Plantago erecta	Plantaginaceae		
Plantago lanceolata	Plantaginaceae	English plaintain	FACU
Plantago major	Plantaginaceae	Common plaintain	FAC
Polygonum arenastrum	Polygonaceae	Common knotweed	NI
Polygonum argyrocoleon	Polygonaceae	Silver-sheath knotweed	FAC
Polygonum aviculare	Polygonaceae	Prastrate knotweed	FACW
Polygonum lapathifolium	Polygonaceae	Willow-weed	OBL
Polygonum persicaria	Polygonaceae	Lady's thumb	FACW
Portulaca oleracea	Portulacaceae	Common purslane	FAC

Genus and species	Family	Common Name	Wetland Status
Forbs (cont.)			
Potentilla glandulosa	Rosaceae	Sticky cinquefoil	FACU
Ranunculus aquatilus	Ranunculuaceae	White water buttercup	OBL
Ranunculus cymbalaria var. saximontanus	Ranunculaceae	Desert buttercup	OBL
Rorippa curvisiliqua	Brassicaceae	Curve-pod yellow cress	OBL
Rumex crispus	Polygonaceae	Curly dock	FACW
Rumex maritimus	Polygonaceae	Golden dock	FACW
Rumex salsifolius var. triangulivalvis	Polygonaceae	Triangular valve dock	FACW
Sagittaria cuneata	Alismataceae	Narrow leaf water plaintain	OBL
Salicornia europaea	Chenopodiaceae	Slender glasswort	OBL
Salsola tragus	Chenopodiaceae	Russian thistle	FACU
Sesuvium verrucosum	Aizoaceae	Western sea-purslane	FACW+
Solanum dulcamara	Solanaceae	Climbing nightshade	FAC
Solidago spectabilis	Asteraceae	Basin goldenrod	FACW
Sonchus asper	Asteraceae	Prickly sow-thistle	FACU
Spergularia marina	Caryophyllaceae	Saltmarsh sandspurry	OBL
Sphaeralcea ambigua	Malvaceae	Desert mallow	NI
Sphaerophysa ambigua	Fabaceae		NI
Sphaerophysa salsula	Fabaceae	Alkali swainsonpea	FAC
Stephanomeria exigua ssp. exigua	Asteraceae	Skeleton-weed	NI
Suaeda calceoliformis	Chenopodiaceae	Pursh seablite	FACW
Taraxacum officinale	Asteraceae	Common dandelion	FACU+
Tragopogon dubius	Asteraceae	Goatsbeard	NI
Trifolium fragiferum	Fabaceae	Strawberry clover	FACW-
Trifolium variegatum	Fabaceae	White-tip clover	FACW-
Urtica dioca	Urticaceae	Stinging nettle	FAC
Veronica anagallis-aquatica	Scrophulariaceae	Water sppedwell	OBL
Veronica peregrina	Scrophulariaceae	Purslane speedwell	FACW+
Xanthium strumarium	Asteraceae	Common cocklebur	FAC
Aquatics			
Azolla mexicana	Salviniaceae	Mosquito-Fern	OBL
Bacopa eisenii	Scrophulariaceae	Water hyssop	OBL
Callitriche hermaphroditica	Callitrichaceae	Autumnal water starwort	OBL
Ceratophyllum sp.	Ceratophylaceae	Coontail	OBL
Lemna minor	Lemnacea	Duckweed	OBL
Marsilea vestita ssp. vestita	Marsiliaceae	Water-Clover	OBL
Najas guadalupensis	Najadaceae	Water nymph	OBL
Potamogeton crispus	Potamogetaceae	Curly pondweed	OBL
Potamogeton filiformis var. latifolius	Potamogetaceae	Nevada pondweed	OBL
Potamogeton nodosus	Potamogetaceae	Long-leaved pondweed	OBL
Potamogeton pectinatus	Potamogetaceae	Sago pondweed	OBL
Ruppia maritima	Ruppiaceae	Widgeon grass	OBL
Zannichellia palustsris	Zannichelliaceae	Horned pondweed	OBL
Agricultural Species			
Medicago sativa	Fabaceae	Alfalfa	NI
Zea mays	Poaceae	Corn	NI

1. Wetland indicator status is taken from Reed (1988).

Appendix E

Average Cover and Constancy of important Plants in Lahontan Valley Wetland Plant Associations

The following tables include the average percent cover and the constancy, or the percentage of plots within a given association where a species was present. All values are based on the 264 intensively sampled plots from the 1993 and 1995 field seasons. The associations are divided by lifeform within seven possible categories: **trees, shrubs, tall graminaceous** (emergent), **low graminaceous** (wet meadow), **grass, aquatic**, and a mixture of **disturbed** sites with herbaceous or exotic dominants. Each of the 40 described associations was assigned to one of these classes.

Tree Communities

POPFRE	*Populus fremontii* Association
POPFRE/ELYTRI	*Populus fremontii/Elymus triticoides* Association
SALEXI	*Salix exigua* Association
SALLAE	*Salix laevigata* Association

Shrub Communities

ALLOCC	*Allenrolfea occidentalis* Association
SARVER	*Sarcobatus vermiculatus* Association
SARVER/PSOPOL	*Sarcobatus vermiculatus/Psorothamnus polydenius* Association
SARVER/SUAMOQ	*Sarcobatus vermiculatus/Suaeda moquinii* Association

Transitional Shrub Communities

ARTTRI	*Artemisia tridentata* Association
ATRLEN	*Atriplex lentiformis* Association
CHRCON/TETTET	*Chrysothamnus nauseosus/Tetradymia tetrameres* Association

Tall Graminaceous Communities

SCIACU	*Scirpus acutus* Association
SCIACU/TYPDOM	*Scirpus acutus/Typha domingensis* Association
SCIMAR	*Scirpus maritimus* Association
SCIPUN	*Scirpus pungens* Asociation
PHRAUS	*Phragmites australis* Association
TYPDOM	*Typha domingensis* Association
TYPLAT	*Typha latifolia* Association

Low Graminaceous Communities

ELEMAC	*Eleocharis macrostachya* Association
ELEMAC/BACEIS	*Eleocharis macrostachya/Bacopa eisenii* Association
ELEPAR	*Eleocharis parishii* Association
JUNBAL	*Juncus balticus* Association
JUNBAL/ELEMAC	*Juncus balticus/Eleocharis macrostachya* Association

Grass Communities

DISSPI	*Distichlis spicata* Association
JUNBAL/DISSPI	*Juncus balticus/Distichlis spicata* Association
ELYTRI	*Elymus triticoides* Association
MUHASP	*Muhlenbergia asperifolia* Association

Aquatic Communities

BACEIS	*Bacopa eisenii* Association
LEMMIN	*Lemna minor* Association
RUPMAR	*Ruppia maritima* Association
POTLAT	*Potamogeton latifolia* Association
POTPEC	*Potamogeton pectinatus* Association
ZANPAL	*Zanichellia palustris* Association

Disturbed Herbaceous and Exotic Communities

BASHYS	*Bassia hyssopifolia* Association
CHEGLA	*Chenopodium glaucum* Association
KOCSCO	*Kochia scoparia* Association
LACSER	*Lactuca serriola* Association
TAMRAM	*Tamarix ramissisoma* Association
TRIFRA	*Trifolium fragiferum* Association

Tree Plant Associations

Community Type	POPFRE	POPFRE LEYTRI	SALEXI	SALLAE
Number of stands per group	3	4	2	5
Trees				
Elaeagnus angustifolius	10 0.67	- ----	5 0.50	tr 0.40
Populus fremontii	27 1.00	20 1.00	tr 0.50	tr 0.20
Salix exigua	- ----	8 0.75	25 1.00	tr 0.40
Salix laevigata	- ----	- ----	- ----	26 1.00
Tamarix ramossisima	tr 0.67	tr 0.25	- ----	- ----
Ulmus pumilla	- ----	- ----	tr 0.50	- ----
Shrubs				
Artemisia tridentata var. tridenta	13 0.33	- ----	5 0.50	- ----
Atriplex canescens	- ----	tr 0.25	- ----	- ----
Atriplex lentiformis ssp. torreyi	3 0.33	- ----	- ----	- ----
Chrysothamnus nauseosus ssp. consimilis	- ----	- ----	tr 0.50	- ----
Chrysothamnus nauseosus ssp. oreophilus	tr 0.33	- ----	- ----	- ----
Psorothamnus polydenius	tr 0.33	- ----	- ----	- ----
Sarcobatus vermiculatus	tr 0.33	- ----	- ----	- ----
Graminoids				
Eleocharis macrostachya	tr 0.67	tr 0.25	- ----	- ----
Equisetum arvense	- ----	tr 0.25	- ----	- ----
Equisetum laevigatum	tr 0.33	- ----	tr 0.50	tr 0.20
Juncus balticus	tr 0.67	13 0.75	10 0.50	2 0.80
Juncus torreyi	- ----	- ----	- ----	2 0.20
Scirpus acutus	tr 0.67	- ----	5 0.50	6 0.60
Scirpus pungens	- ----	- ----	- ----	2 0.80
Typha domingensis	- ----	- ----	- ----	5 0.60
Typha latifolia	- ----	tr 0.25	tr 0.50	11 1.00
Grasses				
Distichlis spicata	tr 0.67	tr 0.50	- ----	tr 0.40
Elymus triticoides	tr 0.33	24 1.00	15 0.50	9 0.60
Hordeum jubatum	tr 0.33	tr 0.25	- ----	tr 0.40
Muhlenbergia asperifolia	tr 0.33	- ----	- ----	tr 0.60
Oryzopsis hymenoides	tr 0.33	- ----	- ----	- ----
Polypogon monspeliensis	- ----	tr 0.25	- ----	2 0.60
Forbs				
Ambrosia acanthicarpa	- ----	3 0.25	- ----	- ----
Artemisia douglasiana	- ----	tr 0.25	- ----	- ----
Asclepias fascicularis	tr 0.33	- ----	tr 0.50	- ----
Asparagus officinalis	- ----	tr 0.25	- ----	tr 0.20
Aster hesperius	tr 0.33	tr 0.25	- ----	- ----
Atriplex patula	tr 0.33	- ----	- ----	- ----
Bassia hyssopifolia	- ----	3 0.50	2 0.50	tr 0.60
Bidens frondosa	- ----	tr 0.25	- ----	- ----
Chenopodium foliosum	- ----	- ----	- ----	tr 0.60
Chenopodium glaucum ssp. salinum	tr 0.33	- ----	- ----	- ----
Conyza canadensis	tr 0.33	- ----	- ----	- ----
Euthamia occidentalis	- ----	3 0.50	6 1.00	tr 0.80
Kochia scoparia	- ----	- ----	- ----	tr 0.40
Lactuca serriola	tr 0.33	tr 0.25	- ----	- ----
Lepidium latifolium	- ----	tr 0.25	- ----	tr 0.20
Lycopus asper	- ----	tr 0.25	5 0.50	tr 0.40
Melilotus alba	- ----	3 0.25	- ----	2 0.20
Polygonum argyrocoleon	- ----	- ----	- ----	tr 0.20

Tree Plant Associations (cont.)

Community Type	POPFRE	POPFRE LEYTRI	SALEXI	SALLAE
Number of stands per group	3	4	2	5
Forbs				
Rumex crispus	tr 0.33	tr 0.25	- ----	tr 0.60
Salsola tragus	tr 0.33	- ----	- ----	tr 0.20
Solanum dulcamara	- ----	- ----	10 0.50	tr 0.20
Sonchus asper	- ----	tr 0.25	- ----	- ----
Tragopogon dubius	- ----	tr 0.25	- ----	- ----
Trifolium fragiferum	- ----	- ----	- ----	tr 0.20
Veronica anagalilis-aquatica	- ----	- ----	- ----	tr 0.20
Aquatics				
Lemna sp.	tr 0.33	tr 0.50	- ----	2 0.80
Potamogeton crispus	- ----	- ----	- ----	10 0.20
Potamogeton pectinatus	- ----	5 0.25	- ----	- ----

Shrub Plant Associations

Community Type	ALLOCC	ARTTRI	ATRLEN	CHRCON TETTET
Number of stands per group	8	1	1	2
Shrubs				
Allenrolfea occidentalis	14 1.00	- ----	- ----	- ----
Artemisia tridentata var. tridenta	- ----	10 1.00	- ----	- ----
Atriplex canescens	- ----	- ----	- ----	6 1.00
Atriplex confertifolia	- ----	- ----	- ----	2 0.50
Atriplex lentiformis ssp. torreyi	- ----	- ----	40 1.00	- ----
Chrysothamnus nauseosus ssp. consimilis	- ----	- ----	- ----	15 1.00
Chrysothamnus nauseosus ssp. oreophilus	- ----	- ----	- ----	tr 0.50
Grayia spinosa	- ----	- ----	- ----	tr 0.50
Lycium shockleyi	- ----	- ----	- ----	tr 0.50
Psorothamnus polydenius	- ----	- ----	- ----	5 0.50
Rosa woodsii var. ultramontana	- ----	10 1.00	- ----	- ----
Sarcobatus vermiculatus	tr 0.13	- ----	- ----	5 0.50
Suaeda moquinii	2 0.38	- ----	3 1.00	- ----
Tetradymia glabrata	- ----	- ----	- ----	tr 0.50
Tetradymia spinosa	- ----	- ----	- ----	tr 0.50
Tetradymia tetrameres	- ----	- ----	- ----	10 1.00
Graminoids				
Juncus balticus	- ----	20 1.00	3 1.00	tr 0.50
Grasses				
Distichlis spicata	2 0.38	- ----	10 1.00	10 1.00
Elymus triticoides	- ----	tr 1.00	- ----	tr 0.50
Oryzopsis hymenoides	- ----	- ----	- ----	tr 0.50
Forbs				
Atriplex phyllostegia	- ----	- ----	3 1.00	- ----
Bassia hyssopifolia	2 0.38	tr 1.00	- ----	- ----
Cressa truxillensis	tr 0.13	- ----	- ----	- ----
Eriastrum sparsiflorum	- ----	- ----	- ----	tr 0.50
Euthamia occidentalis	- ----	3 1.00	- ----	- ----
Iva axillaris	- ----	- ----	- ----	2 0.50
Lactuca serriola	- ----	3 1.00	- ----	- ----
Rumex crispus	- ----	tr 1.00	- ----	- ----
Salsola tragus	tr 0.25	- ----	- ----	3 1.00
Suaeda calceoliformis	tr 0.13	- ----	- ----	- ----

Shrub Plant Associations

Community Type	SARVER	SARVER PSOPOL	SARVER SUAMOQ	SUAMOQ
Number of stands per group	10	2	5	2
Trees				
Tamarix ramossisima	tr 0.10	- ----	- ----	- ----
Shrubs				
Allenrolfea occidentalis	tr 0.20	- ----	tr 0.20	- ----
Artemisia spinescens	- ----	2 0.50	tr 0.20	- ----
Atriplex canescens	tr 0.10	- ----	tr 0.20	- ----
Atriplex confertifolia	2 0.20	5 0.50	3 0.80	- ----
Psorothamnus polydenius	tr 0.30	10 1.00	- ----	- ----
Sarcobatus vermiculatus	17 1.00	11 1.00	18 1.00	tr 1.00
Suaeda moquinii	tr 0.10	- ----	12 1.00	15 1.00
Tetradymia tetrameres	- ----	2 0.50	- ----	- ----
Graminoids				
Eleocharis macrostachya	tr 0.10	- ----	- ----	- ----
Grasses				
Agrostis stolonifera	tr 0.10	- ----	- ----	- ----
Bromus willdenowii	tr 0.20	- ----	- ----	- ----
Distichlis spicata	2 0.40	- ----	tr 0.40	- ----
Festuca pratensis	tr 0.10	- ----	- ----	- ----
Hordeum jubatum	tr 0.20	- ----	- ----	- ----
Oryzopsis hymenoides	tr 0.10	7 1.00	- ----	- ----
Polypogon monspeliensis	tr 0.10	- ----	- ----	- ----
Puccinellia distans	tr 0.10	- ----	- ----	- ----
Forbs				
Artemisia ludoviciana	tr 0.10	- ----	- ----	- ----
Aster sp.	tr 0.10	tr 0.50	- ----	- ----
Atriplex argentea	- ----	- ----	tr 0.20	- ----
Atriplex phyllostegia	tr 0.10	- ----	- ----	- ----
Bassia hyssopifolia	tr 0.20	- ----	tr 0.60	2 0.50
Camissonia claviformis ssp. integrior	tr 0.20	2 1.00	- ----	- ----
Chamaesyce ocellata ssp. arenicola	tr 0.10	- ----	- ----	- ----
Chenopodium glaucum ssp. salinum	tr 0.10	- ----	- ----	- ----
Cryptantha circumscissa	- ----	2 0.50	- ----	- ----
Eriastrum sparsiflorum	tr 0.10	- ----	tr 0.20	- ----
Eriogonum deflexum	tr 0.10	- ----	- ----	- ----
Eriogonum maculatum	tr 0.10	- ----	tr 0.20	- ----
Halogeton glomeratus	3 0.40	- ----	tr 0.20	- ----
Helianthus annuus	tr 0.10	- ----	- ----	- ----
Kochia scoparia	2 0.10	- ----	- ----	- ----
Lactuca serriola	tr 0.10	- ----	- ----	- ----
Lepidium perfoliatum	- ----	- ----	tr 0.20	- ----
Lupinus sp.	tr 0.10	2 0.50	- ----	- ----
Malvella sp.	- ----	2 0.50	- ----	- ----
Oenothera elata	tr 0.10	- ----	- ----	- ----
Opuntia pulchella	tr 0.10	- ----	- ----	- ----
Salicornia europaea	- ----	- ----	- ----	10 0.50
Salsola tragus	2 0.40	12 1.00	tr 0.40	- ----
Spergularia marina	- ----	2 1.00	- ----	- ----
Stephanomeria exigua	tr 0.10	2 0.50	- ----	- ----
Xanthium strumarium	tr 0.10	- ----	- ----	- ----

Tall Graminaceous (Emergent) Plant Associations

Community Type	SCIACU	SCIACU TYPDOM	SCIMAR	SCIPUN
Number of stands per group	6	4	10	11
Trees				
Elaeagnus angustifolius	3 0.14	- ----	- ----	- ----
Tamarix ramossisima	- ----	- ----	tr 0.10	- ----
Shrubs				
Sarcobatus vermiculatus	3 0.43	- ----	- ----	- ----
Graminoids				
Eleocharis macrostachya	tr 0.14	2 0.50	tr 0.10	- ----
Eleocharis parishii	- ----	- ----	- ----	4 0.27
Juncus balticus	- ----	tr 0.50	- ----	tr 0.27
Juncus torreyi	tr 0.14	- ----	- ----	- ----
Scirpus acutus	44 0.86	50 1.00	tr 0.30	3 0.18
Scirpus maritimus	- ----	- ----	13 1.00	tr 0.18
Scirpus nevadensis	- ----	- ----	- ----	2 0.09
Scirpus pungens	tr 0.29	- ----	- ----	41 1.00
Triglochin maritima	- ----	- ----	- ----	tr 0.09
Typha domingensis	- ----	35 1.00	2 0.40	2 0.45
Grasses				
Distichlis spicata	tr 0.29	tr 0.25	tr 0.20	16 0.91
Echinochloa crusgalli	tr 0.14	- ----	- ----	- ----
Elymus triticoides	5 0.43	- ----	- ----	- ----
Hordeum jubatum	tr 0.14	- ----	tr 0.10	3 0.55
Leptochloa fascicularis	- ----	- ----	2 0.30	- ----
Muhlenbergia asperifolia	- ----	- ----	- ----	tr 0.09
Polypogon monspeliensis	tr 0.14	tr 0.25	tr 0.10	tr 0.09
Puccinellia distans	- ----	- ----	- ----	tr 0.09
Puccinellia nuttalliana	tr 0.29	- ----	- ----	tr 0.27
Forbs				
Asclepias fascicularis	tr 0.14	- ----	- ----	- ----
Aster hesperius	- ----	- ----	tr 0.10	tr 0.09
Atriplex patula	tr 0.14	- ----	- ----	- ----
Bassia hyssopifolia	tr 0.29	- ----	tr 0.40	tr 0.18
Bidens frondosa	tr 0.29	- ----	- ----	- ----
Chenopodium foliosum	tr 0.14	- ----	- ----	tr 0.09
Chenopodium glaucum ssp. salinum	- ----	- ----	tr 0.20	- ----
Cirsium vulgare	tr 0.14	- ----	- ----	- ----
Conyza canadensis	tr 0.14	- ----	- ----	- ----
Euthamia occidentalis	tr 0.14	tr 0.25	- ----	tr 0.09
Iva axillaris	tr 0.14	- ----	- ----	- ----
Kochia scoparia	tr 0.14	- ----	- ----	tr 0.18
Lactuca serriola	- ----	tr 0.25	- ----	tr 0.09
Lycopus asper	tr 0.14	- ----	- ----	- ----
Medicago sativa	tr 0.14	- ----	- ----	- ----
Mentha arvensis	tr 0.14	- ----	- ----	- ----
Ranunculus cymbalaria ssp. saximontanus	- ----	- ----	- ----	tr 0.09
Rumex crispus	tr 0.29	- ----	- ----	tr 0.09
Sagittaria cuneata	tr 0.14	tr 0.25	- ----	- ----
Solanum dulcamara	tr 0.29	- ----	- ----	- ----
Suaeda calceoliformis	- ----	- ----	- ----	tr 0.09
Aquatics				
Bacopa eisenii	- ----	tr 0.50	tr 0.10	- ----
Lemna sp.	tr 0.14	tr 0.25	tr 0.10	tr 0.09
Najas guadalupensis	- ----	- ----	tr 0.10	- ----
Potamogeton nodosus	- ----	tr 0.25	- ----	- ----
Potamogeton pectinatus	- ----	- ----	tr 0.10	- ----
Zanichellia palustris	- ----	- ----	tr 0.10	- ----

Tall Graminaceous (Emergent) Plant Associations

Community Type	PHRAUS	TYPDOM	TYPLAT
Number of stands per group	2	9	8
Trees			
Elaeagnus angustifolius	- ----	- ----	tr 0.13
Salix exigua	- ----	- ----	tr 0.13
Graminoids			
Eleocharis macrostachya	- ----	8 0.44	3 0.38
Equisetum laevigatum	- ----	- ----	tr 0.25
Juncus balticus	- ----	tr 0.33	2 0.38
Juncus torreyi	- ----	- ----	tr 0.13
Phragmites australis	80 1.00	- ----	- ----
Scirpus acutus	tr 0.50	- ----	6 0.25
Scirpus pungens	- ----	6 0.44	- ----
Typha domingensis	- ----	56 1.00	- ----
Typha latifolia	- ----	- ----	20 1.00
Grasses			
Agrostis stolonifera	- ----	- ----	2 0.38
Beckmannia sizigachne	- ----	- ----	tr 0.13
Distichlis spicata	tr 0.50	2 0.33	tr 0.13
Elymus triticoides	- ----	tr 0.11	2 0.50
Hordeum jubatum	- ----	tr 0.11	2 0.25
Muhlenbergia asperifolia	- ----	- ----	tr 0.13
Paspalum distichum	- ----	tr 0.11	- ----
Polypogon monspeliensis	- ----	tr 0.11	tr 0.25
Forbs			
Asclepias speciosa	- ----	tr 0.11	tr 0.25
Aster hesperius	- ----	- ----	tr 0.25
Atriplex heterosperma	- ----	- ----	tr 0.13
Atriplex phyllostegia	tr 0.50	- ----	- ----
Bassia hyssopifolia	- ----	tr 0.22	tr 0.13
Bidens frondosa	- ----	- ----	tr 0.13
Centaurea repens	- ----	tr 0.11	- ----
Chenopodium foliosum	- ----	tr 0.11	- ----
Epilobium ciliatum ssp. ciliatum	- ----	- ----	tr 0.25
Euthamia occidentalis	- ----	tr 0.11	10 0.50
Heliotropium curassavicum	tr 0.50	- ----	tr 0.13
Kochia scoparia	- ----	tr 0.11	3 0.38
Lactuca serriola	tr 0.50	tr 0.22	- ----
Lepidium latifolium	- ----	- ----	2 0.25
Lycopus asper	- ----	- ----	tr 0.38
Melilotus alba	- ----	- ----	tr 0.13
Mentha arvensis	- ----	- ----	tr 0.13
Plantago erecta	- ----	- ----	tr 0.13
Polygonum arenastrum	- ----	- ----	tr 0.13
Polygonum argyrocoleon	- ----	tr 0.11	- ----
Polygonum lapathifolium	- ----	- ----	2 0.25
Polygonum persicaria	- ----	tr 0.11	- ----
Portulaca oleracea	- ----	- ----	tr 0.13
Ranunculus cymbalaria ssp. saximontanus	- ----	tr 0.11	- ----
Rumex crispus	- ----	tr 0.11	6 0.50
Sagittaria cuneata	- ----	tr 0.11	- ----
Spergularia marina	- ----	tr 0.11	- ----
Xanthium strumarium	- ----	- ----	tr 0.13
Aquatics			
Azolla mexicana	- ----	- ----	tr 0.13
Bacopa eisenii	- ----	tr 0.11	- ----
Lemna sp.	- ----	- ----	tr 0.38
Potamogeton pectinatus	- ----	tr 0.22	- ----
Zanichellia palustris	- ----	- ----	tr 0.25

Low Graminaceous (Wet Meadow) Plant Associations

Community Type	ELEMAC	ELEMAC BACEIS	ELEPAR	JUNBAL	JUNBAL ELEMAC
Number of stands per group	13	3	1	12	5
Trees					
Elaeagnus angustifolius	tr 0.15	- ----	- ----	tr 0.08	- ----
Populus fremontii	tr 0.08	- ----	- ----	tr 0.08	- ----
Salix exigua	tr 0.08	- ----	- ----	- ----	- ----
Tamarix ramossisima	tr 0.08	- ----	- ----	tr 0.25	- ----
Shrubs					
Atriplex confertifolia	- ----	- ----	- ----	tr 0.08	- ----
Atriplex lentiformis ssp. torreyi	- ----	- ----	- ----	- ----	tr 0.20
Chrysothamnus nauseosus ssp. consimilis	tr 0.23	- ----	- ----	- ----	tr 0.20
Chrysothamnus nauseosus ssp. oreophilus	- ----	- ----	- ----	tr 0.08	- ----
Chrysothamnus viscidiflorus	- ----	- ----	- ----	tr 0.08	- ----
Sarcobatus vermiculatus	- ----	- ----	- ----	tr 0.08	tr 0.20
Tetradymia tetrameres	- ----	- ----	- ----	tr 0.08	- ----
Graminoids					
Carex lanuginosa	- ----	- ----	- ----	3 0.08	- ----
Carex vulpinoidea	2 0.08	- ----	- ----	- ----	tr 0.20
Eleocharis macrostachya	29 1.00	47 1.00	tr 1.00	tr 0.08	16 1.00
Eleocharis parishii	tr 0.15	tr 0.33	60 1.00	2 0.25	5 0.60
Juncus articulatus	- ----	tr 0.33	- ----	- ----	- ----
Juncus balticus	3 0.77	tr 0.33	- ----	45 1.00	24 1.00
Juncus torreyi	- ----	tr 0.33	- ----	- ----	- ----
Scirpus acutus	tr 0.08	- ----	- ----	tr 0.08	- ----
Scirpus maritimus	tr 0.08	- ----	- ----	3 0.08	- ----
Scirpus pungens	4 0.38	- ----	- ----	2 0.17	3 0.60
Triglochin maritima	tr 0.08	- ----	- ----	- ----	- ----
Typha domingensis	tr 0.15	- ----	- ----	3 0.17	tr 0.40
Typha latifolia	tr 0.15	- ----	- ----	tr 0.08	- ----
Grasses					
Agrostis stolonifera	- ----	- ----	- ----	tr 0.08	- ----
Beckmannia sizigachne	- ----	- ----	- ----	- ----	4 0.40
Bromus tectorum	tr 0.08	- ----	- ----	- ----	- ----
Distichlis spicata	2 0.62	- ----	- ----	tr 0.42	- ----
Echinochloa crusgalli	tr 0.15	tr 0.33	- ----	tr 0.08	2 0.20
Elymus triticoides	tr 0.23	- ----	- ----	2 0.25	- ----
Festuca pratensis	tr 0.23	tr 0.33	- ----	tr 0.08	- ----
Hordeum brachyantherum	- ----	- ----	- ----	- ----	- ----
Hordeum jubatum	3 0.62	tr 0.67	tr 1.00	3 0.58	5 0.80
Leptochloa fascicularis	- ----	- ----	- ----	- ----	tr 0.40
Muhlenbergia asperifolia	tr 0.31	- ----	- ----	tr 0.33	tr 0.20
Paspalum distichum	tr 0.15	3 0.33	- ----	tr 0.08	- ----
Poa pratensis	- ----	- ----	- ----	tr 0.08	- ----
Polypogon monspeliensis	tr 0.46	tr 0.33	tr 1.00	tr 0.17	tr 0.40
Puccinellia nuttalliana	tr 0.23	- ----	- ----	- ----	tr 0.20
Forbs					
Artemisia dracunculus	- ----	- ----	- ----	tr 0.08	- ----
Asclepias fascicularis	tr 0.08	- ----	- ----	- ----	tr 0.20
Asclepias speciosa	- ----	- ----	- ----	tr 0.08	- ----
Asparagus officinalis	- ----	- ----	- ----	tr 0.08	- ----
Aster hesperius	tr 0.15	- ----	- ----	tr 0.08	3 0.40
Bassia hyssopifolia	tr 0.08	- ----	- ----	tr 0.17	- ----
Berula erecta	tr 0.08	- ----	- ----	- ----	- ----

Low Graminaceous (Wet Meadow) Plant Associations (Cont.)

Community Type	ELEMAC	ELEMAC BACEIS	ELEPAR	JUNBAL	JUNBAL ELEMAC
Number of stands per group	13	3	1	12	5
Forbs					
Chamaesyce ocellata ssp. arenicola	- ----	- ----	- ----	- ----	tr 0.20
Chenopodium album	tr 0.15	- ----	- ----	tr 0.08	- ---
Chenopodium foliosum	- ----	- ----	- ----	tr 0.08	- ----
Cirsium vulgare	tr 0.08	- ----	- ----	- ----	- ----
Conyza canadensis	tr 0.08	- ----	- ----	tr 0.17	2 0.20
Euthamia occidentalis	tr 0.08	- ----	- ----	tr 0.25	3 0.40
Gnaphalium luteo-album	- ----	- ----	- ----	- ----	tr 0.20
Kochia scoparia	tr 0.08	- ----	- ----	tr 0.08	- ----
Lactuca serriola	tr 0.08	- ----	- ----	tr 0.25	- ----
Lotus tenuis	tr 0.08	- ----	- ----	tr 0.25	tr 0.40
Lycopus asper	- ----	- ----	- ----	tr 0.08	- ----
Melilotus alba	tr 0.08	- ----	- ----	- ----	- ----
Mentha arvensis	tr 0.15	- ----	- ----	- ----	- ----
Mimulus guttatus	tr 0.15	tr 0.33	3 1.00	- ----	- ----
Mirabilis alipes	tr 0.08	- ----	- ----	- ----	- ----
Plantago lanceolata	tr 0.15	- ----	- ----	- ----	tr 0.60
Plantago major	tr 0.23	- ----	- ----	tr 0.08	- ----
Plantago sp.	tr 0.08	- ----	- ----	- ----	- ----
Polygonum arenastrum	- ----	- ----	- ----	- ----	tr 0.20
Polygonum argyrocoleon	tr 0.15	- ----	- ----	tr 0.33	- ----
Polygonum lapathifolium	tr 0.08	- ----	- ----	tr 0.08	tr 0.20
Polygonum persicaria	tr 0.31	tr 0.33	- ----	tr 0.17	3 0.80
Portulaca oleracea	- ----	- ----	- ----	- ----	tr 0.20
Ranunculus cymbalaria ssp. saximontanus	tr 0.31	tr 0.33	- ----	- ----	- ----
Rorippa curvisiliqua	- ----	- ----	- ----	- ----	tr 0.20
Rumex crispus	tr 0.38	- ----	- ----	tr 0.25	tr 0.60
Rumex triangulivalvis	tr 0.15	- ----	- ----	- ----	tr 0.20
Sagittaria cuneata	tr 0.15	tr 0.67	- ----	tr 0.08	tr 0.20
Salsola tragus	- ----	- ----	- ----	tr 0.17	- ----
Suaeda calceoliformis	tr 0.08	- ----	- ----	- ----	- ----
Taraxacum officinale	tr 0.15	- ----	- ----	tr 0.25	2 0.40
Trifolium fragiferum	2 0.62	tr 0.33	- ----	tr 0.17	2 0.80
Trifolium variegatum	tr 0.08	- ----	- ----	- ----	- ----
Veronica anagallis-aquatica	tr 0.15	- ----	- ----	- ----	- ----
Veronica peregrina	- ----	tr 0.33	- ----	- ----	tr 0.40
Xanthium strumarium	tr 0.08	- ----	- ----	- ----	- ----
Aquatics					
Azolla mexicana	- ----	tr 0.33	- ----	- ----	- ----
Bacopa eisenii	tr 0.31	23 1.00	- ----	tr 0.08	tr 0.40
Lemna sp.	tr 0.08	- ----	- ----	tr 0.08	- ----
Marsilea vestita	- ----	tr 0.67	- ----	tr 0.25	tr 0.40
Potamogeton filiformis var. latifolius	tr 0.08	- ----	- ----	- ----	- ----
Potamogeton nodosus	tr 0.15	tr 0.33	- ----	- ----	- ----
Potamogeton pectinatus	3 0.23	- ----	- ----	tr 0.17	- ----
Zanichellia palustris	tr 0.08	- ----	- ----	- ----	- ----

Grass Plant Associations

Community Type	DISSPI	JUNBAL DISSPI	LEYTRI	MUHASP
Number of stands per group	32	28	4	2
Trees				
Elaeagnus angustifolius	- ----	tr 0.25	- ----	- ----
Salix exigua	- ----	tr 0.04	- ----	- ----
Tamarix ramossisima	tr 0.09	tr 0.11	- ----	- ----
Shrubs				
Allenrolfea occidentalis	tr 0.15	tr 0.07	- ----	- ----
Atriplex canescens	tr 0.03	- ----	- ----	- ----
Atriplex confertifolia	- ----	tr 0.04	- ----	- ----
Atriplex lentiformis ssp. torreyi	- ----	tr 0.07	- ----	- ----
Chrysothamnus nauseosus ssp. consimilis	tr 0.12	tr 0.36	- ----	- ----
Chrysothamnus nauseosus ssp. oreophilus	tr 0.03	tr 0.11	- ----	- ----
Chrysothamnus viscidiflorus	- ----	tr 0.04	- ----	- ----
Sarcobatus vermiculatus	tr 0.21	tr 0.07	tr 0.33	- ----
Suaeda moquinii	tr 0.06	- ----	- ----	- ----
Graminoids				
Carex vulpinoidea	- ----	- ----	tr 0.33	- ----
Eleocharis macrostachya	30 0.21	2 0.21	- ----	- ----
Eleocharis parishii	tr 0.15	tr 0.07	- ----	- ----
Equisetum laevigatum	- ----	- ----	tr 0.33	- ----
Juncus balticus	tr 0.18	21 0.96	11 0.67	6 1.00
Juncus torreyi	- ----	tr 0.04	- ----	- ----
Scirpus acutus	tr 0.03	tr 0.04	- ----	tr 0.50
Scirpus maritimus	- ----	tr 0.04	- ----	- ----
Scirpus nevadensis	- ----	tr 0.04	- ----	- ----
Scirpus pungens	tr 0.09	3 0.25	- ----	tr 0.50
Typha domingensis	tr 0.03	- ----	tr 0.33	- ----
Typha latifolia	tr 0.03	- ----	tr 0.33	- ----
Grasses				
Agrostis stolonifera	- ----	- ----	tr 0.33	- ----
Distichlis spicata	30 0.97	22 1.00	tr 0.33	6 1.00
Echinochloa crusgalli	tr 0.03	tr 0.11	- ----	- ----
Elymus triticoides	tr 0.03	tr 0.11	43 1.00	- ----
Eremopyrum triticeum	- ----	- ----	tr 0.33	- ----
Festuca pratensis	- ----	tr 0.04	3 0.33	- ----
Hordeum jubatum	tr 0.27	3 0.54	tr 0.67	2 0.50
Leptochloa fascicularis	tr 0.03	- ----	- ----	- ----
Muhlenbergia asperifolia	tr 0.06	2 0.36	- ----	75 1.00
Paspalum distichum	- ----	tr 0.04	- ----	- ----
Polypogon monspeliensis	2 0.24	tr 0.14	- ----	5 0.50
Puccinellia distans	tr 0.09	tr 0.07	- ----	- ----
Puccinellia nuttalliana	tr 0.09	tr 0.07	- ----	- ----
Forbs				
Asclepias fascicularis	- ----	- ----	tr 0.33	tr 0.50
Asclepias speciosa	- ----	tr 0.04	tr 0.67	- ----
Asparagus officinalis	- ----	- ----	- ----	- ----
Aster hesperius	tr 0.06	tr 0.07	2 1.00	- ----
Atriplex argentea	- ----	tr 0.14	- ----	- ----
Atriplex heterosperma	tr 0.06	tr 0.04	- ----	- ----
Atriplex phyllostegia	tr 0.03	tr 0.07	- ----	- ----
Bassia hyssopifolia	2 0.61	tr 0.36	- ----	2 0.50
Bidens frondosa	- ----	tr 0.04	- ----	- ----

Grass Plant Associations (Cont.)

Community Type	DISSPI	JUNBAL DISSPI	LEYTRI	MUHASP
Number of stands per group	32	28	4	2
Forbs				
Centaurium exaltatum	- ----	- ----	- ----	tr 0.50
Chenopodium album	tr 0.03	tr 0.04	- ----	- ----
Chenopodium foliosum	tr 0.03	- ----	- ----	- ----
Chenopodium glaucum ssp. salinum	tr 0.03	tr 0.14	- ----	- ----
Cichorium intybus	- ----	tr 0.11	- ----	- ----
Cirsium vulgare	tr 0.06	- ----	tr 0.33	- ----
Convolvulus arvensis	tr 0.03	- ----	- ----	- ----
Conyza canadensis	tr 0.03	tr 0.04	- ----	- ----
Cressa truxillensis	tr 0.06	tr 0.04	- ----	- ----
Descurania pinnata	- ----	tr 0.04	- ----	tr 0.50
Erodium cicutarium	- ----	tr 0.04	- ----	- ----
Euthamia occidentalis	tr 0.06	tr 0.11	- ----	- ----
Grindelia squarosa	- ----	tr 0.04	- ----	- ----
Halogeton glomeratus	tr 0.03	- ----	- ----	- ----
Heliotropium curassavicum	tr 0.03	tr 0.14	- ----	- ----
Iva axillaris	- ----	tr 0.04	tr 0.33	- ----
Kochia scoparia	tr 0.03	tr 0.14	- ----	- ----
Lactuca serriola	tr 0.12	tr 0.11	- ----	tr 0.50
Lepidium latifolium	tr 0.03	- ----	- ----	- ----
Lycopus asper	- ----	tr 0.07	- ----	- ----
Malvella leprosa	- ----	tr 0.04	- ----	- ----
Medicago sativa	tr 0.03	- ----	- ----	- ----
Melilotus alba	- ----	- ----	tr 0.33	- ----
Plantago lanceolata	- ----	tr 0.07	- ----	- ----
Plantago major	- ----	tr 0.11	- ----	- ----
Polygonum arenastrum	tr 0.09	tr 0.18	- ----	- ----
Polygonum argyrocoleon	tr 0.06	tr 0.18	tr 0.33	tr 0.50
Polygonum aviculare	tr 0.03	- ----	- ----	- ----
Polygonum lapathifolium	- ----	tr 0.04	tr 0.33	- ----
Polygonum persicaria	- ----	tr 0.07	tr 0.33	- ----
Portulaca oleracea	- ----	tr 0.04	- ----	- ----
Ranunculus cymbalaria ssp. saximontanus	tr 0.12	tr 0.07	- ----	- ----
Rorippa curvisiliqua	- ----	tr 0.04	- ----	- ----
Rumex crispus	tr 0.09	tr 0.21	tr 0.33	- ----
Sagittaria cuneata	tr 0.03	tr 0.07	- ----	- ----
Salicornia europaea	tr 0.06	- ----	- ----	- ----
Salsola tragus	tr 0.09	tr 0.25	- ----	- ----
Sesuvium verrucosum	- ----	tr 0.04	- ----	- ----
Spergularia marina	tr 0.03	tr 0.04	- ----	- ----
Suaeda calceoliformis	- ----	tr 0.07	- ----	- ----
Taraxacum officinale	tr 0.03	tr 0.18	- ----	- ----
Trifolium fragiferum	tr 0.09	tr 0.36	- ----	- ----
Trifolium variegatum	tr 0.03	- ----	- ----	- ----
Veronica peregrina	- ----	tr 0.04	- ----	- ----
Aquatics				
Bacopa eisenii	tr 0.03	tr 0.04	- ----	- ----
Marsilea vestita	tr 0.03	- ----	- ----	- ----
Potamogeton nodosus	tr 0.03	tr 0.04	- ----	- ----
Potamogeton pectinatus	tr 0.09	- ----	- ----	- ----
Ranunculus aquatilis	- ----	tr 0.07	- ----	- ----
Zanichellia palustris	- ----	tr 0.07	- ----	- ----

Aquatic Plant Associations

Community Type	BACEIS	LEMMIN	POTLAT	POTPEC	RUPMAR	ZANPAL
Number of stands per group	3	1	1	8	6	3
Trees						
Elaeagnus angustifolius	- ----	- ----	- ----	tr 0.25	- ----	- ----
Tamarix ramossisima	- ----	- ----	- ----	tr 0.13	- ----	- ----
Graminoids						
Eleocharis macrostachya	2 1.00	- ----	- ----	2 0.25	- ----	tr 0.33
Equisetum laevigatum	- ----	3 1.00	- ----	- ----	- ----	- ----
Juncus balticus	- ----	1 1.00	- ----	5 0.50	- ----	3 0.33
Juncus torreyi	- ----	3 1.00	- ----	tr 0.13	- ----	- ----
Scirpus acutus	- ----	30 1.00	- ----	- ----	- ----	tr 0.33
Scirpus maritimus	- ----	- ----	- ----	tr 0.13	- ----	- ----
Scirpus pungens	- ----	- ----	- ----	tr 0.13	- ----	tr 0.33
Typha domingensis	tr 0.33	- ----	- ----	tr 0.13	- ----	3 0.33
Typha latifolia	tr 0.33	10 1.00	- ----	- ----	- ----	- ----
Grasses						
Distichlis spicata	- ----	- ----	- ----	2 0.50	- ----	tr 0.33
Elymus triticoides	- ----	- ----	- ----	tr 0.13	- ----	- ----
Hordeum jubatum	- ----	- ----	- ----	tr 0.38	- ----	tr 0.33
Muhlenbergia asperifolia	- ----	- ----	- ----	tr 0.25	- ----	- ----
Polypogon monspeliensis	- ----	- ----	- ----	- ----	- ----	tr 0.33
Forbs						
Asclepias fascicularis	- ----	- ----	- ----	tr 0.13	- ----	- ----
Aster hesperius	- ----	- ----	- ----	tr 0.25	- ----	- ----
Bassia hyssopifolia	- ----	- ----	- ----	tr 0.38	- ----	tr 0.33
Cressa truxillensis	- ----	- ----	- ----	- ----	- ----	tr 0.33
Euthamia occidentalis	- ----	tr 1.00	- ----	tr 0.13	- ----	- ----
Halogeton glomeratus	- ----	- ----	- ----	tr 0.13	- ----	- ----
Heliotropium curassavicum	- ----	- ----	- ----	tr 0.13	- ----	- ----
Lepidium latifolium	- ----	3 1.00	- ----	- ----	- ----	- ----
Lycopus asper	- ----	10 1.00	- ----	- ----	- ----	- ----
Mentha arvensis	- ----	- ----	- ----	tr 0.13	- ----	- ----
Polygonum argyrocoleon	tr 0.33	- ----	- ----	- ----	- ----	- ----
Rumex crispus	- ----	3 1.00	- ----	tr 0.38	- ----	- ----
Salsola tragus	- ----	- ----	- ----	tr 0.13	- ----	- ----
Sphaerophysa salsula	- ----	- ----	- ----	tr 0.13	- ----	- ----
Urtica dioca	- ----	3 1.00	- ----	- ----	- ----	- ----
Aquatics						
Bacopa eisenii	57 1.00	- ----	- ----	- ----	- ----	- ----
Callitriche hermaphroditica	- ----	- ----	- ----	- ----	- ----	tr 0.33
Lemna sp.	- ----	70 1.00	- ----	tr 0.13	- ----	- ----
Marsilea vestita	10 0.33	- ----	- ----	- ----	- ----	- ----
Potamogeton filiformis var. latifolius	- ----	- ----	60 1.00	tr 0.13	- ----	- ----
Potamogeton nodosus	- ----	- ----	- ----	3 0.38	- ----	- ----
Potamogeton pectinatus	- ----	- ----	- ----	29 1.00	- ----	tr 0.33
Ranunculus aquatilis	- ----	- ----	- ----	tr 0.13	- ----	- ----
Ruppia maritima	- ----	- ----	- ----	- ----	73 1.00	- ----
Zanichellia palustris	- ----	- ----	- ----	tr 0.13	- ----	47 1.00

Disturbed Herbaceous and Exotic Plant Associations

Community Type	BASHYS	CHEGLA	KOCSCO	LACSER	TAMRAM	TRIFRA
Number of stands per group	13	1	7	3	8	14
Trees						
Elaeagnus angustifolius	- ----	- ----	- ----	- ----	tr 0.13	- ----
Populus fremontii	- ----	- ----	tr 0.29	- ----	- ----	- ----
Tamarix ramossisima	tr 0.15	- ----	- ----	- ----	22 1.00	tr 0.07
Ulmus pumilla	- ----	- ----	tr 0.29	- ----	- ----	- ----
Shrubs						
Allenrolfea occidentalis	- ----	- ----	- ----	- ----	tr 0.13	tr 0.07
Artemisia tridentata var. tridentata	- ----	- ----	tr 0.14	- ----	- ----	- ----
Atriplex lentiformis ssp. torreyi	- ----	- ----	- ----	- ----	tr 0.13	- ----
Chrysothamnus nauseosus ssp. consimilis	- ----	- ----	tr 0.14	- ----	- ----	tr 0.14
Chrysothamnus nauseosus ssp. oreophilus	- ----	- ----	- ----	tr 0.33	2 0.50	- ----
Chrysothamnus viscidiflorus	tr 0.08	- ----	- ----	- ----	- ----	tr 0.07
Sarcobatus vermiculatus	tr 0.08	- ----	- ----	- ----	- ----	tr 0.07
Graminoids						
Carex athrostachya	- ----	- ----	- ----	- ----	- ----	tr 0.07
Carex lanuginosa	- ----	- ----	- ----	- ----	- ----	tr 0.07
Carex vulpinoidea	- ----	- ----	tr 0.29	- ----	- ----	- ----
Eleocharis macrostachya	tr 0.08	- ----	- ----	- ----	tr 0.25	2 0.29
Eleocharis parishii	- ----	- ----	- ----	- ----	- ----	6 0.50
Juncus balticus	3 0.31	- ----	2 0.57	tr 0.33	tr 0.38	13 0.93
Phragmites australis	2 0.08	- ----	- ----	- ----	- ----	- ----
Scirpus maritimus	tr 0.08	- ----	- ----	- ----	tr 0.13	- ----
Scirpus pungens	- ----	- ----	- ----	- ----	tr 0.13	2 0.14
Triglochin maritima	- ----	- ----	- ----	- ----	- ----	tr 0.07
Typha domingensis	- ----	tr 1.00	- ----	- ----	- ----	- ----
Grasses						
Agrostis stolonifera	- ----	- ----	tr 0.71	- ----	- ----	- ----
Bromus tectorum	- ----	tr 1.00	- ----	tr 0.33	- ----	- ----
Distichlis spicata	6 0.46	3 1.00	2 0.57	tr 0.67	tr 0.50	4 0.71
Echinochloa crusgalli	- ----	- ----	- ----	- ----	- ----	2 0.21
Elymus triticoides	- ----	tr 1.00	3 1.00	- ----	- ----	tr 0.07
Hordeum jubatum	tr 0.38	- ----	tr 0.14	- ----	tr 0.13	8 1.00
Leptochloa fascicularis	- ----	- ----	- ----	- ----	tr 0.13	tr 0.07
Muhlenbergia asperifolia	- ----	- ----	tr 0.14	- ----	- ----	3 0.36
Paspalum distichum	- ----	- ----	- ----	- ----	- ----	2 0.21
Poa pratensis	- ----	- ----	- ----	- ----	- ----	tr 0.07
Polypogon monspeliensis	tr 0.15	- ----	tr 0.43	tr 0.33	tr 0.38	tr 0.14
Puccinellia distans	- ----	- ----	- ----	- ----	- ----	tr 0.14
Puccinellia nuttalliana	tr 0.08	- ----	- ----	- ----	- ----	tr 0.21
Setaria viridis	- ----	- ----	tr 0.29	- ----	- ----	- ----
Forbs						
Artemisia ludoviciana	- ----	- ----	tr 0.14	- ----	- ----	- ----
Asclepias speciosa	- ----	- ----	2 0.71	- ----	- ----	- ----
Aster hesperius	- ----	- ----	tr 0.57	- ----	- ----	tr 0.07
Atriplex argentea	tr 0.08	- ----	- ----	- ----	- ----	- ----
Atriplex heterosperma	tr 0.08	- ----	- ----	- ----	- ----	tr 0.07
Atriplex patula	tr 0.08	- ----	- ----	- ----	- ----	- ----
Atriplex phyllostegia	- ----	- ----	- ----	- ----	tr 0.13	- ----
Bassia hyssopifolia	28 1.00	tr 1.00	tr 0.29	5 1.00	tr 0.63	tr 0.07
Bidens frondosa	- ----	- ----	2 0.86	- ----	- ----	tr 0.07

Herbaceous, Disturbed, or Exotic Plant Associations (Cont.)

Community Type	BASHYS	CHEGLA	KOCSCO	LACSER	TAMRAM	TRIFRA
Number of stands per group	13	1	7	3	8	14
Forbs						
Carderia pubescens	- ----	- ----	- ----	- ----	- ----	tr 0.07
Centaurea repens	- ----	- ----	- ----	- ----	- ----	tr 0.14
Chenopodium album	tr 0.08	- ----	tr 0.14	- ----	- ----	tr 0.07
Chenopodium glaucum ssp. salinum	tr 0.08	30 1.00	- ----	tr 0.33	- ----	tr 0.07
Cichorium intybus	tr 0.15	- ----	- ----	- ----	- ----	tr 0.14
Cirsium vulgare	- ----	tr 1.00	- ----	- ----	- ----	tr 0.21
Convulvulus arvensis	- ----	- ----	- ----	- ----	- ----	tr 0.07
Conyza canadensis	tr 0.08	- ----	- ----	- ----	tr 0.13	- ----
Descurania pinnata	tr 0.15	- ----	tr 0.14	- ----	- ----	- ----
Euthamia occidentalis	- ----	- ----	tr 0.57	- ----	tr 0.13	tr 0.07
Helianthus annuus	- ----	- ----	tr 0.43	- ----	- ----	- ----
Heliotropium curassavicum	tr 0.08	- ----	- ----	- ----	tr 0.13	- ----
Kochia scoparia	- ----	3 1.00	5 0.86	- ----	- ----	- ----
Lactuca serriola	tr 0.23	- ----	tr 0.29	53 1.00	- ----	- ----
Lepidium perfoliatum	- ----	- ----	- ----	- ----	- ----	tr 0.07
Lotus tenuis	- ----	- ----	- ----	- ----	- ----	tr 0.21
Malvella leprosa	tr 0.15	- ----	- ----	- ----	tr 0.13	- ----
Melilotus alba	- ----	- ----	tr 0.29	- ----	- ----	- ----
Mentha arvensis	- ----	- ----	- ----	- ----	tr 0.13	- ----
Mimulus guttatus	- ----	- ----	- ----	- ----	- ----	tr 0.07
Plantago erecta	- ----	- ----	tr 0.14	- ----	- ----	- ----
Plantago lanceolata	- ----	- ----	- ----	- ----	- ----	4 0.29
Plantago major	- ----	- ----	- ----	- ----	- ----	2 0.43
Polygonum arenastrum	tr 0.08	- ----	- ----	- ----	- ----	tr 0.14
Polygonum argyrocoleon	tr 0.08	- ----	- ----	- ----	- ----	tr 0.21
Polygonum lapathifolium	- ----	- ----	- ----	- ----	- ----	tr 0.07
Polygonum persicaria	- ----	- ----	- ----	- ----	- ----	tr 0.14
Ranunculus cymbalaria ssp. saximontanus	- ----	- ----	- ----	- ----	- ----	tr 0.14
Rumex crispus	tr 0.15	tr 1.00	tr 0.57	- ----	- ----	tr 0.79
Sagittaria cuneata	- ----	- ----	- ----	- ----	- ----	tr 0.07
Salsola tragus	2 0.15	- ----	tr 0.29	- ----	tr 0.38	tr 0.14
Suaeda calceoliformis	tr 0.08	- ----	- ----	- ----	- ----	- ----
Taraxacum officinale	- ----	- ----	tr 0.14	- ----	- ----	3 0.71
Trifolium fragiferum	tr 0.08	- ----	- ----	- ----	- ----	24 1.00
Veronica peregrina	- ----	- ----	tr 0.14	- ----	- ----	- ----
Xanthium strumarium	tr 0.08	- ----	tr 0.29	- ----	- ----	- ----
Aquatics						
Bacopa eisenii	- ----	- ----	- ----	- ----	- ----	tr 0.07
Potamogeton pectinatus	- ----	- ----	- ----	- ----	tr 0.13	- ----
Zanichellia palustris	- ----	- ----	- ----	- ----	tr 0.13	- ----

Appendix F

Wetland Plant Association Classification for the Lahontan Valley

Wetland Plant Association Descriptions

This wetland plant association classification provides a comprehensive description for each of the 40 wetland plant plant associations intensively sampled in the Lahontan Valley. Each description includes the name of the association, management unit distribution, range of water depths (m), range of soil electrical conductivity (mmhos/cm^{-1}), historical references, current distribution, association vegetation structure and composition, soils, and field condition ranking.

Management area abreviations used throughout the text include:

SNWR - Stillwater National Wildlife Refuge
SWMA - Stillwater Wildlife Management Area
FNWR - Fallon National Wildlife Refuge
CLAKE - Carson Lake and Pasture
CCLUB - Canvasback Gun Club
FIR - Fallon Paiute-Shoshone Indian Reservation
OUT - Outside Managed Area Boundaries

Historical References

Any reference in the historical literature to the plant association is cited. A recent literature review (Donohue 1993) which identified historical records describing association composition, structure, and associations of wetland associations within Lahontan Valley was used for comparison. Historical references are on a local scale only, and are not inclusive of other classification work performed in riparian or meadow types within the western United States.

Current Distribution

The general physiographic location, elevation, and upland or adjacent plant associations are provided for the plant association. The physiographic location is provided to assist in the determination of which elements of wetland plant associations are represented within specific managed and unmanaged areas in Lahontan Valley. This information may also help land managers to set goals for the maintenance and restoration of wetland plant associations within the regional landscape.

Association Structure and Composition

The dominant and/or co-dominant species within each vegetation stratum (e.g., overstory, understory) is presented. Many of the associations consist of only a single layer of vegetation; this is considered the overstory and no other strata are described. Plant species with cover less than 10 percent are broken into two descriptive classes. A plant species with an average cover of 3 to 10 percent is characterized as having nominal cover. Plant species with less than 3 percent cover in a association are characterized as appearing in trace amounts within a specified association. Many species that appear in nominal or trace amounts are annual exotic types and may indicate an affected or disturbed environment within specific associations.

Soils

The wetland associations were found on a variety of soil types. Soil characterization for each vegetation plant association is derived from the appropriate soil series descriptions for the Lahontan Valley (Soil Conservation Service 1975), and includes soil depth, slopes, permeability,

runoff potential and seasonal high water tables. In addition, soil salinity and pH, as determined through laboratory analysis of soil samples (see Methods section), are presented. For salinity, soils were categorized into one of four salinity categories, based on electrical conductivity (EC) and sodium absorption ration (SAR):

(1) **Saline** soil has an EC of 4.0 mmho cm^{-1} or greater and has a SAR less than 13. Formerly, these soils were called *white alkali*.

(2) **Sodic** soil has a SAR of 13 or more and an EC of less than 4.0 mmho cm^{-1}. Formerly, these were called *black alkali*.

(3) **Saline-sodic** soil has both the electrical conductivity to qualify as saline ($EC \geq 4.0$ mmho cm^{-1}) and a SAR of 13 or more needed to qualify as sodic. Formerly, these were considered either *white* or *black alkali*.

(4) **Normal** soils are soils not affected by high saline concentrations and have an EC of less than 4.0 mmho cm^{-1} and a SAR of less than 13.

Most of the plant associations occur on either normal or saline-sodic soil types. However, *Allenrolfea occidentalis*, *Sarcobatus vermiculatus*, *Suaeda moquinii*, and *Sarcobatus vermiculatus-Suaeda moquinii* are highly saline sodic plant associations.

Field Condition Ranking

The current condition of the sampled associations was noted. Rankings were graded from "good" to "poor" based upon subjective evaluation of the quality (size and number of individuals representing association), condition of the site and vegetation canopy, evidence of disturbance, sustainability or reproductive success, and capacity to protect the site from threat or current disturbance levels.

Association Categories

Associations were divided into eight categories based on a combination of lifeform and habitat preference. By group, they include:

Tree Associations
Shrub Associations
Transitional Shrub Associations
Tall Graminaceous (Emergent) Associations
Low Graminaceous (Wet Meadow) Associations
Grass Associations
Aquatic Associations
Disturbed Herbaceous and Exotic Associations

Tree Associations

Populus fremontii/Elymus triticoides Plant Association
Fremont Cottonwood-Alkali Wild Rye Grass Association

Location: OUT
Water Depth: No Standing Water
Soil EC: 13.7 - 2.1 9.7±5.1

Historical References - Fremont (1845), Simpson (1876), Sperry (1929), Billings (1945), and Marshall (1949).

Early observations depicted this association as occupying the freshwater, floodplain habitat directly adjacent to the Carson River. Understory composition was varied though *Salix* sp., *Typha* sp., *Melilotus alba*, *Juncus* sp., *Chrysothamnus* sp., *Lepidium* sp., and *Distichlis spicata* were common.

Current Distribution - The *Populus fremontii-Elymus triticoides* plant association (p.a.) is a major type that occurs in the floodplain habitat adjacent to the Carson River at a mean elevation of 1230 meters. This p.a. is commonly bordered by *Salix* or *Typha/Scirpus* associations which occupy sites adjoined to the river. Upland associations vary from natural to agricultural plant associations. Natural sites are dominated by *Artemisia tridentata* ssp. *tridentata* or *Atriplex confertifolia* whereas agricultural fields are predominately alfalfa (*Medicago sativa*).

Association Structure and Composition - *Populus fremontii* dominates a tall, open-canopied tree layer with *Elaeagnus angustifolius* and *Salix exigua* as occasional associates within the understory. A conspicuous shrub layer is not present. *Elymus triticoides* dominates the graminaceous layer with as much as 30 percent cover. *Juncus balticus* is often present as a graminaceous codominant. Other graminoids, when present, are sparse and include *Distichlis spicata*. The species composition of the herbaceous layer is highly variable and can include *Solidago occidentalis*, *Equisetum arvense*, *Aster lanceolatus* ssp. *hesperius*, *Bassia hyssopifolia*, *Medicago sativa* and *Tragopogon dubius* in nominal to trace amounts.

Soils - The cottonwood associations were sampled on Fernley and Dia soils which are described as very deep, nearly level, somewhat poorly drained soils formed in sandy alluvium from mixed rock. The soils are on narrow stringers, which are recent river channels on smooth flood plains and low stream terraces. Slope is 0 to 2 percent. Permeability is very rapid. Runoff is very slow and the hazard of erosion is none to slight. Seasonal high water table is 1 to 1.5 meters in depth. The soils are currently saline-sodic, indicating a lack of periodic flooding which would flush accumulated salts from the soil. Soil pH ranged from 7.2 - 8.5.

Field Condition Ranking - Fair-Good. The sampled associations have a good representative number of large trees with natural regeneration evident. Condition of the sites are relatively undisturbed. Light recreational use is evident. Exotic plants documented in over and understory.

***Populus fremontii* Plant Association**
Fremont Cottonwood Association

Location: SNWR, SWMA, OUT
Water Depth: No Standing Water
Soil EC: 3.1 - 0.3 2.09 ± 2.1

Historical References - Fremont (1845), Simpson (1876), Sperry (1929), Billings (1945), and Marshall (1949).

Historical references similar to the *Populus fremontii - Elymus triticoides* plant association.

Current Distribution - The *Populus fremontii* association was commonly found along the lower Carson river corridor at elevations between 1186 and 1193 m msl. Adjacent associations were primarily upland shrubs and graminoids distributed along gently rolling sand dunes. Although aquatic associations were not present at the time of sampling related to high water releases, *Ruppia maritima* was observed later in the growing season.

Association Structure and Composition - The overstory of this association is dominated by *Populus fremontii* with *Elagnus angustifolia* contributing to the upper canopy layer. A mixture of shrubs including *Artemisia tridentata, Atriplex lentiformis, Chrysothamnus nauseosus, Psorothamnus polydenius,* and *Sarcobatus vermiculatus* can be present but not indicative of the association. The understory is comprised of a mixture of graminaceous species containing *Juncus balticus, Distichlis spicata,* and *Eleocharis macrostachya*. Although an emergent component was present (*Scirpus acutus*), no aquatic species were identified.

Soils - The cottonwood association was sampled on Alluvial, Badland, Carson-Stillwater, and Tipperary soils. Most of these types are poorly drained, have high surface clay content, and are associated with alluvial deposits along gentle slopes of the river corridor. Although most samples were located on the lower Carson river, salinty levels were low (2.45 mmhos/cm) and reaction pH was only slightly alkaline ranging from 7.7 - 7.8. This may reflect the recent flooding, and subsequent flushing of accumulated salts along the Carson river as all samples were collected in 1995.

Field Condition Ranking - Fair-Good. Most sites were considered lightly disturbed based on the presence of livestock grazing. Considering the encroachment of *Tamarix ramossisima* and *Elaeagnus angustifolia*, the *Populus fremontii* association may be indicative of a slow degradation from the *Populus fremontii-Elymus triticoides* association. Most stands were of mature to senescing cottonwoods with some sign of regeneration in the understory. The presence of regeneration results in an overall ranking of good.

Salix exigua Plant Association
Sandbar Willow Association

Location:	OUT	
Water Depth:	1.10 - 0.20	0.64 ± 0.41
Soil EC:	1.10 - 0.60	0.85 ± 0.40

Historical Reference - The *Salix exigua* p.a. has not been described previously.

Current Distribution - The *Salix exigua* p.a. is a minor type that occurs directly adjacent to active channels of the Carson River, at elevations ranging from 1210 to 1246 meters. This p.a. is commonly adjoined by emergent associations of *Typha latifolia* and *Scirpus acutus*, which are located within the river channel, and *Populus fremontii-Elymus triticoides* or *Sarcobatus vermiculatus* plant associations in the adjacent uplands.

Association Structure and Composition - *Salix exigua* dominates a nearly impenetrable willow overstory. Tall trees or tree-like shrubs such as *Salix laevigata* or *Ulmus pumila*, an introduced exotic species, may be present in trace amounts. Low-stature shrubs such as *Artemisia tridentata* ssp. *tridentata* and *Chrysothamnus nauseosus* ssp. *consimilis* are present in minor or trace amounts. The undergrowth is characterized by tall emergent species, such as *Typha latifolia* and *Scirpus acutus*, located within the active channel of the river . Other common graminaceous species include *Juncus balticus*, *Elymus triticoides* and *Polypogon monspeliensis*. The herbaceous layer, other than *Solanum dulcamara* and *Solidago occidentalis*, is usually sparse and may include *Asclepias fascicularis*, *Asclepias speciosa*, *Atriplex heterosperma*, *Bassia hyssopifolia*, *Epilobium ciliatum*, *Equisetum laevigatum*, and *Lycopus asper* in trace amounts.

Soils - The *Salix exigua* p.a. was sampled on Fernley and Bango-Stubble soils. The soils are characterized as being very deep, nearly level, somewhat poorly drained, formed in sandy alluvium from mixed rock. They occur as narrow stringers, which are recent river channels on smooth flood plains and low stream terraces. Slope is 0 to 2 percent. Permeability is very rapid. Runoff is very slow and the hazard of erosion is none to slight. Seasonal high water table is 1 to 1.5 meters in depth. The soils are normal, characteristic of freshwater environments, with a pH range from 6.1 - 7.7.

Field Condition Ranking - Good-Excellent. Good diversity and cover of dominant species. Natural regeneration of dominants was occurring and association appears viable and sustainable. Association canopy and underlying soil substrate is in good condition. Ground cover disturbance is nominal. There is no evidence of animal or mechanical disturbance on these sites nor any apparent drought effects.

***Salix laevigata* Plant Association**
Red Willow Association

Location:	OUT	
Water Depth:	0.90 - 0.00	0.41 ± 0.55
Soil EC:	4.20 - 1.30	2.86 ± 1.10

Historical Reference - The *Salix laevigata* p.a. has not been described previously.

Current Distribution - The *Salix laevigata* p.a. is a minor type that occurs directly adjacent to the Carson River. Elevations range from 1198 to 1207 meters. This p.a. occurs at lower elevations than the *Salix exigua* p.a. along the active channel of the Carson River. This p.a. is commonly adjoined by emergent associations of *Typha latifolia* and *Scirpus acutus*, which are located within the river channel, with *Populus fremontii-Elymus triticoides*, *Sarcobatus vermiculatus* or agricultural plant associations in the adjacent uplands.

Association Structure and Composition - *Salix laevigata* dominates a very dense willow overstory. Other trees or tall shrubs may be present on an occasional basis and may include *Populus fremontii, Elaeagnus angustifolius* or *Salix exigua* in trace amounts. A tall, emergent graminaceous layer is common and may be characterized by species such as *Typha latifolia, Typha domingensis, Scirpus acutus,* and *Scirpus pungens*. The emergent layer is located within the active river channel. On the ground below the willow, *Juncus balticus* and *Elymus triticoides* dominate a dense grass layer. Other grass species are common but are often present in trace amounts. A distinct herbaceous layer is not present due to the shading effect of the overstory species. Although this layer is indistinct, it may be highly variable and comprised primarily of exotic species such as *Asparagus officinalis* ssp. *officinalis, Bassia hyssopifolia, Kochia scoparia, Lepidium latifolium, Medicago sativa, Melilotus alba, Polygonum argyrocoleum, Rumex crispus, Salsola tragus, Solanum dulcamara* and *Trifolium fragiferum* in trace amounts.

Soils - This p.a. was found on Alluvial, Dia and Dithod soils. The soils are described as very deep and nearly level on smooth floodplains and low stream terraces that are frequently flooded. They consist of recently deposited, poorly drained sediment washed from soils derived from mixed rock, and they range widely in texture. Because soil material is deposited or removed during each period of overflow, the texture of the surface layer changes frequently. Slope is 0 to 2 percent. Seasonal high water table is at the soil surface to 1.5 meters in depth. The soils are normal, characteristic of freshwater environments, with a pH range of 7.2 - 8.5.

Field Condition Ranking - Fair-Good. Good diversity and cover of dominant species. Natural regeneration of dominants was evident and association appears viable and sustainable. Ground cover disturbance due to cattle grazing is moderate on 40 percent of the sites sampled.

Shrub Associations

Allenrolfea occidentalis Plant Association
Iodinebush Association

Location:	SNWR, CLAKE, OUT	
Water Depth:	0.10 - 0.00	0.01 ± 0.05
Soil EC:	127.0 - 22.2	45.61 ± 35.2

Historical References - Sperry (1929), Billings (1945), USFWS (1952), Macklin et al. (1960).

This association is usually represented by scattered plants of the iodinebush, *Allenrolfea occidentalis*, and is occasionally found with *Distichlis spicata* in the understory. The soils usually stay wet all summer and are comprised of saline clay, which is moderately alkaline.

Current Distribution - The *Allenrolfea occidentalis* p.a. is a minor type sampled in the historical Carson Lake area in Lahontan Valley at elevations between 1181 and 1192 meters. It occupies alluvial terraces associated with historical, broad, shallow marshes of Carson Lake. Adjacent plant associations include *Distichlis spicata, Juncus balticus* and mixed meadow grass associations.

Association Structure and Composition - *Allenrolfea occidentalis* dominates an open association with at least 20 percent cover, and with low species diversity. The understory is characterized by a sparse cover of *Distichlis spicata*. Other shrub species are rare. The herbaceous layer is sparse and may include *Cressa truxillensis* and *Salsola tragus*.

Soils - The *Allenrolfea occidentalis* p.a. occurs on Pelic soils, which are described as very deep, nearly level, very poorly drained soils that are formed from sandy alluvium derived from mixed rock. Slope is 0 to 2 percent. Permeability is generally rapid but ranges to very slow where lake-laid clay or silty clay are present. The seasonal high water table is 0 to 1 meter in depth. The soils are saline-sodic with a pH range from 7.3 - 8.8.

Field Condition Ranking - Poor. There was a low number of shrubs present with little evidence of new recruitment or reproductive success. The understory component is negligible and bare, open soil is very apparent. The sites are heavily grazed with ground cover disturbance varying from 20 to greater than 40 percent. Trampling by cattle is evident.

Sarcobatus vermiculatus Plant Association
Big Greasewood Association

Location:	SNWR, SWMA, CLAKE, OUT	
Water Depth:	0.10 - 0.00	0.01 ± 0.02
Soil EC:	40.0 - 1.60	15.60 ± 13.60

Historical References - Bailey (1898), Billings (1945).

This association consists primarily of *Sarcobatus vermiculatus* and *Atriplex lentiformis* with a sparse understory dominated by *Distichlis spicata, Salsola tragus* and *Bassia hyssopifolia*. This association occupies saline clay soils around the margins of the playas where the subsoil is always moist and only the surface layer dries in late summer.

Current Distribution - The *Sarcobatus vermiculatus* p.a. is a major type in Lahontan Valley and occurs in all wetland physiographic forms including riverine, lacustrine, and palustrine systems that are periodically desiccated. This p.a. occupies low-lying terraces associated with the ephemeral lakes and playas and lies within the floodplain of the Carson River in an elevational range of 1197 to 1220 meters.

Association Structure and Composition - In lake and palustrine systems, *Sarcobatus vermiculatus* dominates an open-canopied association with approximately 30 percent cover. There are usually open areas between shrubs, and other shrub species such as *Allenrolfea occidentalis* and *Atriplex confertifolia* may be present in minor or trace amounts. The understory is characterized by a sparse cover of *Distichlis spicata* and *Suaeda moquinii*.

Along the river, this p.a. occurs in the ecotone between riparian associations and monotypic upland types. The understory is characteristic of cottonwood and willow plant associations and may include *Elymus triticoides* in the grass layer. Other shrubs are negligible but may include *Eleagnus angustifolia* and *Iva axillaris* in trace amounts. The herbaceous layer is usually lacking, but *Bidens frondosa, Rumex crispus* and *Solanum dulcamarum* may occur infrequently.

Soils - In lake and palustrine systems, the *Sarcobatus vermiculatus* p.a. primarily occupies Appian and Tipperary soils. These soils are very deep, excessively drained, and formed in sandy alluvium over lacustrine sand, both of which were derived from mixed rock. Slope is 0 to 2 percent. The seasonal high water table is 1 to greater than 1.5 meters in depth. The soils are saline-sodic with a pH range from 7.7 - 9.4.

Along the river, this p.a. was found on Dithod soils, described as very deep, somewhat poorly drained with a slope of 0 to 2 percent. This soil type is saline-sodic with a pH of 8.4.

Field Condition Ranking - Good. High density and cover of dominant species. Natural regeneration was evident and association appears viable and sustainable. Association canopy and underlying soil substrate was in good condition.

Sarcobatus vermiculatus-Psorothamnus polydenius Plant Association
Big Greasewood-Dalea Association

Location: OUT
Water Depth: No Standing Water
Soil EC: 1.6 - 1.4 1.50 ± 0.1

Historical Reference - The *Sarcobatus vermiculatus-Psorothamnus polydenius* p.a. has not been described previously.

Current Distribution - The *Sarcobatus vermiculatus-Psorothamnus polydenius* p.a. is a major type in the Lahontan Valley and occurs strictly in natural, palustrine systems with periodic desiccation at an elevational range of 1198 to 1252 meters. This p.a. occupies low-lying terraces between lake or playa associations with monotypic Big Greasewood associations in the adjacent areas. Its distribution is primarily to the north of Highway 50 out of Hazen and Fallon, Nevada.

Association Structure and Composition - *Sarcobatus vermiculatus* dominates a diverse, open-canopied association with at least 30 percent cover. *Psorothamnus polydenius* is common as a codominant with cover rarely exceeding 10 percent. Additional shrub species are be highly variable and include *Artemisia spinosa, Atriplex canescens, Atriplex confertifolia, Chrysothamnus nauseosous* ssp. *consimilis, Grayia spinosa, Iva axillaris, Lycium shockleyi, Tetradymia glabrata, T. spinosa* and *T. tetrameres* in minor or trace amounts. The grass component is usually sparse, and may include *Achnatherum hymenoides, Distichlis spicata* or *Bromus tectorum* in trace amounts. The annual herbaceous component is quite complex with a high species diversity. *Camissomia clamiformis* ssp. *integrior, Eriastrum sparsiflorum, Eriogonum maculatum, Halogeton glomeratus, Salsola tragus, Spergularia marina* and *Stephanomeria exigua* ssp. *exigua* occur with regular frequency within the association. More infrequent forbs may include *Astragalus* sp., *Atriplex argentea, Atriplex heterosperma, Bassia hyssopifolia, Chamaesyce ocellata, Chenopodium album, Cressa truxillensis, Cryptantha circumscissa, Eriogonum deflexum, Kochia scoparia, Lepidium lapathifolium, Lupinus* sp., *Opuntia puchella* and *Suaeda moquinii*.

Soils - This p.a. primarily occupies Appian and Tipperary soils. These soils are very deep, excessively drained, and formed in sandy alluvium over lacustrine sand, derived from mixed rock. Slope is 0 to 2 percent. The seasonal high water table is 1 to greater than 1.5 meters in depth. The soils are saline-sodic, although lower in salinity than soils associated with the Big Greasewood p.a., with a pH range from 7.2 - 8.5.

Field Condition Ranking - Overall good. High density of dominant species with natural regeneration evident. Ground cover disturbance was light, but grazing or intermittent recreational activity was evident in 60 percent of the plots. High diversity of herbaceous species although many of them are exotics, possibly due to grazing.

Sarcobatus vermiculatus* - *Suaeda moquinii Plant Association
Big Greasewood - Bush Seepweed Association

Location: SNWR, OUT
Water Depth: No Standing Water
Soil EC: 37.3 - 1.3 28.72 ± 12.1

Historical References - The *Sarcobatus vermiculatus* - *Suaeda moquinii* plant association has not been previously described.

Current Distribution - This association was typically found along the ephemeral to upland edge of natural, lacustrine and palustrine wetlands. Sites were never flooded during our observation and were generally > 100 m from the nearest available standing water.

Association Structure and Composition - The middle canopy layer is codominated by *Sarcobatus vermiculatus* and *Suaeda moquinii* with *Atriplex confertifolia* often found within the association. Although low in canopy cover and constancy, three other shrubs (*Allenrolfea occidentalis*, *Artemesia spinescens*, and *Atriplex canescens*) may be present in trace amounts. There is no significant representation by graminaceous species in this association. Exotic forbs (*Bassia hyssopifolia* and *Salsola tragus*) constitute the herbaceous ground cover layer.

Soils - The Big greasewood - bush seepweed association was located on a variety of soils including Appian, Badland, Tipperary, and Dune. These series all contain a sand - sand/loam surface texture and are considered very deep and well-drained. Chemically, soil types are saline/sodic with mean EC at 40.8 mmhos/cm and the highest mean sodium adsorption ratio documented (542.3). This is not unusual considering that most sampled sites were a minimum 100 m from the nearest standing water source. Soil pH is alkaline ranging from 7.6 - 8.9.

Field Condition Ranking - Fair. Although sample locations were relatively undisturbed, low canopy coverage, lack of a graminaceous layer, and the existance of exotic species precludes a higher ranking. Considering that 1995 (when most sites of this association were sampled) was a high water year with excess water inundating and/or flushing previously unflooded sites, little regeneration of dominant species was evident.

***Suaeda moquinii* Plant Association**
Bush Seepweed Association

Location: SNWR, SWMA, OUT
Water Depth: No Standing Water
Soil EC: 50.0 - 16.0 33.83 ± 24.0

Historical References - The *Suaeda moquinii* plant association has not been previously described.

Current Distribution - The bush seepweed association was located along the edge of dry lacustrine wetlands at elevation ranges between 1185 and 1200 m msl.

Association Structure and Composition - This association is an incidental plant association characterized by low canopy coverage and diversity of species. Only four species were present including two shrubs (*Suaeda moquinii* and *Sarcobatus vermiculatus*) and two forbs (*Bassia hyssopifolia* and *Salicornia europaea*). Again, no graminaceous species were present within this plant association, but, an exotic annual, *Salsola tragus*, averaged 10 % cover. This association was not considered part of the *Sarcobatus vermiculatus* - *Suaeda moquinii* association based on lower canopy coverage of extant shrubs and differences in species composition.

Soils - Samples were collected on Appian and Dune soils which are described as very deep and well drained. Similar to the *Sarcobatus vermiculatus* - *Suaeda moquinii* association, surface texture is sandy and soils are considered saline-sodic (mean EC and SAR = 33.0 mmhos/cm and 171.9, respectively) with soil pH ranging from 8.8 to 9.0. Slope varies by soil series (0 to 2 % for appian and variable for Dune) with seasonal high water table 1 to 1.5 meters below the surface.

Field Condition Ranking - Fair. Lack of diversity, low canopy coverage by extant species, and poor species regeneration results in a fair condition ranking. Little disturbance impact, the occurrence on natural sites, and the presence of *Salicornia europeae* (a rare species based on our collection data) raise this association from the poor range.

Transitional Shrub Associations
Upland Shrub Associations Sampled Near Wetland Edge

Artemisia tridentata* ssp. *tridentata Plant Association
Big Sagebrush Association

Location: OUT
Water Depth: No Standing Water
Soil EC: 12.8 - 12.8 12.8 ± 0.00

Historical Reference - Billings (1945).

The sagebrush association is described as being typical of the semi-arid steppe country surrounding the Carson Desert on the west and north and on the higher mountains to the east.

Current Distribution - The *Artemisia tridentata* ssp. *tridentata* p.a. is an incidental type that occurs on flood plain terraces adjacent to the Carson River on the west side of Lahontan Valley. This p.a. is prevalent in areas along the river which have been historically channelized and disturbed by agricultural development and the construction of Lahontan Dam.

Association Structure and Composition - *Artemisia tridentata* ssp. *tridentata* predominates the overstory with *Rosa woodsii* var. *ultramontane* present as a minor component. *Juncus balticus* predominates in the understory. Grass and herbaceous cover is nominal and includes *Elymus triticoides*, *Bassia hyssopifolia*, *Lactuca serriola*, *Rumex crispus* and *Solidago occidentalis*.

Soils - This p.a. was sampled on Bunejug soils, which are described as very deep, somewhat poorly drained, and formed in sediment derived from mixed rock. The soils are on smooth flood plains with a slope of 0 to 2 percent. Seasonal high water table is 1 to 1.5 meters deep. The soils are saline-sodic with a pH 7.6.

Field Condition Ranking - Good. Good number of individuals and cover of dominant species. Natural regeneration of dominants was occurring and association appears viable and sustainable. Association canopy and underlying soil substrate is in good condition. Ground cover disturbance is nominal although ditch and canal construction is evident adjacent to the sites.

Atriplex lentiformis Plant Association
Quailbush Association

Location: SWMA
Water Depth: No Standing Water
Soil EC: 6.7 - 6.7 6.7 ± 0.00

Historical Reference - The *Atriplex lentiformis* p.a. has not been described previously.

Current Distribution - The *Atriplex lentiformis* p.a. is an incidental type sampled adjacent to a small artesian lake just south of Leter Reservoir at an elevation of 1190 meters. This p.a. is adjoined by an emergent association located adjacent to the lake and dominated by *Scirpus acutus*. *Sarcobatus vermiculatus* dominates in the adjacent uplands.

Association Structure and Composition - *Atriplex lentiformis* predominates the open shrub overstory with a mean cover class of 40 percent. *Sarcobatus vermiculatus* is present in minor amounts. A conspicuous grass layer is present and comprised strictly of *Distichlis spicata*. The herbaceous layer is almost nonexistent, but *Atriplex phyllostegia* and *Salsola tragus* may be present in nominal amounts.

Soils - This p.a. was sampled on Tipperary soils, described as very deep, excessively drained and formed from sandy alluvium derived from mixed rocks with 0 to 2 percent slopes. Seasonal high water table is greater than 1.5 meters in depth. The soil was normal with a pH of 7.9.

Field Condition Ranking - Poor. Although there are a good number of individual plants present to represent this association, shrub dieback due to drought and other causes are evident. Ground cover disturbance from cattle trampling is greater than 20 percent and results in an increase in the exposure of bare soil between the plants.

Chrysothamnus nauseosus - Tetradymia tetrameres Plant Association
Rubber Rabbitbrush - Spiney Horsebrush Association

Location: SWMA
Water Depth: No Standing Water
Soil EC: 1.6 - 0.7 1.15 ± 0.60

Historical References - The *Chrysothamnus nauseosus - Tetradymaia tetrameres* p.a. has not been previously described.

Current Distribution - The *Chrosothamnus nauseosus ssp. consimilis - Tetradymia tetrameres* plant association was typically distributed in an upland band around ephemeral wetlands and playas in the Stillwater Wildlife Management Area. Related associations include the *Distichlis spicata* plant association which was located within the wetland basin. The mean elevation of the two sites sampled is 1191 m msl.

Association Structure and Composition - The upper canopy is co-dominated by *Chrysothamnus nauseosus ssp. consimilis and Tetradymia tetrameres* and contains several other shrub species in trace amounts (*Atriplex canescens, Grayia spinosa, Lycium shockleyi, and Psorothamnus polydenius*). Few other species are present in this association with the exception of *Distichlis spicata* which forms a low graminaceous layer typically found at the base of the shrubs.

Soils - The rubber rabbitbrush - spiney horsebrush association was sampled on Appian and Tipperary soils which are very deep, well drained, and typically found in smooth to gently rolling topography. Both soils share a clay/loam surface texture overlying a highly stratified sand layer resulting in surface water initially collecting, then rapidly infiltrating through subsurface horizons. Soil chemistry can be classified as normal with an EC of 1.15 ± 0.6 mmhos/cm and an SAR of 3.25 ± 2.0. Soil pH is near nuetral at 7.7.

Field Condition Ranking - Fair. Associated habitats where the *Chrysothamnus nauseosus ssp. consimilis - Tetradymia tetrameres* plant association occurred were described as lightly to moderately disturbed, usually related to cattle grazing. Poor vegetative diversity, low canopy cover of extant species, and little documented regeneration resulted in this ranking. However, few exotic species were observed suggesting that this is a natural shrub association.

Tall Graminaceous (Emergent) Associations

Phragmites australis Plant Association
Common Cane Association

Location:	SNWR	
Water Depth:	0.50 - 0.00	0.17 ± 0.29
Soil EC:	3.40 - 3.00	3.28 ± 0.30

Historical Reference - Fowler (1992).

Wuzzie George, a Paiute Indian, remembered patches of common cane near the historic Freeman Ranch and at the northwest edge of Stillwater Marsh.

Current Distribution - The *Phragmites australis* p.a. is an incidental type found adjacent to Freeman Pond, on the historic Freeman Ranch, at an elevation of 1180 meters. This p.a. is adjoined by a *Typha domingensis* p.a. located within and adjacent to the pond, and a *Distichlis spicata-Hordeum jubatum* association in the uplands.

Association Structure and Composition - *Phragmites australis* is a broad-leaved grass species with a jointed stem, similar to bamboo. It dominates the tall, dense overstory with a cover of 40 percent. *Distichlis spicata, Hordeum jubatum* and *Juncus balticus* can be found along the peripheral edge of the association. A conspicuous forb layer was present and dominated by *Bassia hyssopifolia* with *Atriplex heterosperma, Malvella leprosa, Rumex crispus* and *Xanthium strumarium* present in trace amounts.

Soils - This association was found on fine-grain clay soils of the Marsh series. The water table was 0.75 meters deep in August. The soil was categorized as saline, and had a pH of 7.2.

Field Condition Rating - Overall the association conditions were good. High density of individual plants with natural regeneration evident. Association appears viable and sustainable. Ground cover disturbance is less than 20 percent with evidence of light grazing within the plant canopy.

Scirpus acutus Plant Association
Bulrush (Tule) Association

Location:	SNWR, SWMA, CLAKE, OUT	
Water Depth:	0.50 - 0.00	0.19 ± 0.13
Soil EC:	9.00 - 0.90	3.43 ± 3.10

Historical References - Bailey (1898), Sperry (1929), Billings (1945), Marshall (1949), USFWS (1952), Giles (1953), DeQuille (1963).

This association has been described in the literature as a perennial association dominated by *Scirpus acutus*. In general, this p.a. is most commonly found in ephemeral, shallow ponds that are periodically desiccated.

Current Distribution - The *Scirpus acutus* p.a. is a common emergent association typically associated with the active channel of the Carson River and shallow lake systems that are periodically desiccated. Local environments varied from freshwater, inundated habitats to dry soils with moderate saline-sodic conditions. It was found at elevations ranging from 1190 to 1220 meters. This p.a. was found in S-line Reservoir, Mahala Slough, the Fallon Reservation, and in a small artesian lake just south of Leter Reservoir.

Association Structure and Composition - *Scirpus acutus* dominates a tall, very dense, monotypic association which averages 1.4 to 4 meters in height. In early summer the depth of standing water may make this p.a. inaccessible except by boat, but by late summer, the association may occur in slight depressions with only partly saturated soil moisture. In the early summer, this p.a. can be adjoined by aquatic associations dominated by *Lemna minor* or *Potamogeton pectinatus*. *Typha domingensis*, *Scirpus pungens* and *Solidago occidentalis* can be present in the canopy in minor or trace amounts. Later in the summer season when water levels drop, annual species such as *Chenopodium foliosum* and *Lactuca serriola* may form a sparse forb cover along the edge of the association.

Soils - This p.a. was found on Marsh, Lakebottom, and Tipperary soils. These soils are very deep, poorly drained and comprised of fine-grain, clay alluvium derived from mixed rock. Hydrologic conditions can vary from inundated to desiccated states. Slope is 0 to 2 percent. Seasonal high water tables fluctuate from the soil surface to 1.5 meters in depth. The soils are normal to saline, indicative of freshwater conditions during inundation periods and the accumulation of salts in the soil profile precipitated by periodic desiccation. Soil pH ranges from 7.1 - 8.2.

Field Condition Ranking - In general, the associations sampled were in good condition, displaying a high number of individuals and evident reproduction. This p.a. can be impacted by cattle grazing during periods of desiccation because of an increase in the accessibility to the association by livestock.

Scirpus maritimus Plant Association
Alkali Bulrush (Nutsedge) Association

Location:	SNWR, CLAKE, OUT	
Water Depth:	0.60 - 0.00	0.10 ± 0.17
Soil EC:	10.1 - 3.40	6.45 ± 2.20

Historical References - Bailey (1898), Sperry (1929), Billings (1945), Marshall (1949), USFWS (1952, 1968), Giles (1953).

This association is dominated by *Scirpus maritimus*, most commonly known as nutsedge. This association is found in ephemeral, shallow lakes in water less than 1 m. It is the most salt-tolerant of all the emergent associations and can be found in strongly-saline environments within the valley. The distribution of this association is limited by alkalinity.

Current Distribution - The *Scirpus maritimus* p.a. is a common, emergent association typically associated with saline, shallow lakes that are periodically desiccated. Within the regional landscape, this p.a. is strictly limited in its distribution to the historic Carson Lake area (near West Lee Drain) and Stillwater Point Reservoir at elevations of 1190 meters. The associations occurred in clear, shallow water 0.10 to 0.50 meters deep.

Association Structure and Composition - *Scirpus maritimus* dominates an open, monotypic association with at least 13 percent cover and averages 0.8 meters in height. Under well watered, inundated conditions, this p.a. may have an aquatic component in the understory which can include *Lemna minor, Potamogeton latifolius, Potamogeton pectinatus* and *Zannichellia palustris*. This p.a. may adjoin other emergent associations dominated by *Typha domingensis* or *Scirpus acutus*. At the ephemeral edge of the salt marsh, *Tamarix ramosissima* may be present in the association in minor or trace amounts. Other graminoids, when present, are often sparse but may include *Distichlis spicata, Echinochloa crus-galli, Hordeum jubatum, Leptochloa fascicularis*, and *Polypogon monspeliensis*. An herbaceous cover is negligible, but may include *Aster lanceolatus, Bassia hyssopifolia, Chenopodium glaucum* and *Heliotropium curassavicum* in trace amounts.

Soils - This p.a. was found on Marsh, Lakebottom, and Lahontan soils. The soils are very deep, poorly drained and formed in fine-grained, clay alluvium derived from mixed rock. Slope is 0 to 2 percent. Seasonal high water tables fluctuate from 0 to 1.5 meters in depth. The soils are saline with a pH range from 6.9 - 8.5.

Field Condition Ranking - In general, the associations sampled were in good condition, displaying a high number of individuals and evident reproduction. This p.a. may be impacted by cattle grazing during periods of desiccation because of an increase in the accessibility to the association by livestock..

Scirpus pungens Plant Association
Common Three-square Association

Location:	SWMA, FNWR, CLAKE, OUT	
Water Depth:	0.70 - 0.00	0.28 ± 0.31
Soil EC:	24.0 - 2.70	7.23 ± 6.10

Historical References - Marshall (1949), Osugi (1973, 1974), Osugi and Barber (1976), Barber (1977).

This association is dominated by *Scirpus pungens* and is found in very shallow water at the edge of lakes and marshes. Requires a well saturated soil which remains moist throughout the summer season.

Current Distribution - The *Scirpus pungens* p.a. is a major, emergent association that occurs in a variety of habitats within Lahontan Valley. It is predominantly found in natural palustrine systems that are periodically desiccated. Although the soil surface may appear dry, high water tables are apparent within the soil profile in late summer. Occasionally, associations can be found adjacent to shallow lakes, ponds or ditches in clear, shallow water 0.10 meters deep. Elevation range is 1190 to 1220 meters. *Sarcobatus vermiculatus* p.a. occupies the adjacent uplands. The p.a. was found in Massie Slough, Indian Lakes area, adjacent to Big and Little Soda Lakes, and adjacent to a variety of small ponds in the valley.

Association Structure and Composition - *Scirpus pungens* dominates this association at 40 percent cover with *Distichlis spicata* as a codominant. Other graminaceous species are infrequent, but can include *Eleocharis parishii, Juncus balticus, Scirpus acutus, Scirpus maritimus, Scirpus nevadensis, Triglochon maritima* and *Typha domingensis* in nominal to trace amounts. Outside of *Distichlis spicata*, other grass and forb species are infrequent and have nominal to trace cover values. *Bassia hyssopifolia, Aster lanceolatus, Chenopodium album, Chenopodium foliosum, Kochia scoparia, Lactuca serriola, Plantago major, Polygonum lapathifolium, Ranunculus cymbalaria, Rumex crispus, Solidago occidentalis, Suaeda calciformis, Taraxacum officinale* and *Trifolium fragiferum* may be found in trace amounts.

Soils - The *Scirpus pungens* p.a. is primarily found on fine- to coarse-textured sandy soils with small amounts of clay and loam. Soil types are highly variable and include Appian, Marsh, Parran, Tiperrary, Soda Lake and Lake Bottom soils. The soils are very deep, well-drained and formed in sandy alluvium or sediment derived from mixed rock. Slope is 0 to 2 percent. Seasonal high water tables are from the soil surface to greater than 1.5 meters in depth. Soils vary from normal to highly saline with a pH range from 7.4 - 9.1.

Field Condition Ranking - Overall the associations were in good condition. High density of individual plants with natural regeneration evident. Association appears viable and sustainable. Ground cover disturbance is less than 20 percent with evidence of light grazing within the plant canopy.

Typha domingensis Plant Association
Southern Cattail Association

Location:	SNWR, CLAKE, FIR, OUT	
Water Depth:	0.40 - 0.00	0.16 ± 0.16
Soil EC:	8.00 - 0.80	6.64 ± 2.80

Historical References - Sperry (1929), Billings (1945), Marshal (1949, 1952), USFWS (1952), Macklin et al. (1960), Osugi (1973, 1974).

This association is dominated by *Typha domingensis* and is dependent primarily on a fresh, perennial water source up to six feet deep and well-oxygenated. This species does not tolerate desiccation or saline conditions.

Current Distribution - The *Typha domingensis* p.a. is found in freshwater palustrine systems adjacent to shallow lakes or ponds in clear, shallow water 0.10 to 0.25 m deep, at elevations ranging from 1182 to 1197 meters. This p.a. was found south of Harmon Reservoir, on the Fallon Reservation, and in Massie Slough.

Association Structure and Composition - *Typha domingensis* dominates a tall, very dense emergent association with 55 percent cover. In early summer the depth of standing water can be as deep as 0.5 m, but by late summer, the association may occur in slight depressions with only partly saturated soil moisture. This association is characteristically monotypic, but where this p.a. interfaces with other associations, shorter emergent species such as *Eleocharis macrostachya, Juncus balticus,* and *Scirpus pungens* can be found within its understory. When inundated, aquatic and submergent species such as *Bacopa eisenii, Potamogeton pectinatus* and *Sagittaria cuneata* may be found at the base of the plants.

Under drier conditions, a sparse grass component may be present along the edge of the association and may include *Distichlis spicata, Hordeum jubatum* or *Polypogon monspeliensis* in minor or trace amounts. In addition, forbs such as *Bassia hyssopifolia, Chenopodium foliosum,* and *Spergularia marina* can also be present in minor to trace amounts.

Soils - The *Typha domingensis* p.a. was sampled on Marsh, Dithod and Tipperary soils. These soils are characterized as being very deep, nearly level, and somewhat poorly drained soils comprised of fine-grained alluvium derived from mixed rock. Slope is 0 to 2 percent. Seasonal high water table is at the soil surface to 1.5 meters in depth. The soils are normal to slightly saline with a pH range from 6.4 - 7.9.

Field Condition Ranking - In general, the associations sampled were in good condition, displaying a high number of individuals and evident reproduction. This p.a. can be impacted by cattle grazing during periods of desiccation because of an increase in the accessibility to the association by livestock.

Typha domingensis-Scirpus acutus Plant Association
Southern Cattail-Hardstem Bulrush Association

Location:	SWMA, CCLUB, FIR, OUT	
Water Depth:	0.30 - 0.00	0.16 ± 0.14
Soil EC:	5.60 - 0.60	2.55 ± 2.20

Historical Reference - The *Typha domingensis-Scirpus acutus* p.a. has not been previously described. However, both elements have been previously described on an individual basis.

Current Distribution - The *Typha domingensis-Scirpus acutus* p.a. is found in freshwater palustrine systems adjacent to shallow lakes or ponds. The associations occur in clear, shallow water 0.10 to 0.25 m at elevations ranging from 1182 to 1190 meters. The associations sampled were found adjacent to Freeman Pond at the Canvasback Duck Club, and adjacent to a small artesian lake south of Leter Reservoir.

Association Structure and Composition - The dominant vegetation in this p.a. is comprised of native, perennial species. *Typha domingensis* and *Scirpus acutus* share dominant status in a tall, very dense association with each species averaging 35 and 50% cover, respectively. This association is characteristically monotypic, but *Eleocharis macrostachya, Juncus balticus, Distichlis spicata,* or *Polypogon monspeliensis* may be present in nominal to trace amounts. Aquatic and emergent species such as *Bacopa eisenii, Lemna minor* and *Potamogeton nodosus* can be found at the base of the plants in trace amounts.

Soils - The *Typha domingensis-Scirpus acutus* p.a. was sampled on Marsh and Tipperary soils. These soils are characterized as being very deep, nearly level, and somewhat poorly drained soils comprised of fine-grained alluvium derived from mixed rock. Slope is 0 to 2 percent. Seasonal high water table is at the soil surface to 1.5 meters in depth. The soils are normal to slightly saline with a pH range of 5.9 - 7.6.

Field Condition Ranking - In general, the associations sampled were in good condition, displaying a high number of individuals and evident reproduction. This p.a. may be impacted by cattle grazing during periods of desiccation because of an increase in the accessibility to the association by livestock..

Typha latifolia Plant Association
Broad-leaved Cattail Association

Location:	SNWR, CLAKE, OUT	
Water Depth:	0.45 - 0.00	0.16 ± 0.13
Soil EC:	16.8 - 0.80	6.81 ± 6.00

Historical Reference - Marshall (1949).

This association is dominated by *Typha latifolia* and is found in shallow, clear water in lakes, ponds or canals in water that is less than three feet deep. This association does not tolerate desiccation or saline conditions.

Current Distribution - Within the regional landscape, the *Typha latifolia* p.a. is restricted in its distribution to freshwater habitats in the Carson River corridor at elevations ranging from 1206 to 1230 m msl. This p.a. occurs primarily in clear, shallow water 0.25 meters deep within the river corridor, but was also found in a few canals near the river.

Association Structure and Composition - *Typha latifolia* dominates a tall, dense, association with at least 40 percent cover. In shallow water, the understory can be comprised of other, shorter emergent species, such as *Eleocharis macrostachya, Juncus balticus, Juncus torreyi,* and *Scirpus acutus* in minor amounts. A grass layer is not commonly conspicuous, but can include *Agrostis stolinifera, Beckmannia syzigachne* or *Hordeum jubatum* in trace amounts. *Solidago occidentalis* can dominate a highly variable forb layer which may include *Asclepias speciosa, Aster lanceolatus, Epilobium ciliatum, Equisetum laevigatum, Lepidium latifolium, Lycopus asper, Mentha arvense, Polygonum lapathifolium, Rumex crispus* and *Urtica dioca* in trace amounts.

In deeper water, a conspicuous aquatic layer dominated by *Lemna minor* may be present on the water surface at the base of the plants and can include *Azolla filiculoides, Sagittaria cuneata* and *Zannichellia palustris* in trace amounts.

Soils - The *Typha latifolia* p.a. was sampled on Alluvium and East Fork soils. These soils are very deep, nearly level, and recently deposited from mixed rock. Slope is 0 to 2 percent. Seasonal high water tables fluctuate from the soil surface to 1 meter in depth. The soils were comprised primarily of coarse sand. The soils are normal, characteristic of freshwater environments, with a pH range from 6.9 - 8.1.

Field Condition Ranking - Overall good. The floristics of some sites indicate that exotic species may be present due to depositional patterns of the propagules within the river corridor, and not due to disturbance necessarily. Ground cover disturbance was slight with no evidence of animal or mechanical disturbance on these sites. The sample sites are susceptible to intermittent displacement due to flooding effects of the Carson River.

Low Graminaceous (Wet Meadow) Associations

Eleocharis macrostachya Plant Association
Common Spikerush Association

Location:	SNWR, SWMA, CLAKE, CCLUB, FIR, OUT	
Water Depth:	0.30 - 0.00	0.11 ± 0.10
Soil EC:	32.0 - 1.30	5.03 ± 9.40

Historical References - Sperry (1929), Billings (1945), USFWS (1952), Macklin et al. (1960).

This association is dominated by *Eleocharis macrostachya* which occasionally forms pure stands in shallow water that seldom exceeds six inches in depth. It is particularly abundant in old ditches. It is commonly found as a border association fringing the more temporary sloughs as well as recently dried lake beds. It can co-occur with *Typha* sp. and *Scirpus maritimus* and is tolerant of saline conditions similar to the nutsedge association.

Current Distribution - The *Eleocharis macrostachya* p.a. is found at elevations ranging from 1183 to 1212 meters, in freshwater palustrine and wet meadow systems which periodically desiccate. Although the soil surface may appear dry, high water tables are apparent within the soil profile in late summer. Occasionally, associations can be found adjacent to shallow lakes, ponds, or ditches in clear, shallow water 0.10 m deep. This p.a. is often found in very thin bands behind tall emergent associations that occupy sites adjacent to open water. This p.a. was found in the Indian Lakes area, in an artesian system south of Leter Reservoir, on the Fallon Reservation, the Canvasback Duck Club, and on private land located within the historic terminus of the Carson River.

Association Structure and Composition - *Eleocharis macrostachya* dominates this diverse association with 30 percent cover. *Hordeum jubatum* and *Distichlis spicata* are frequently present in nominal amounts. Other graminaceous species, when present, are sparse and include *Juncus balticus, Scirpus pungens, Typha domingensis, Typha latifolia, Bromus tectorum, Echinochloa crus-gali, Festuca praetense, Elymus triticoides, Muhlenbergia aperifolia, Polypogon monspeliensis* and *Puccinellia nuttalliana* in trace amounts. Herbaceous cover other than *Rumex crispus* is usually infrequent and may include *Berula erecta, Lotus tenuis, Mentha arvense, Mimulus guttatus, Plantago lanceolata, Polygonum lapathifolium, Polygonum persicaria, Ranunculus cymbalaria, Rumex obtusifolius, Taraxacum officinale, Trifolium fragiferum* and *Veronica anagallis-aquatica* in trace amounts.

Soils - The *Eleocharis macrostachya* p.a. was sampled on Marsh, Dia, Carson-Stillwater and Lake Bottom soils. These soils are very deep, poorly drained and formed in fine-grained alluvium derived from mixed rock. Soil texture varied from fine clay to fine sand. Slope is 0 to 2 percent. Seasonal high water tables fluctuate from the soil surface to greater 1.5 meters in depth. The soils are primarily normal with a pH range of 6.1 - 8.0.

Field Condition Ranking - Overall the field conditions were marginal due to impacts from cattle grazing. 100 percent of the associations sampled are currently being grazed by cattle. Many of the herbaceous species present within the canopy are ruderal, early seral species, indicative of site disturbance and association degradation. Ground cover disturbance ranges from 10 to greater than 40 percent in some locations.

Eleocharis macrostachya-Bacopa eisenii Plant Association
Common Spikerush-Water-hyssop Association

Location:	SWMA, CLAKE	
Water Depth:	0.15 - 0.10	0.13 ± 0.04
Soil EC:	2.70 - 1.60	2.53 ± 0.6

Historical Reference - The *Eleocharis macrostachya-Bacopa eisenii* p.a. has not been described previously.

Current Distribution - This p.a. is a freshwater aquatic association typically associated with natural palustrine systems with perennial hydrologic regimes. Palustrine systems border shallow lakes and have surface water 0.10 to 0.20 meters deep. Elevation ranges from 1182 to 1190 meters. Adjacent, emergent associations most often include those belonging to the *Typha domingensis* and *Scirpus acutus* p.a. *Sarcobatus vermiculatus* p.a. predominates the upland sites. This p.a. was founds on the Fallon Reservation, and adjacent to a small artesian lake south of Leter Reservoir.

Association Structure and Composition - The dominant vegetation in this p.a. is comprised of native, perennial species. *Eleocharis macrostachya* typically dominates this association with 40 percent cover. *Bacopa eisenii* is codominant with 20 percent cover. Other graminaceous species are varied and include *Juncus balticus, Eleocharis parishii, Juncus articulatus, Juncus torreyi, Scirpus pungens, Typha domingensis, Bechmannia syzigachne, Distichlis spicata, Echinochloa crus-gali, Festuca pratense, Hordeum jubatum, Leptochloa fascicularis, Elymus triticoides, Muhlenbergia aperifolia* and *Polypogon monspeliensis* in minor or trace amounts. A conspicuous forb layer is not present, but may include a variety of incidental species including *Bassia hyssopifolia, Conyza canadense, Lotus tenuis, Mimulus guttatus, Plantago laneolata, Polygonum lapathifolium, Polygonum persicaria, Ranunculus cymbylaria, Rumex crispus, Solidago occidentalis, Taraxacum officinale, Trifolium fragiferum, Trifolium variegatum, Veronica peregrina* and *Xanthium strumarium*. Occasionally, under inundated field conditions, other aquatic plants such as *Azolla filiculoides, Marsilea vestita, Potamogeton nodosus*, and *Sagittaria cuneata* may be present in minor to trace amounts.

Soils - This p.a. was sampled on Marsh, Appian, Tipperary, and Carson soils. These soils are very deep, well-drained soils that formed in fine-grained, sandy alluvium or sediment derived from mixed rocks. These soils are on smooth terraces with slop of 0 to 2 percent. Seasonal high water tables are at the soil surface to 1 meter in depth. The soils are normal, indicative of freshwater environments, and have a pH range from 5.8 - 6.9.

Field Condition Ranking - Overall the field conditions were fair due to impacts from cattle grazing. 100 percent of the associations sampled are currently being grazed by cattle. Many of the herbaceous species present within the canopy are ruderal, early seral species, indicative of site disturbance and association degradation. Ground cover disturbance ranges from 10 to greater than 40 percent in some locations.

***Eleocharis parishii* Plant Association**
Parish's Spikerush Association

Location: SWMA
Water Depth: No Standing Water
Soil EC: 2.3 - 2.3 2.3 ± 0.0

Historical References - (Marshall 1949, USFWS 1952, Macklin et al. 1960).

The Parish's spike rush association has been historically described within a generic, wire rush association. Dominant's include either a combination or monoculture of *Eleocharis parishii*, *Eleocharis macrostachya*, *Juncus balticus*, and *Ranunculus cymbalaria* ssp. *saximontanus* and are typically found at the shallow edge of freshwater lakes and ponds or in wet meadow habitats.

Current Distribution - This p.a. was located in the bottom of Vaughn slough in the Indian Lakes area at an elevation of 1190 m msl. There was considerable residual Chrysothamnus nauseosus in the slough suggesting that the excess water in 1995 has begun a successional change within this previously dessicated habitat. A drier band of Juncus balticus was located adjacent to this p.a. along the banks of the slough. Although typically a wet meadow association, the Eleocharis parishii could potentially occur in any seasonally flooded habitat.

Association Structure and Composition - This plant association contains the spikerush elements of the historically described association (*Eleocharis macrostachya*) but is clearly dominated by *Eleocharis parishii*. The association is lacking a tree or shrub layer but does contain a significant grass component comprised of *Hordeum jubatum* and *Polypogon monspeliensis*. No other species were present in our sample.

Soils - This association occurred on an Appian soil which is described as very deep, well drained, and formed in mixed alluvium over lacustrine sand of mixed origin. Slopes are 0-2 % with elevation of our sample at 1190 m msl. Soil chemistry is normal with EC = 2.3 and SAR = 10.6. Soil pH is slightly alkaline at 8.1.

Field Condition Ranking - Good. Although this association was characterized by low species diversity; good evidence of regeneration, lack of apparent disturbance, and the presence of natural graminaceous species result in an overall condition ranking of good. The *Eleocharis parishii* plant association is an historically described, naturally occurring, graminaceous association that was rarely encountered in our sampling effort.

Juncus balticus Plant Association
Wire Rush Association

Location:	SNWR, SWMA, CLAKE, CCLUB, FIR, OUT
Water Depth:	0.50 - 0.00 0.10 ± 0.16
Soil EC:	40.7 - 0.90 7.19 ± 6.10

Historical References - Marshall (1949), USFWS (1952), Macklin et al. (1960).

This association is dominated by *Juncus balticus* and is commonly found at the shallow edge of freshwater lakes or ponds and in meadows that have saturated soil conditions for some period during the year. This association can occur as a monoculture or mixed in a association with *Eleocharis macrostachya, Eleocharis parishii* and *Ranunculus cymbalaria*.

Current Distribution - The *Juncus balticus* p.a. is a major type in the Lahontan Valley and occurs predominantly in palustrine systems that are periodically desiccated. Elevation ranges from 1182 to 1230 meters. The associations occur in diverse habitats ranging from shallow water, 0.10 meters deep, to dry upland sites. Under inundated conditions, this p.a. forms distinct bands and is commonly bordered by other emergent associations dominated by *Scirpus pungens* or *Eleocharis macrostachya*. *Sarcobatus vermiculatus* and *Artemisia tridentata* ssp. *tridentata* associations often dominate the adjacent uplands.

Association Structure and Composition - *Juncus balticus* dominates this association with approximately 40 percent cover. This p.a. can appear as a monotypic association or with other graminaceous species including *Carex lanuginosa, Eleocharis parishii, Typha domingensis, Typha latifolia, Distichlis spicata, Echinochloa crus-gali, Hordeum brachyantherum, Hordeum jubatum, Elymus triticoides, Muhlenbergia asperifolia*, and *Puccinellia distans* in minor or trace amounts. A conspicuous shrub component is usually lacking, but the encroachment of shrubs can develop with site disturbance. Under disturbed conditions, shrub species such as *Tamarix ramosissima, Elaeagnus angustifolius, Chrysothamnus nauseosus* ssp. *consimilis*, and *Chrysothamnus visidiflorus* can be present in trace amounts. In addition, disturbed sites can often foster the encroachment of a variety of exotic and/or annual herbaceous species. *Atriplex heterosperma, Bassia hyssopifolia, Chenopodium glaucum, Cirsium vulgare, Heliotropium currassivicum, Kochia scoparia, Lactuca serriola, Polygonum arenastrum, Polygonum argyrocoleon, Taraxacum officinale* and *Trifolium fragiferum* are just a few of the forbs that may occur.

Soils - The *Juncus balticus* p.a. is primarily found on fine- to medium-textured sandy soils with small amounts of clay. Soil types are highly variable and include Appian, East Fork, Marsh, Pelic, Soda Lake, Carson-Stillwater, Dithod, Erber, Tiperrary and Lake Bottom series. The soils are very deep, well-drained and formed in sandy alluvium or sediment derived from mixed rock. Slope is 0 to 2 percent. Seasonal high water tables are at the soil surface to greater than 1.5 meters in depth. Soils vary from normal to moderately saline with a pH range from 6.9 - 8.6.

Field Condition Ranking - Overall the field conditions were marginal due to impacts from cattle grazing.. Many of the herbaceous species present within the canopy are ruderal, early seral species, indicative of site disturbance and association degradation. Ground cover disturbance ranges from 10 to greater than 40 percent in some locations. Sixty-nine percent of the associations sampled had soil cover disturbance levels greater than 40 percent. Soil disturbance of this magnitude affects erosion potential and compaction of the soil surface, thus influencing plant association composition and viability.

Juncus balticus-Eleocharis macrostachya Plant Association
Wire Rush-Spike Rush Association

Location:	SWMA, CLAKE, FIR, OUT	
Water Depth:	0.15 - 0.00	0.08 ± 0.11
Soil EC:	21.5 - 1.00	6.34 ± 5.50

Historical Reference - The *Juncus balticus-Eleocharis macrostachya* p.a. has not been described previously.

Current Distribution - The *Juncus balticus-Eleocharis macrostachya* p.a. is found in freshwater palustrine systems adjacent to shallow lakes or ponds. The associations primarily occur in soils that have high water tables even into late summer, and at elevations ranging from 1183 to 1202 meters. Adjacent, upland associations are most often dominated by *Sarcobatus vermiculatus*. The sampled associations were found in the Fallon Reservation, Indian Lakes area, and the Canvasback Duck Club.

Association Structure and Composition - *Juncus balticus* typically dominates this association with 30 percent cover. *Eleocharis macrostachya* is codominant with 10 percent cover. *Eleocharis parishii, Muhlenbergia asperifolia* and *Trifolium fragiferum* can occur as infrequent codominants within the canopy. A conspicuous shrub layer is not present, but *Chrysothamnus nauseosus* ssp. *consimilis* can occur under disturbed conditions in trace amounts. Other graminaceous species can be present in trace or nominal amounts and may include *Carex lanuginosa, Scirpus pungens, Typha domingensis, Distichlis spicata, Hordeum jubatum, Paspalum distichum, Polypogon monspeliensis, Puccinellia distans* and *Puccinellia nuttalliana*. An herbaceous layer other than *Aster lanceolatus* and *Polygonum persicaria* is usually rare, but may include a variety of species in trace amounts.

Soils - The *Juncus balticus-Eleocharis macrostachya* p.a. is found on fine-textured sand or clay soils. Soil types are highly variable and include Sagoupse, Lake Bottom, Churchill-Playa, Carson-Stillwater and Tiperrary series. The soils are very deep, well-drained and formed in alluvium or sediment derived from mixed rock. Slope is 0 to 2 percent. Seasonal high water tables are from the soil surface to greater than 1.5 m in depth. Soils are primarily normal, indicative of freshwater environments, with a pH range from 7.0 -8.2.

Field Condition Ranking - Overall the field conditions were fair due to impacts from cattle grazing.. Many of the herbaceous species present within the canopy are ruderal, early seral species, indicative of site disturbance and association degradation. Ground cover disturbance ranges from 20 to greater than 40 percent in some locations. Sixty-nine percent of the associations sampled had soil cover disturbance levels greater than 40 percent. Soil disturbance of this magnitude affects erosion potential and compaction of the soil surface, thus influencing plant association composition and viability.

Grass Associations

Distichlis spicata Plant Association
Saltgrass Association

Location:	SNWR, SWMA, FNWR, CLAKE, CCLUB, OUT	
Water Depth:	0.25 - 0.00	0.02 ± 0.07
Soil EC:	83.0 - 1.20	19.35 ± 19.40

Historical References - Sperry (1929), Billings (1945), Marshall (1949, 1952), USFWS (1952), Macklin et al. (1960).

The dominant plant of this association is *Distichlis spicata* and may be found on almost any saline soil in the valley. Extensive stands occur in the shallow water around the edges of some of the more permanent playa lakes. It is highly salt tolerant and can tolerate periodic desiccation.

Current Distribution - The *Distichlis spicata* p.a. is a major type in Lahontan Valley and occurs in both lake and palustrine systems that are periodically desiccated. The elevation range is from 1180 to 1224 meters. The p.a. occurs in diverse habitats ranging from shallow water, 0.10 meters deep, around the edges of small lakes and palustrine associations to dry upland sites. In shallow lakes or inundated palustrine systems, this p.a. forms distinct bands and is commonly bordered by *Juncus balticus, Scirpus pungens,* or *Eleocharis macrostachya* associations that occupy the deep-water habitats, with *Sarcobatus vermiculatus* p.a. in the adjacent uplands. Soil salinity varies from slight to highly saline conditions with evident salt-encrusted soil surfaces. Within the regional landscape, this p.a. was found in Mahala and Massie Sloughs, Mud Lake, historical Carson Lake area, the Indian Lakes area, the Canvasback Duck Club, the Fallon Reservation, and a variety of canals and small ponds throughout the valley.

Association Structure and Composition - *Distichlis spicata* dominates this monotypic association with approximately 40 percent cover. A conspicuous shrub component is usually lacking, but the encroachment of shrubs can develop with site disturbance. Under disturbed conditions, shrub species such as *Tamarix ramossisima, Allenrolfea occidentalis, Chrysothamnus nauseosus* ssp. *consimilis, Iva axillaris* and *Sarcobatus vermiculatus* can be present in nominal to trace amounts. In addition, disturbed sites can often foster the encroachment of a variety of exotic and annual species including *Atriplex phyllostegia, Bassia hyssopifolia, Chenopodium album, Chenopodium foliosum, Cirsium vulgare, Halogeton glomeratus, Lactuca serriola, Polygonum arenastrum, Polygonum argyrocoleon, Salsola tragus, Suaeda moquinii, Taraxacum officinale* and *Trifolium fragiferum*. Other graminoid species are rare, but may include *Eleocharis parishii, Juncus balticus, Scirpus pungens* or *Muhlenbergia asperifolia* in trace amounts.

Soils - The *Distichlis spicata* p.a. was found on a wide variety of soil types and textures. Soil types include Appian, Parran, East Fork, Playa, Bunejug, Lahontan, Carson, Marsh, Pelic, Soda Lake and Carson-Stillwater series. Soil texture classes range from fine clay to coarse sand. Slope is 0 to 2 percent. Seasonal high water tables are from the soil surface to greater than 1.5 m in depth. Soils are highly saline with a pH range from 7.2 - 10.0.

Field Condition Ranking - Field conditions were marginal due to impacts from cattle grazing.. Many of the herbaceous species present are ruderal, early seral species, indicative of site disturbance and association degradation. Ground cover disturbance ranges from 20 to greater than 40 percent in some locations. Fifty-four percent of the associations sampled had soil cover disturbance levels greater than 40 percent. Soil disturbance of this magnitude affects erosion potential and compaction of the soil surface, thus influencing plant association viability.

Elymus triticoides Plant Association
Alkali Wild Rye Association

Location: FIR, OUT
Water Depth: No Standing Water
Soil EC: 15.7 - 0.60 6.01 ± 3.30

Historical Reference - Marshall (1949).

This association is dominated by *Elymus triticoides* and is often found in pure stands under well watered conditions.

Current Distribution - The *Elymus triticoides* p.a. is a minor type found in slightly saline, palustrine systems. High water tables are apparent within the soil profile in late summer. Elevation ranges from 1190 to 1202 meters. The p.a. was found on the Fallon Reservation and in S-Line Reservoir.

Association Structure and Composition - *Elymus triticoides* dominates this association with 50 percent cover with *Juncus balticus* present as a codominant with 10 percent cover. Other graminaceous species are sparse and may include *Carex vulpinoides, Distichlis spicata, Hordeum jubatum* and *Muhlenbergia asperifolia* in minor to trace amounts. An herbaceous layer is usually lacking. although *Asclepias fascicularis, Asclepias speciosa, Aster Lanceolatus, Circium vulgare, Lactuca serriola, Polygonom argyrocoleon, Polygonum persicaria* and *Solidago occidentalis* are a few of the herbaceous species forbs that may occur in trace amounts.

Soils - The *Elymus triticoides* p.a. was found on silt or loam soils of the Dithod, Parran or Churchill-Playa soil types. The soils are very deep, well-drained and formed in sandy alluvium or sediment derived from mixed rock. Slope is 0 to 2 percent. Seasonal high water tables are 0.5 to greater than 1.5 m deep. Soils are slightly to moderately saline with a pH range from 7.2 - 8.3.

Field Condition Ranking - Overall the associations were in good condition. High density of individual plants with natural regeneration evident. Association appears viable and sustainable. Ground cover disturbance is less than 20 percent with evidence of light grazing within the plant canopy.

Juncus balticus-Distichlis spicata Plant Association
Wire Rush-Salt Grass Association

Location:	SWMA, CLAKE, CCLUB, FIR, OUT	
Water Depth:	0.05 - 0.00	0.01 ± 0.02
Soil EC:	32.0 - 0.60	6.46 ± 6.20

Historical Reference - The *Juncus balticus-Distichlis spicata* p.a. has not been described previously.

Current Distribution - The *Juncus balticus-Distichlis spicata* p.a. is a major type in Lahontan Valley and occurs at elevations ranging from 1188 to 1199 meters, predominantly in palustrine systems that are periodically desiccated. *Sarcobatus vermiculatus* associations may dominate the adjacent uplands. Soil conditions are moderately saline, higher than soils occupied by the *Juncus balticus* c.t and less than the *Distichlis spicata* p.a. This association may represent a transitional p.a. from *Juncus balticus* to a *Distichlis spicata* p.a. and may be primarily affected by an increase in salinity concentrations. Within the regional landscape, this p.a. was found on the Fallon Reservation, the historical Carson Lake area, Indian Lakes area, and Harmon Reservoir.

Association Structure and Composition - *Juncus balticus* and *Distichlis spicata* share dominant status in this association with each species having approximately 30 percent cover.
This association is characteristically monotypic, but other graminaceous species including *Eleocharis macrostachya, Scirpus pungens, Hordeum jubatum, Muhlenbergia asperifolia*, and *Puccinellia distans* may be present in trace amounts. A conspicuous shrub component is usually lacking, but the encroachment of shrubs can develop with site disturbance. Under disturbed conditions, shrub species such as *Tamarix ramosissima, Elaeagnus angustifolius, Allenrolfea occidentalis, Atriplex lentiformis, Chrysothamnus nauseosus* ssp. *consimilis* and *Sarcobatus vermiculatus* can be present in nominal to trace amounts. In addition, disturbed sites can often foster the encroachment of a variety of exotic and/or annual species. *Atriplex argentea, Bassia hyssopifolia, Chenopodium album, Heliotropium currassivicum, Kochia scoparia, Polygonum arenastrum, Polygonum argyrocoleon, Portulaca oleracea, Rumex crispus, Salsola tragus, Taraxacum officinale* and *Trifolium fragiferum* are just a few of the forbs that can occur.

Soils - The *Juncus balticus-Distichlis spicata* p.a. is primarily found on fine- to medium-textured sandy soils with small amounts of silt and loam. Soil types are highly variable and include Appian, Marsh, Pelic, Erber, Carson, Swope, Sagoupse and Lake Bottom soils. The soils are very deep, well-drained and formed in sandy alluvium or sediment derived from mixed rock. Slope is 0 to 2 percent. Seasonal high water tables are from the soil surface to greater than 1.5 meters in depth. Soils vary from normal to highly saline with a pH range from 6.6 - 8.8.

Field Condition Ranking - Field conditions were marginal due to impacts from cattle grazing.. Many of the herbaceous species present are ruderal, early seral species, indicative of site disturbance and association degradation. Ground cover disturbance ranges from 20 to greater than 40 percent in some locations. Fifty-four percent of the associations sampled had soil cover disturbance levels greater than 40 percent. Soil disturbance of this magnitude affects erosion potential and compaction of the soil surface, thus influencing plant association viability.

Muhlenbergia asperifolia Plant Association
Muhly Grass Association

Location: SNWR, OUT
Water Depth: No Standing Water
Soil EC: 8.00 - 1.00 4.75 ± 4.60

Historical References - The Muhly grass association is previously undescribed for the Lahonton Valley.

Current Distribution - This c.t was observed on both sandy, palustrine and lacustrine sites, typically along a drier hydrological band around the wetland edge. It constitutes a previously undescribed annual grass association that may be bordered by Distichlis spicata and Hordeum jubatum p.a.s.

Association Structure and Composition - *Muhlenbergia asperifolia* dominates this typically grass association with an average of 75 % canopy coverage. Other important grasses include *Distichlis spicata* (6 %), *Polypogon monspeliensis* (5 %), and *Hordeum jubatum* (2 %), which are the primary species included in the historically described, mixed meadow grass association. In wetter environments, a low graminaceous layer may be present with Juncus balticus and Scirpus pungens. Forbs can occur in trace amounts including *Asclepius fascicularis, Bassia hyssopifolia, Centauria exaltatum, Descurania pinnata, Lactuca serriola,* and *Polygonum argyrocoleon*; however, no tree, shrub, emergent, or aquatic component is evident.

Soils - The Muhly grass association was sampled on Badland soils which are described as gently to moderately sloping, saline sodic soils subject to high erosional loss. Surface texture was sandy and this soil is considered well-drained. Soil pH ranged from 7.6 - 8.2.

Field Condition Ranking - Excellent. Quality stands averaging 75 % coverage with good regeneration evident characterized this association. Both samples were undisturbed and contained a diversity of other grass associations. Very little encroachment by invader species was observed resulting in an overall rating of excellent.

Submergent and Aquatic Plant Associations

Bacopa eisenii Plant Association
Water-hyssop Association

Location:	CLAKE	
Water Depth:	0.15 - 0.10	0.12 ± 0.03
Soil EC:	2.90 - 2.70	2.77 ± 0.10

Historical Reference - Marshall (1949).

Marshall is the only author to mention this association. It is dominated by *Bacopa eisenii* (corrected from *Bacopa rotundifolia* due to elevation limits of < 100 m). It is most often found in palustrine meadow systems that are well saturated to the soil surface.

Current Distribution - The *Bacopa eisenii* p.a. is a freshwater aquatic association typically associated with natural palustrine systems with perennial hydrologic regimes. Elevation ranges from 1190 to 1197 meters. Adjacent, emergent associations most often include those belonging to the *Typha domingensis, Scirpus acutus* and *Eleocharis macrostachya* p.a. The *Bacopa eisenii* p.a. was located adjacent to a small, artesian lake south of Leter Reservoir.

Association Structure and Composition - The dominant vegetation in this p.a. is comprised of native, annual species. *Bacopa eisenii* typically dominates the association on shallow, slow moving, water surfaces though cover needs only be 10 percent. *Lemna minor, Marsilea vestita* and *Potamogeton pectinatus* are frequently present in trace amounts.

Soils - The *Bacopa eisenii* p.a. is found on Appian and Tipperary soils under saturated conditions. These soils are very deep, but poorly drained due to hydrologic conditions. They are formed in sandy alluvium over lacustrine sand derived from mixed rock. Slope is 0 to 2 percent. The seasonal high water table is from the soil surface to 1 meter in depth. The soils are categorized as normal, indicative of freshwater habitats, with a pH range from 8 - 8.4.

Field Condition Ranking - Overall the association conditions were good. High density of individual plants with natural regeneration evident. Association appears viable and sustainable. Ground cover disturbance is less than 20 percent with evidence of light grazing within the plant canopy.

Lemna minor Plant Association
Duckweed Association

Location:	CLAKE, OUT	
Water Depth:	0.25 - 0.25	0.25 ± 0.00
Soil EC:	7.00 - 1.40	3.11 ± 3.20

Historical Reference - The *Lemna minor* p.a. has not been described previously.

Current Distribution - The *Lemna minor* p.a. is an incidental type found primarily within the waters of the Carson River. It is a freshwater aquatic association found in relatively deep, slow moving water that is greater than 1 meter deep. Adjacent, emergent associations included those belonging to the *Typha latifolia* and *Scirpus acutus* p.a. Scattered distributions of this type have been noted in canals within the Lahontan Valley, but distribution among natural systems is limited strictly to the Carson River.

Association Structure and Composition - *Lemna minor* was found to dominate the surface water along the Carson River with 70 percent cover. It was primarily monotypic with *Sagittaria cuneata* present in trace amounts.

Soils - Subsurface soils were comprised of fine-grained, alluvium soils of the East Fork series. These are inundated, very deep, somewhat poorly drained soils formed in loamy alluvium derived from mixed rock. Slope is 0 to 2 percent. The seasonal high water table is from the soil surface to 1 meter in depth. The soils are normal, indicative of freshwater habitats, with a pH of 5.8.

Field Condition Ranking - Overall good association condition with high densities of individuals. The association occupies water surfaces that are subject to intermittent changes in water and turbidity levels.

Potamogeton filiformis ssp. latifolia Plant Association
Nevada Pondweed Association

Location:	SNWR, SWMA, OUT	
Water Depth:	1.00 - 0.10	0.44 ± 0.22
Soil EC:	26.0 - 1.20	6.71 ± 7.10

Historical References - The *Potamogeton filiformis* association is previously undescribed for the Lahonton Valley.

Current Distribution - The Nevada pondweed association could be found in nearly any deepwater habitat throughout the Lahonton Valley. The majority of sites occurred in the Goose lake and Nutgrass units of the Stillwater National Wildlife Refuge, but it was also observed in several ditch systems throughout the valley. Water depths for this plant association range from 10 cm to 100 cm.

Association Structure and Composition - The *Potamogeton filiformis* ssp. *latifolia* association formed monotypic stands with no other species documented. Average cover was 60 %. This species can easily be confused with *Potamogeton pectinatus*.

Soils - This association can be distributed on any soil type which retains permanent water throughout the year. It was generally sampled on the Lake bottom soil which is a generic series that encompasses all permanently flooded bodies of water. Soils were described as saline-saline/sodic and had a pH range from 7.6 - 8.7.

Field Condition Ranking - Good. As stated, this association formed monotypic stands with no other species documented. It lacked diversity, but the quality, coverage of the stands (60 %), and lack of disturbance result in an overall ranking of good.

Potamogeton pectinatus Plant Association
Sago Pondweed Association

Location:	SNWR, SWMA, FNWR, CLAKE, OUT
Water Depth:	0.60 - 0.15 0.42 ± 0.24
Soil EC:	13.0 - 3.30 9.67 ± 4.60

Historical References - USFWS (1952), Macklin et al. (1960), Osugi (1973, 1974), Osugi and Barber (1976), Gerdes (1986).

This association is dominated by *Potamogeton pectinatus* and is found in shallow ponds with a silt substrate in water less than 1 m deep. The water quality can be fresh water to moderately saline, but clear with little turbidity. This species can be found alone or in association with *Lemna minor* and *Potamogeton latifolius*.

Current Distribution - The *Potamogeton pectinatus* p.a. is an aquatic association typically associated with shallow lakes within the Lahontan Valley. The associations sampled occurred in clear, shallow water 0.5 meters deep. Water quality varied from freshwater to slightly saline. Elevation ranged from 1188 to 1190 meters. Adjacent emergent associations include those dominated by *Scirpus maritimus, Scirpus acutus* and *Typha domingensis*. This p.a. was located in Stillwater Point Reservoir, and in a small artesian lake south of Leter Reservoir.

Association Structure and Composition - *Potamogeton pectinatus* typically dominates this submergent association with 30 percent cover. This p.a. can be comprised strictly of *Potamogeton pectinatus* or with *Potamogeton latifolius, Potamogeton nodosus* and *Ranunculus aquatilus* in minor or trace amounts.

Soils - The *Potamogeton pectinatus* p.a. is found on fine-grain, alluvium sediments of Lake Bottom and Tipperary series. The soils are nearly level, very deep and poorly drained. Slope is 0 to 2 percent. The seasonal high water table is 0 to 1 meter in depth. The soils are normal to borderline saline, indicative of freshwater to recycled water hydrologic source, and have a pH range from 6.9 - 8.0.

Field Condition Ranking - Overall the association conditions were good. High density of individual plants with natural regeneration evident. Association appears viable and sustainable. Where the associations are exposed at the edge of shallow lakes, ground cover disturbance is less than 20 percent.

Ruppia maritima Plant Association
Widgeon Grass Association

Location:	SNWR, CLAKE, OUT	
Water Depth:	2.00 - 0.10	0.64 ± 0.67
Soil EC:	26.0 - 5.20	13.51 ± 6.20

Historical References - Marshall 1949, USFWS 1952, Osugi 1973,1974, USFWS 1968, Osugi 1973, Gerdes 1987.

This association historically inhabitated relatively saline, shallow lakes and ponds. It could form monotypic stands but was often encountered with *Potamogeton pectinatus*, *Potamogeton filiformis*, and *Chara* sp. in lesser amounts.

Current Distribution - The widgeon grass association can be found in saline waters ranging from very deep (2 m at Big Soda Lake) to shallowly flooded (10 cm at Carson Lake/Big Water Unit).

Association Structure and Composition - The *Ruppia maritima* plant association was sampled exclusively in monotypic stands averaging 73 % canopy coverage.

Soils - Soils were typically Lake Bottom or Marsh; however, this association was sampled on playa soils at the northern end of the valley. These soil types are comprised of fine sediments (usually clay), are flat, and internal drainage is quite poor. Electrical conductivity is high (averaging 13.5 mmhos/cm^{-1}) classifying most soils as saline-sodic. Soil pH is alkaline ranging from 8.9 - 9.5.

Field Condition Ranking - Fair-Good. Most stands were extensive, averaging 73 % canopy coverage. Unfortunately, many of the sites had been disturbed and lacked diversity which results in an overall ranking of fair-good.

Zannichellia palustris Plant Association
Horned Pondweed Association

Location:	SNWR, SWMA, CLAKE, OUT	
Water Depth:	1.00 - 0.05	0.32 ± 0.40
Soil EC:	10.0 - 1.60	5.12 ± 3.20

Historical References - Marshall (1949), Giles (1953), Macklin et al. (1960), USFWS (1968).

This association is dominated by *Zannichellia palustris* and is most abundant in clear, shallow lakes or ponds in water less than two feet deep. The lake or pond substrate is primarily silt with a high mineral content. Water quality can range from relatively freshwater to brackish. Can be found alone or in association with *Potamogeton pectinatus*.

Current Distribution - The *Zannichellia palustris* p.a. is an aquatic association typically associated with shallow lake systems within the Lahontan Valley. The association occurs in clear, shallow water 0.25 to 0.50 meters deep. Water quality varied from freshwater to slightly saline. Elevation ranges from 1190 to 1202 meters. *Scirpus maritimus* and *Scirpus acutus* dominate adjacent emergent associations. This p.a. was located in S-Line Reservoir.

Association Structure and Composition - *Zannichellia palustris* dominates this aquatic association with an average cover of 30 percent. *Potamogeton pectinatus* occurs as a codominant with cover rarely exceeding 10 percent. *Callitriche hermaphroditica* may be present in minor or trace amounts.

Soils - Submergent soils are comprised of fine-grain, clay alluvium of the Marsh, Lakebottom, and Churchill-Playa series. The soils are inundated, very deep, poorly drained and formed in alluvium derived from mixed rock. Slopes are 0 to 2 percent. The seasonal high water table is from the soil surface to 1 meters in depth. The soils are normal to saline, indicative of freshwater and recycled water hydrologic sources and have a pH range from 7.2 - 7.5.

Field Condition Ranking - Overall the association conditions were good. High density of individual plants with natural regeneration evident. Associations appeared viable and sustainable.

Disturbed Herbaceous or Exotic Associations

Bassia hyssopifolia Plant Association
Alkali Weed Association

Location:	SNWR, SWMA, FNWR, CLAKE, OUT	
Water Depth:	0.20 - 0.00	0.01 ± 0.05
Soil EC:	78.0 - 0.50	13.50 ± 14.10

Historical References - USFWS (1952), Macklin et al. (1960).

This association is dominated by *Bassia hyssopifolia* and occupies areas that are subject to infrequent flooding and run-off. This association has been found in a association with *Eleocharis macrostachya* in low-lying areas adjacent to high water mark of salt marshes and playa lakes that flood in winter, but dry out by late spring or early summer. This association is relatively salt-tolerant. Common plants found in conjunction with this association include sea purslane (*Sesuvium* sp.), heliotrope (*Heliotropium currassivicum*) and alkali mallow (*Malvella leprosa*).

Current Distribution - The *Bassia hyssopifolia* p.a. is a common, annual association typically associated with the high water mark of salt marshes and playa lakes that are periodically desiccated. Local environments vary from moist to dry soils with high saline concentrations. Elevation ranges from 1190 to 1220 meters. Within Lahontan Valley, this p.a. primarily occurs in the historical Carson Lake area.

Association Structure and Composition - *Bassia hyssopifolia* dominates an open, monotypic association with a wide range of cover classes from 5 to 30 percent. On playa lake beds, there is often wide spaces of exposed soil between the plants. Graminoid species when present are often sparse and can include *Scirpus maritimus* and *Distichlis spicata*.

Soils - The *Bassia hyssopifolia* p.a. was found on Marsh, Lakebottom, and Lahontan soils. The soils are very deep, poorly drained and comprised of fine-grained, clay alluvium derived from mixed rock. Slopes are 0 to 2 percent. Seasonal high water tables fluctuate from 0 to 1.5 meters in depth. The soils are highly saline with a pH range from 7.5 - 9.6.

Field Condition Ranking - Overall good ranking. Good numbers of individuals of the dominant species, and natural regeneration is evident. Annual association is susceptible to fluctuations in water levels.

Tamarix ramosissima Plant Association
Saltcedar Association

Location:	SNWR, SWMA, OUT	
Water Depth:	1.50 - 0.00	0.24 ± 0.37
Soil EC:	61.0 - 0.20	8.40 ± 12.10

Historical Reference - The *Tamarix ramosissima* p.a. has not been described previously.

Current Distribution - The *Tamarix ramosissima* p.a. occupies areas that are subject to infrequent flooding and run-off. It most commonly forms a prominent zone in low-lying areas adjacent to high water mark of lakes that flood in winter, but dry out by late spring or early summer. The *T. ramosissima* p.a. was found at elevations ranging from 1188 to 1220 meters. Within the Lahontan Valley, this p.a. was found adjacent to Stillwater Point Reservoir, Papoose Lake (Indian Lakes area) and small, natural, ephemeral lakes scattered throughout the valley.

Association Structure and Composition - The dominant vegetation in this p.a. is comprised of introduced, exotic species. *Tamarix ramosissima* dominates a typically open shrub overstory with cover classes ranging from 10 to 20 percent. It may occur in monotypic stands at the edge of shallow lakes, or with a sparse understory comprised of a variety of species including *Allenrolfea occidentalis*, *Atriplex lentiformis*, *Chrysothamnus nauseosous* ssp. *consimilis*, *Bassia hyssopifolia*, *Heliotropium currassivicum*, and *Salsola tragus*. However, in palustrine systems experiencing successional change, the understory may be comprised of species such as *Eleocharis macrostachya*, *Scirpus pungens* and *Juncus balticus* in trace amounts.

Soils - This p.a. is found on a variety of soils common to shallow lakes including Lake Bottom, Badland, Playa and Marsh soil series. These soils occur in nearly level basins of intermittent lakes or in very large bands on gently rolling shorelines of ancient Lake Lahontan. They primarily consist of strongly saline and alkali affected sediment that ranges from a fine sand to clay. Natural drainage is very poor and internal drainage is very slow. Slope is 0 to 2 percent. Seasonal high water tables fluctuate from the soil surface to greater than 1.5 meters in depth. Soils are saline-sodic with a pH range from 7.5 - 9.4.

Field Condition Ranking - Poor. Saltcedar was introduced from Eurasia and planted as an ornamental in shelterbelts or windbreaks within Lahontan Valley. It has become naturalized along streams, canals and reservoirs and is a strong competitor with native vegetation. It is listed as a "weed of the West" by the Western Society of Weed Science with the Western United States Land Grant Universities Cooperative Extension Service (1992).

***Trifolium fragiferum* Plant Association**
Strawberry Clover Association

Location: SWMA, CLAKE, FIR, OUT
Water Depth: No Standing Water
Soil EC: 8.00 - 0.80 1.86 ± 1.60

Historical Reference - The *Trifolium fragiferum* p.a. has not been described previously.

Current Distribution - The *Trifolium fragiferum* p.a. is found in moderate to highly disturbed palustrine systems that are periodically desiccated. High water tables may be apparent within the soil profile in late summer. Elevation ranges from 1184 to 1192 meters. The p.a. was primarily found in the historical Carson Lake area and on Paiute Reservation lands.

Association Structure and Composition - *Trifolium fragiferum* dominates this association with 30 percent cover. Codominant status is shared among *Juncus balticus, Distichlis spicata, Hordeum jubatum* and *Rumex crispus* with 5 to 10 percent cover. A conspicuous shrub component is usually lacking, but the encroachment of shrubs may develop with site disturbance. Under disturbed conditions, shrub species such as *Tamarix ramosissima, Allenrolfea occidentalis, Chrysothamnus nauseosus* ssp. *consimilis* and *Sarcobatus vermiculatus* can be present in nominal to trace amounts. In addition, disturbed sites can often foster the encroachment of a variety of exotic and annual species including *Acroptilon repens, Carderia pubescens, Chenopodium album, Cirsium vulgare, Convolvulus arvensis, Conyza canadensis, Descurainia pinnata, Erodium cicutarium, Lactuca serriola, Lepidium perfoliatum, Lotus tenius, Plantago lanceolata, Plantago major, Polygonum arenastrum, Polygonum argyrocoleon, Salsola tragus,*and *Taraxacum officinale*. Other graminoid species are rare, but may include *Echinochloa crus-gali, Leptichloa fascicularis, Muhlenbergia asperifolia, Paspalum distichum, Poa praetensis* or *Puccinellia nuttalliana* in trace amounts.

Soils - The *Trifolium fragiferum* p.a. was found on Lahontan, Erber, Appian, Pelic and Dia soils. These soils are very deep, poorly drained and formed in fine-grained alluvium derived from mixed rock. Soil texture varied from fine clay to fine sand. Slope is 0 to 2 percent. Seasonal high water tables fluctuate from the soil surface to greater than 1.5 meters in depth. The soils are normal, with a pH range from 7.2 - 8.0.

Field Condition Ranking - Field conditions poor due to impacts from cattle grazing. Many of the herbaceous species present are ruderal, early seral species, indicative of site disturbance and association degradation. Ground cover disturbance ranges from 20 to greater than 40 percent in some locations. Sixty percent of the associations sampled had soil cover disturbance levels greater than 40 percent. Soil disturbance of this magnitude affects erosion potential and compaction of the soil surface, thus influencing plant association viability.

Various Herbaceous Annual Plant Associations

This association is a incorporates three exotic herbaceous, annual plant associations including:

Chenopodium glaucum Plant association	Goosefoot Association
Kochia scoparia Plant association	Kochia Association
Lactuca serriola Plant association	Prickly Lettuce Association

Location: SNWR, OUT
Water Depth: No Standing Water
Soil EC: 18.0 - 1.10 5.00 ± 5.90

Historical References - These Plant associations have not been previously described.

Current Distribution - The herbaceous annual associations were generally found along the banks of irrigation ditches and bare saturated soils following wetland drawdown. These plant associations can be present on any of the defined management areas, but were documented only on the Stillwater National Wildlife Refuge and various drains, ditches, and irrigation reservoirs (Old River Reservoir) located throughout the valley.

Association Structure and Composition - This associations is characterized by a high diversity of annual plants and exotics with little canopy coverage by any one species. It can contain components from any life form category but is typically comprised of herbaceous annual forbs. The only three species which are present in significant cover and constancy are *Chenopodium glaucum*, *Kochia scoparia*, and *Lactuca serriola*. However, *Eleocharis parishii* was documented at 2 % caverage among 56 % of the listed samples.

Soils - Soils were highly variable as most of the association occurrences were on irrigation ditches. The only consistancy was that all samples were collected along the saturated edge (mud flat) of the ditches and wetlands were it was found. Most soils were saline - saline/sodic with ec ranges 1.1 to 18.0 mmhos/cm^{-1}. Soil pH ranged from 7.1 - 8.9.

Field Condition Ranking - Poor to Fair. Most species in this association were herbaceous annuals or exotics that are typically found at heavily disturbed sites. Although diversity was high, average cover was generally low. Regeneration was evident, but generally of poor quality species resulting in an overall ranking of poor-fair.

References Cited

Bailey, V. 1898. Physiography, Nevada: Carson Lake Valley (Wadsworth, Ragtown and Stillwater). Handwritten notes. Smithsonian Institution Archives, Record Unit 7176, U.S. Fish and Wildlife Service, 1860-1961, Field Reports, Box 69, Folder 14, Washington, D.C. 3 pp.

Barber, M.J. 1977. Stillwater Management Area: Report of wildlife management study; monitoring program of wildlife habitat and associated use in the Truckee-Carson Irrigation District, Nevada. Progress Report Number 5 (1976). U.S. Department of Interior, Fish and Wildlife Service, Falllon, NV. 31 pp.

Billings, W.D. 1945. The plant associations of the Carson Desert Region, western Nevada. Butler University Botanical Studies 7:89-123

DeQuille, D. (W. Wright). 1963. Washoe Rambles. Westernlore Press, Los Angeles. CA.

Donohue, B.L. 1993. Preliminary descriptions of wetland plant associations of Lahontan Valley, western Nevada. U.S. Fish and Wildlife Service, Stillwater National Wildlife Refuge, Fallon, NV.

Fremont, J.C. 1845. In: Spence M.L. and D. Jackson (eds) The Expeditions of John Charles Fremont, Volume 2, Supplement, proceedings of the court-martial. 1973. University of Illinois Press, Urbanna, IL.

Gerdes, G.L. 1986. Carson Lake, submerged aquatic plant survey, Fallon, Nevada. U.S. Fish and Wildlife Service, unpublished report on file at Stillwater National Wildlife Refuge, Fallon, NV. 13 pp.

Giles, L.W. 1953. Loss of cattail and bulrush in the Stillwater Marsh outside the Nutgrass unit. Special report, U.S. Department of the Interior, Fish and Wildlife Service, Fallon, NV. 7 pp.

Macklin, R., E.D. Stetson, and H.R. Leach. 1960. Wildlife and fishery use made of drainage waters in Nevada. Unpublished paper, on file at Stillwater National Wildlife Refuge, Fallon, NV. 5 pp. + 2 tables.

Marshall, D.B. 1949. Stillwater Wildlife Management Area, Churchill County, Nevada: A biological investigation of the Stillwater Wildlife Management Area, June 7, 1949 to September 16, 1949. U.S. Department of the Interior, Fish and Wildlife Service, Fallon, NV. 50 pp. + maps.

_____. 1952. Habitat types of the Stillwater Marsh and their value to nesting ducks with reference to future management. U.S. Department of Interior, Fish and Wildlife Service, Fallon, NV.

Osugi, P.a. 1973. Stillwater Wildlife Management Area: Report of wildlife management study; Monitoring program of wildlife habitat and associated use in the Truckee-Carson Irrigation District, Nevada. Progress Report No. 1 (1972). U.S. Department of Interior, Fish and Wildlife Service, Fallon, NV. 45 pp. + 6 maps.

_____. 1974. Stillwater Wildlife Management Area: Report of wildlife management study; Monitoring program of wildlife habitat and associated use in the Truckee-Carson Irrigation District, Nevada. Progress Report No. 2 (1973). U.S. Department of Interior, Fish and Wildlife Service, Fallon, NV. 49 pp. + 6 maps.

Osugi, C.T., and M.J. Barbar. 1976. Stillwater Wildlife Management Area: Report of wildlife management study; Monitoring program of wildlife habitat and associated use in the Truckee-Carson Irrigation District, Nevada. Progress Report No. 3 (1974). U.S. Department of Interior, Fish and Wildlife Service, Fallon, NV. 29 pp.

Simpson, J.H. 1876. Report of explorations across the Great Basin of the Territory of Utah for a direct wagon-route from Camp Floyd to Genoa, in Carson Valley, 1859. U.S. Army, Engineer Department, Washington, D.C. Reprinted by the University of Nevada Press, Reno NV, 1983.

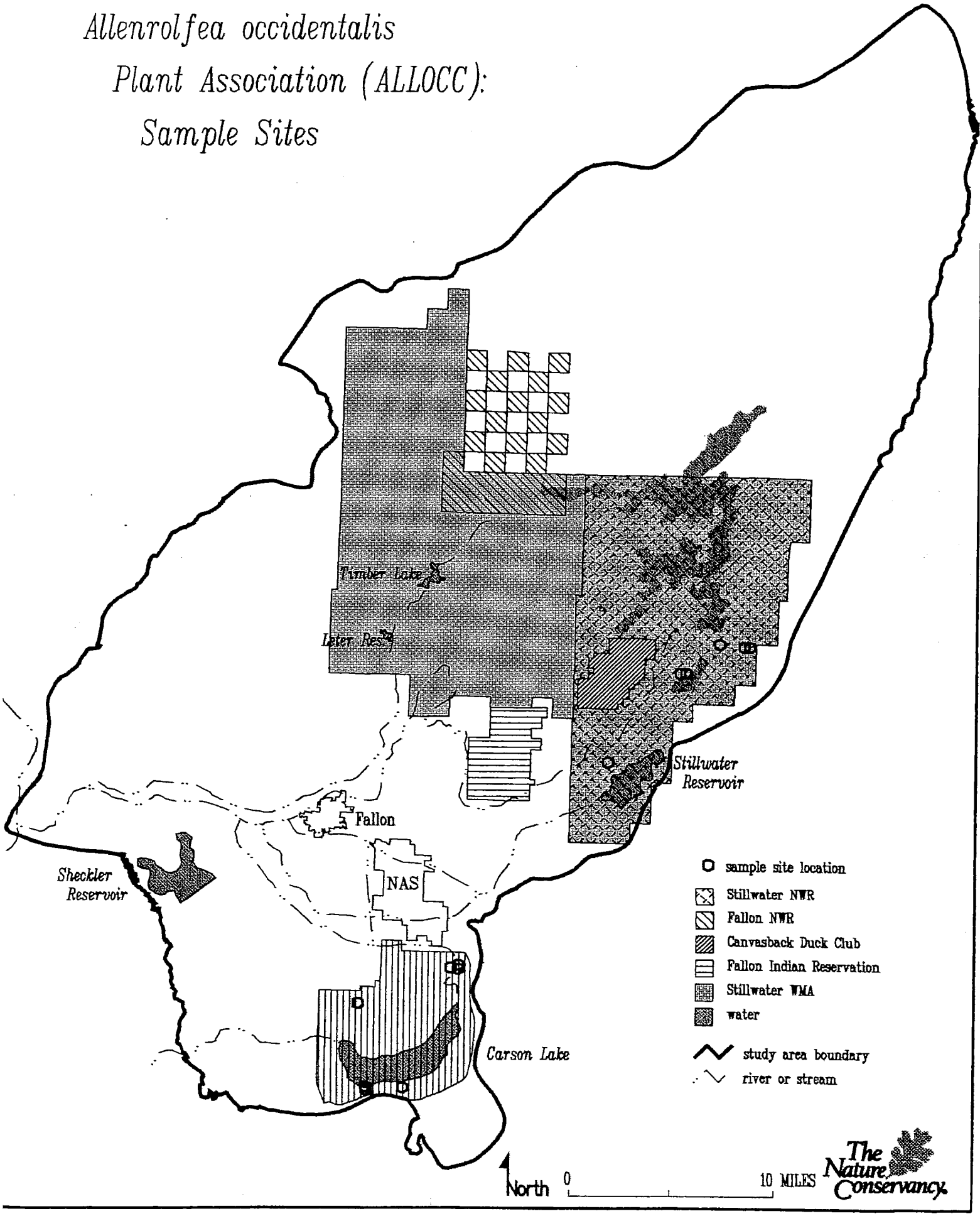
Soil Conservation Service. 1975. Soil Survey Fallon-Fernley Area, Nevada. Parts of Churchill, Lyon, Storrey and Washoe Counties. U.S. Department of Agriculture and U.S. Department of Interior.

Sperry, C.C. 1929. Report on Carson Sink (Churchill Co,.) Nevada: Its duck food resources and value as a federal migratory bird refuge site. Unpublished report, Smithsonian Institute Archives, Washington, D.C. 3 pp. + maps.

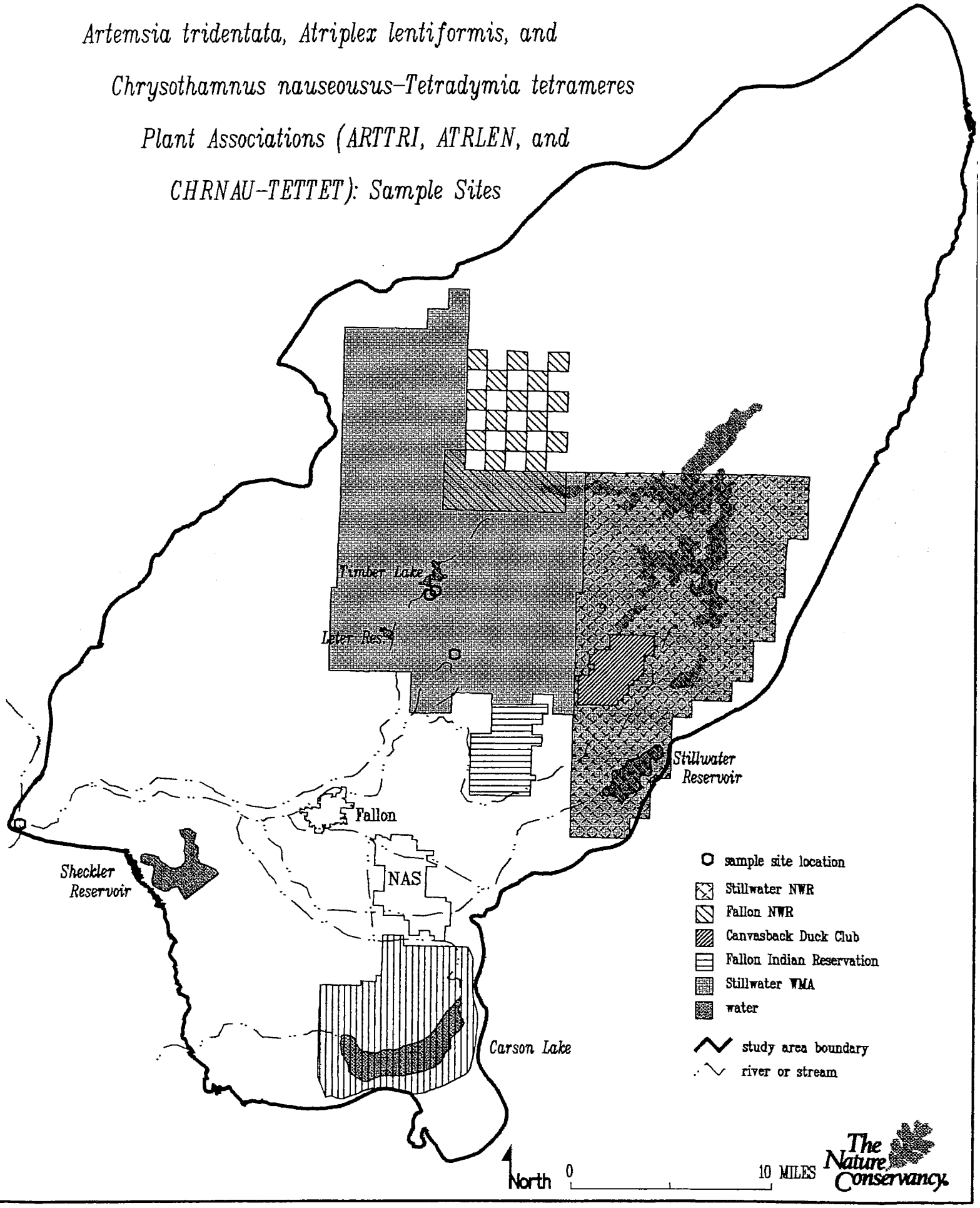
U.S. Fish and Wildlife Service. 1952. Narrative report: Stillwater Wildlife Management Area, January-April, 1952. Unpublished report, on file at Stillwater National Wildlife Refuge, Fallon, NV.

_____. 1968. Stillwater Management Area, Anaho Island NWR, Fallon NWR: refuge narrative report, 1968. Unpublished report, on file at Stillwater National Wildlife Refuge, Fallon, NV.

Allenrolfea occidentalis Plant Association (ALLOCC): Sample Sites



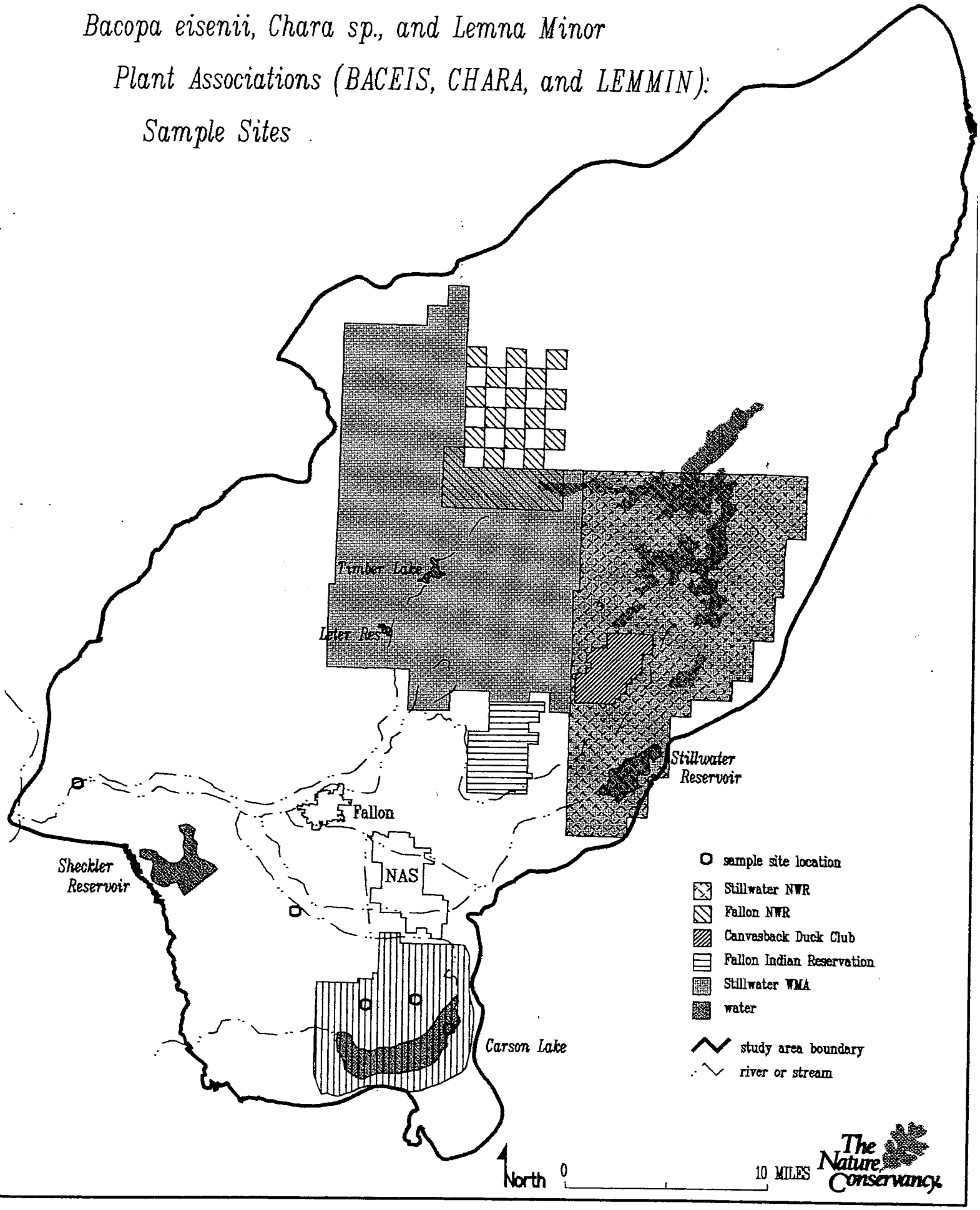
Artemsia tridentata, Atriplex lentiformis, and Chrysothamnus nauseousus–Tetradymia tetrameres Plant Associations (ARTTRI, ATRLEN, and CHRNAU–TETTET): Sample Sites



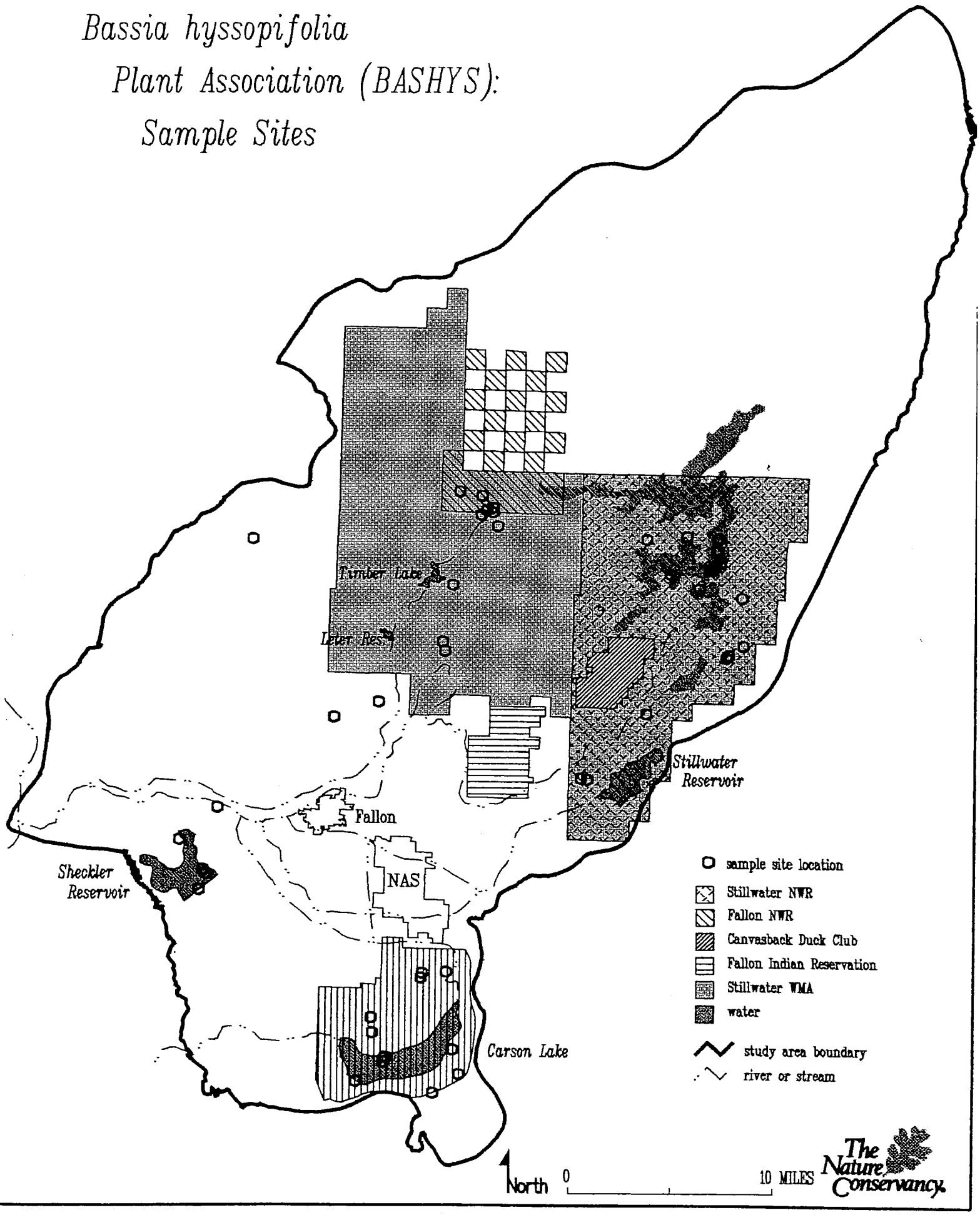
Bacopa eisenii, Chara sp., and Lemna Minor

Plant Associations (BACEIS, CHARA, and LEMMIN):

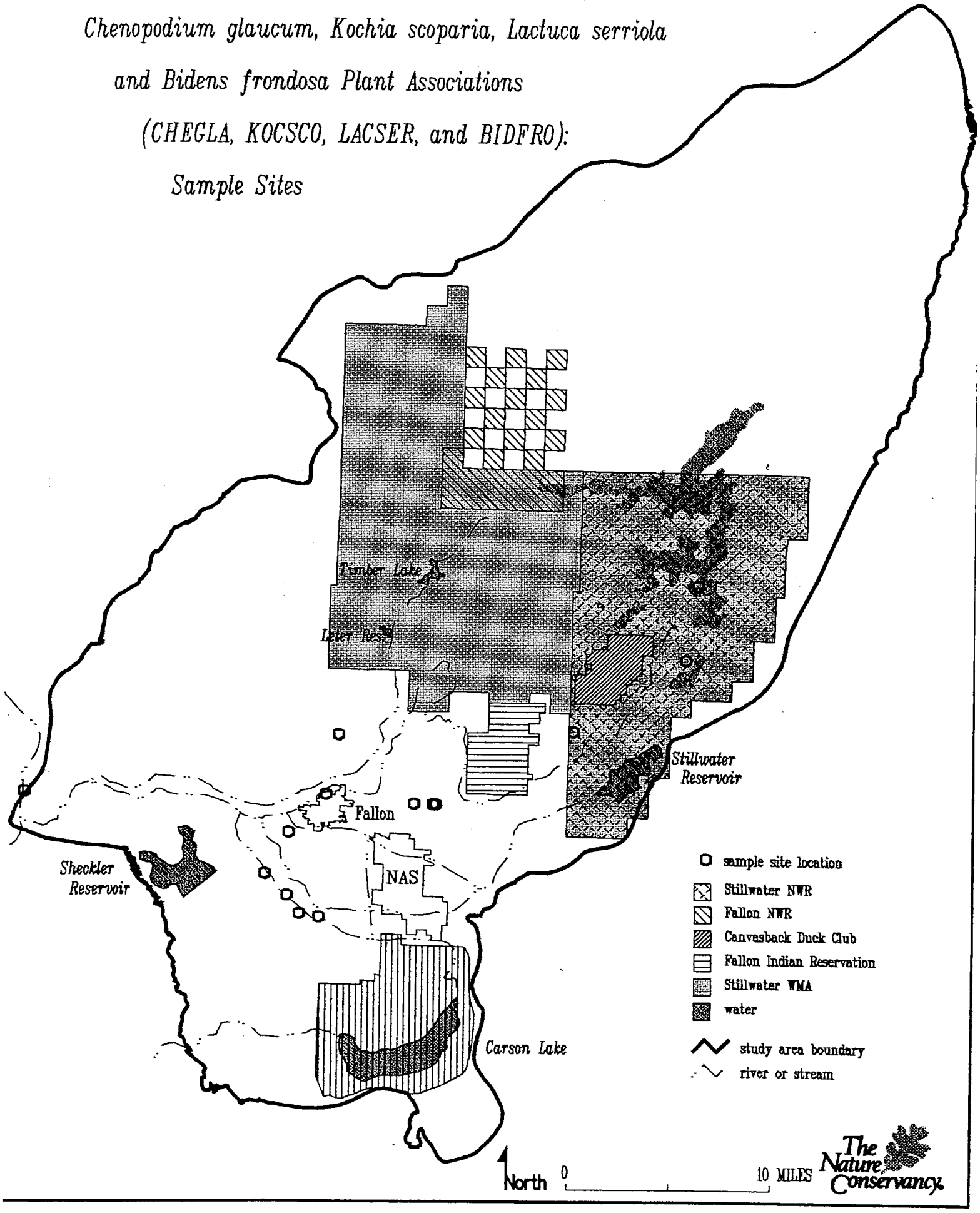
Sample Sites



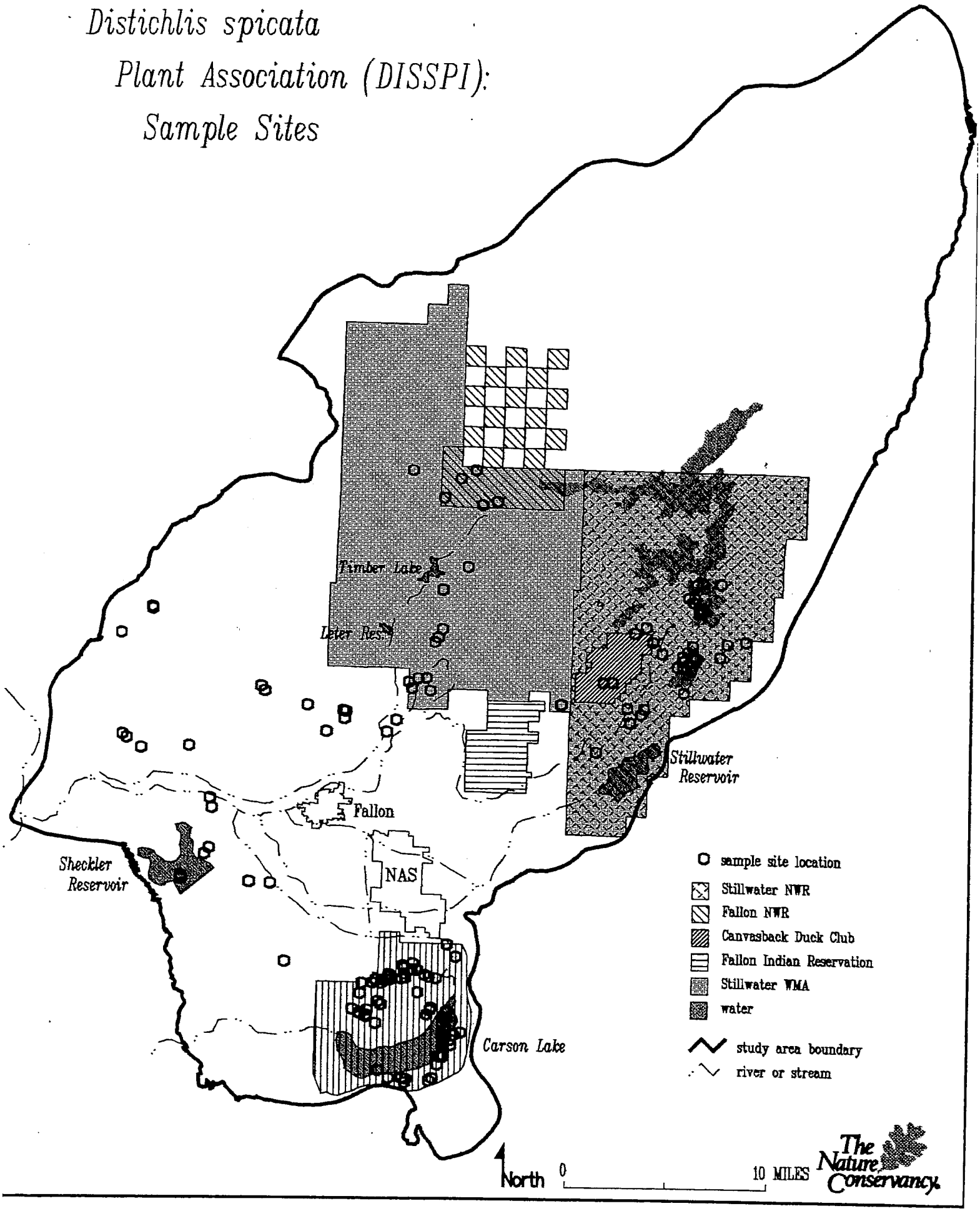
Bassia hyssopifolia Plant Association (BASHYS): Sample Sites



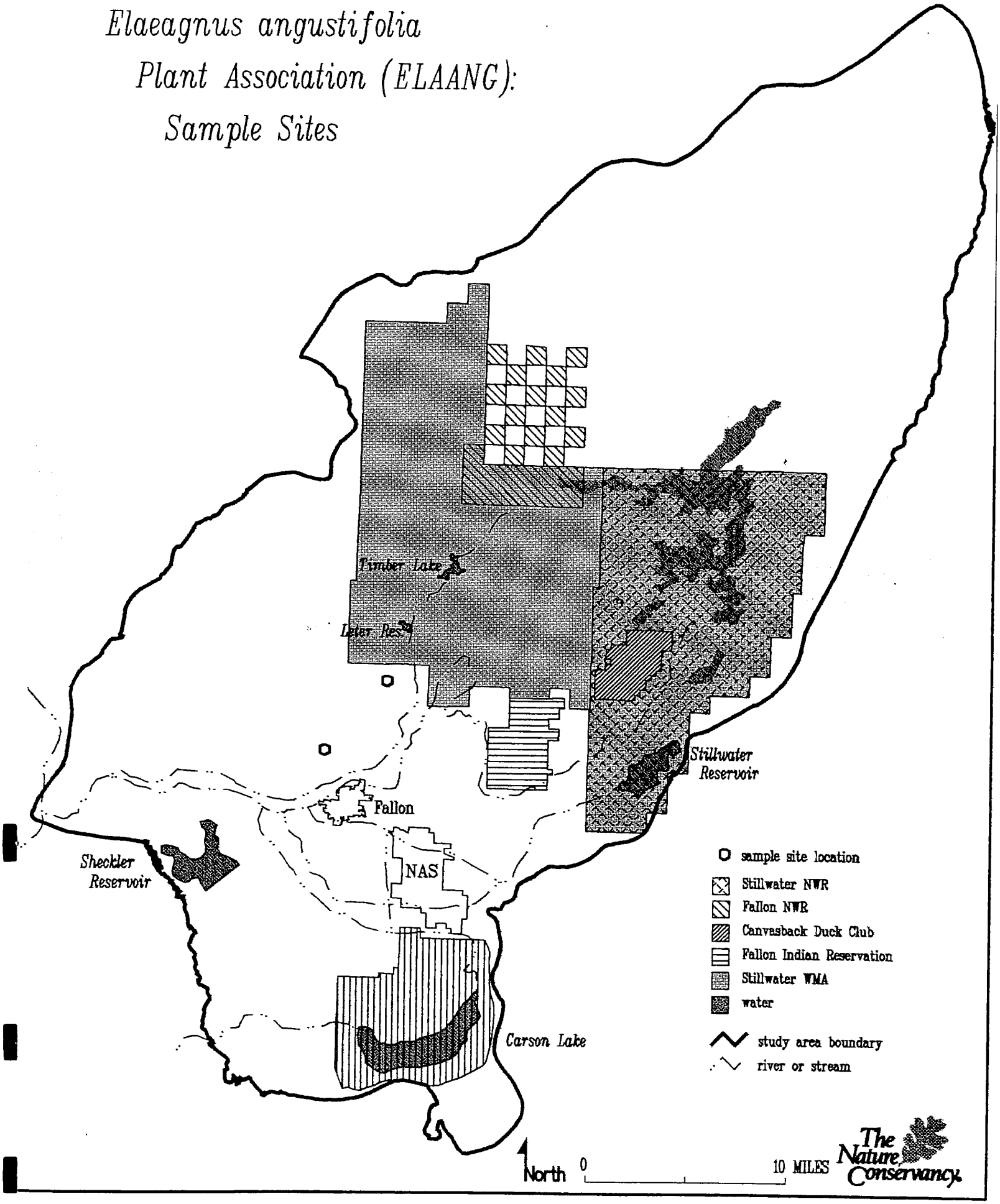
Chenopodium glaucum, Kochia scoparia, Lactuca serriola and Bidens frondosa Plant Associations (CHEGLA, KOCSCO, LACSER, and BIDFRO): Sample Sites



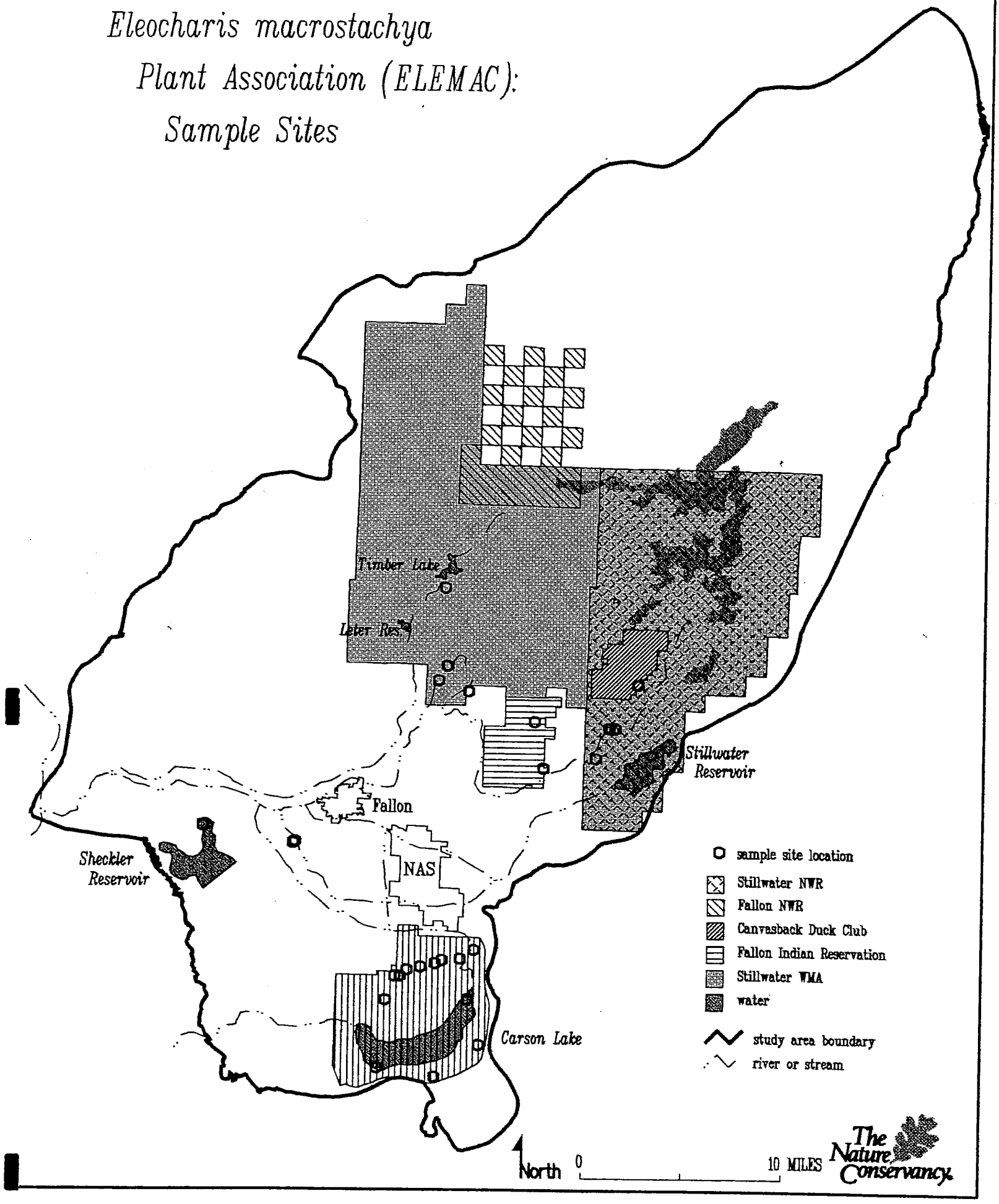
Distichlis spicata Plant Association (DISSPI): Sample Sites



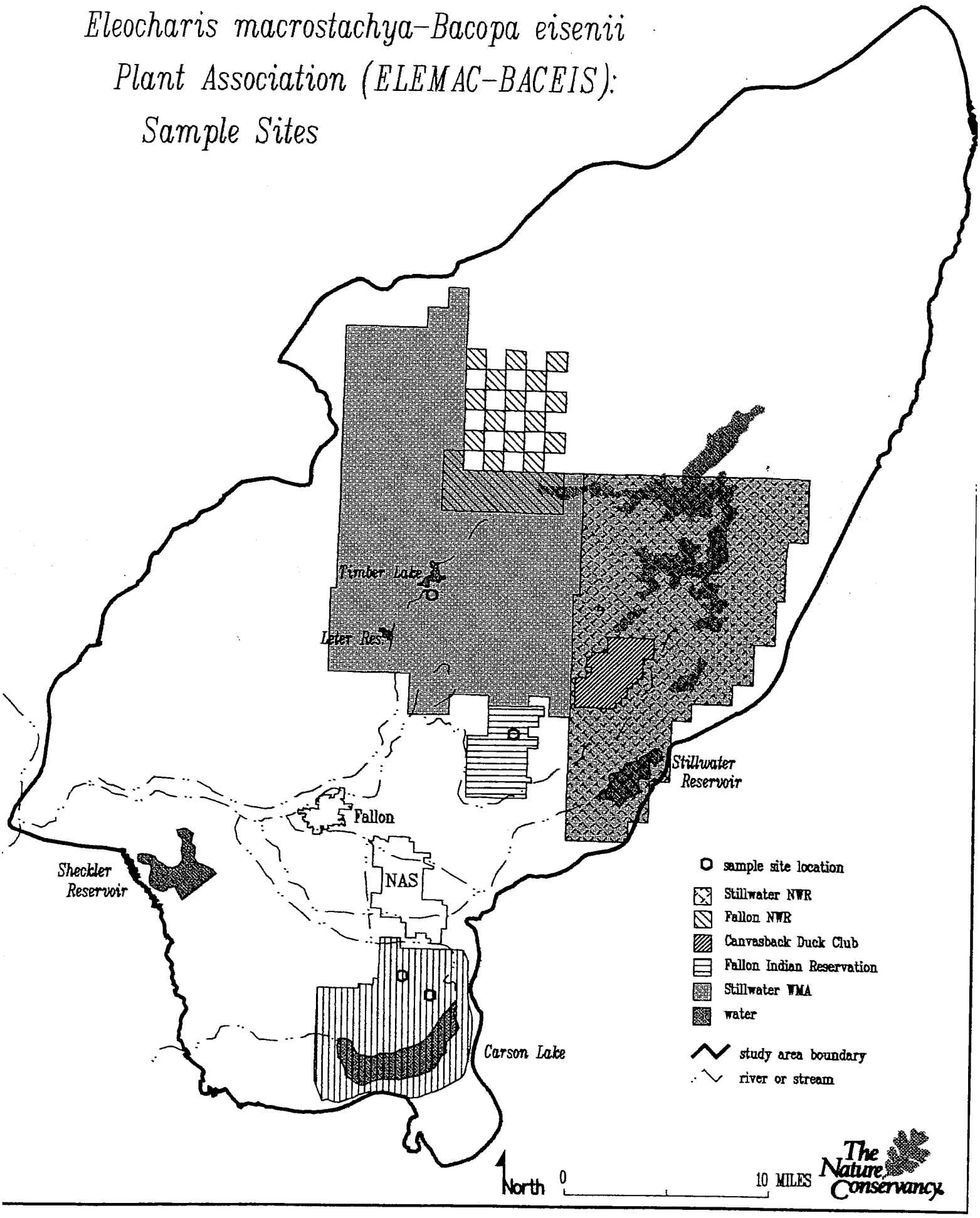
Elaeagnus angustifolia Plant Association (ELAANG): Sample Sites



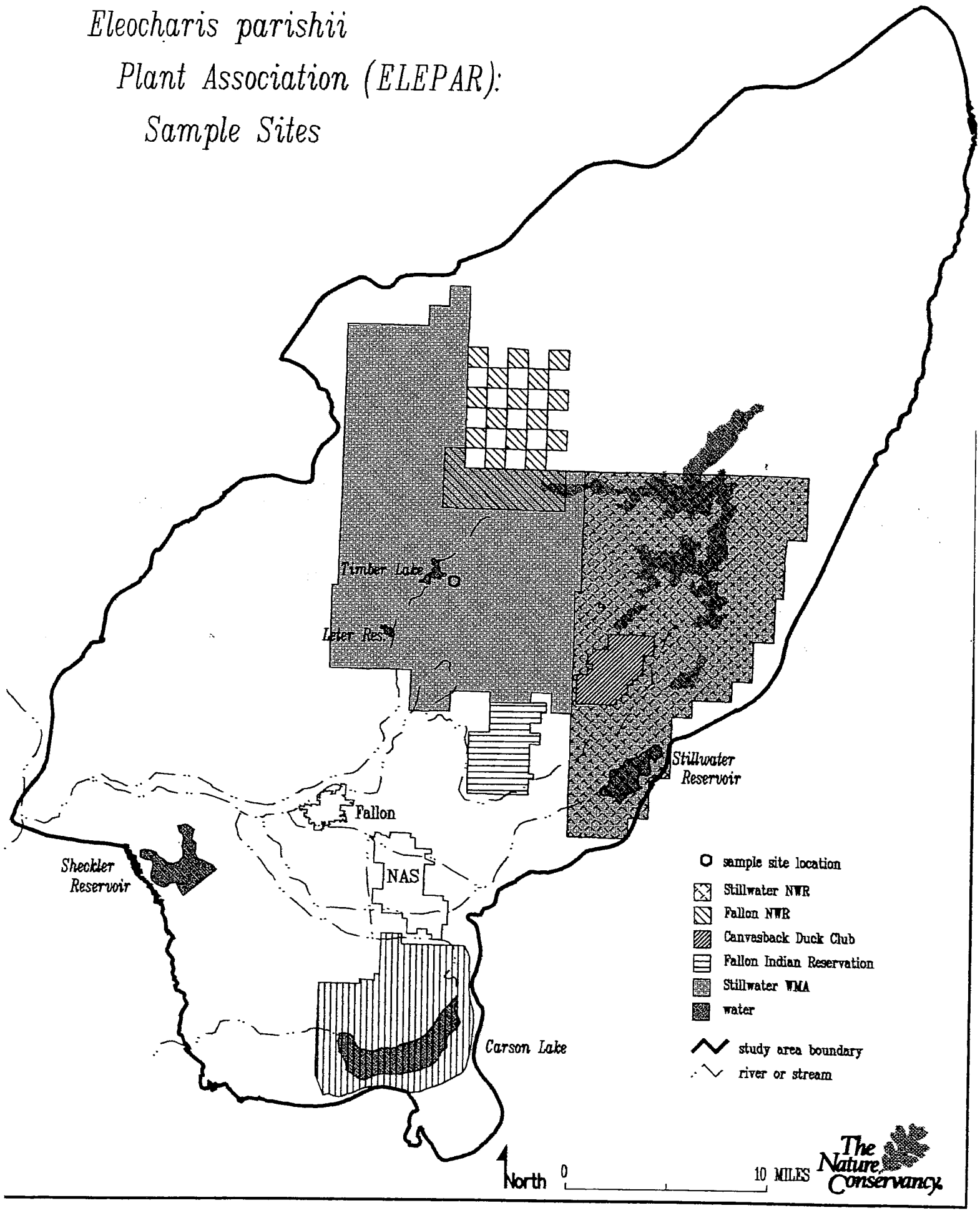
Eleocharis macrostachya Plant Association (ELEMAC): Sample Sites



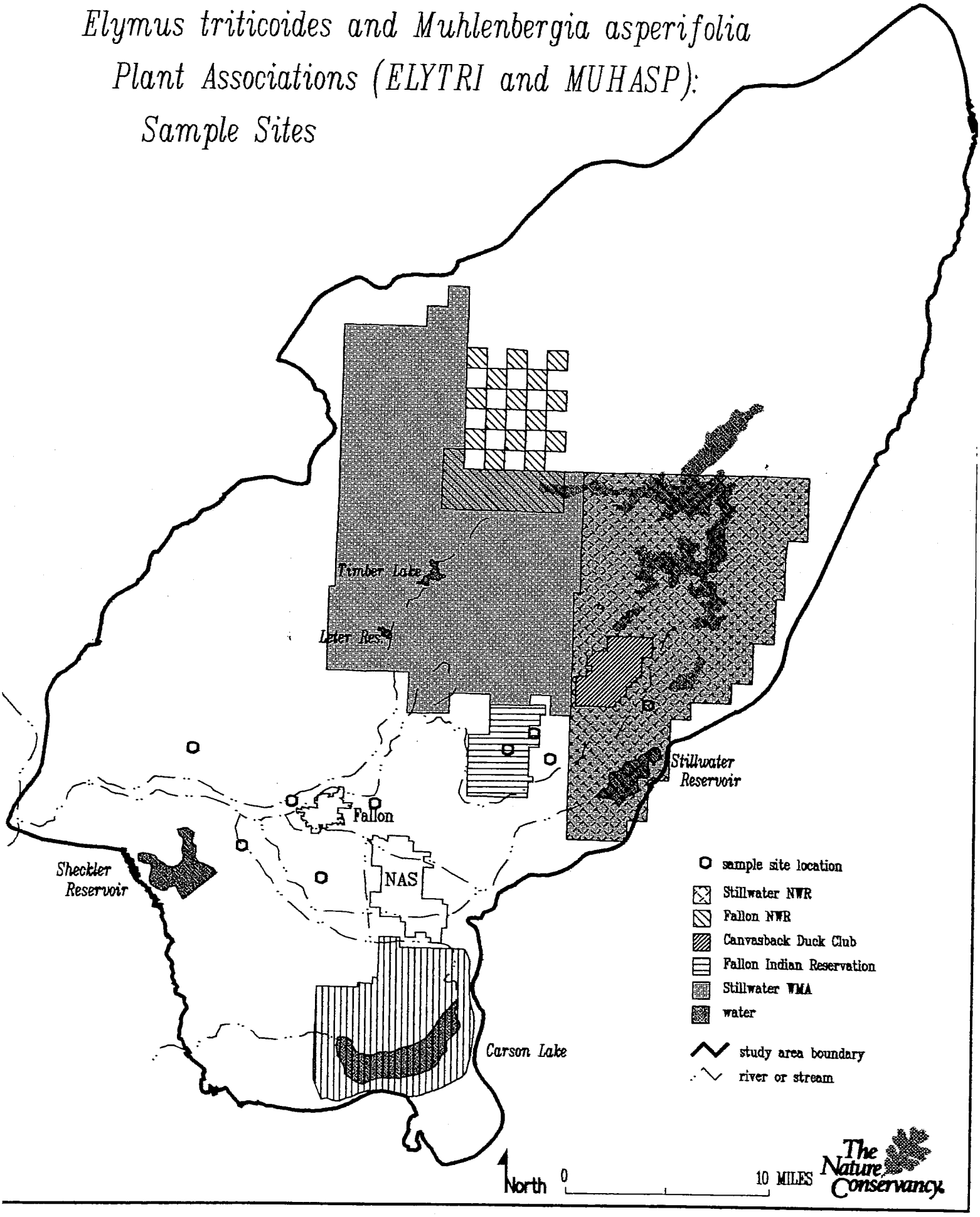
Eleocharis macrostachya–Bacopa eisenii Plant Association (ELEMAC–BACEIS): Sample Sites



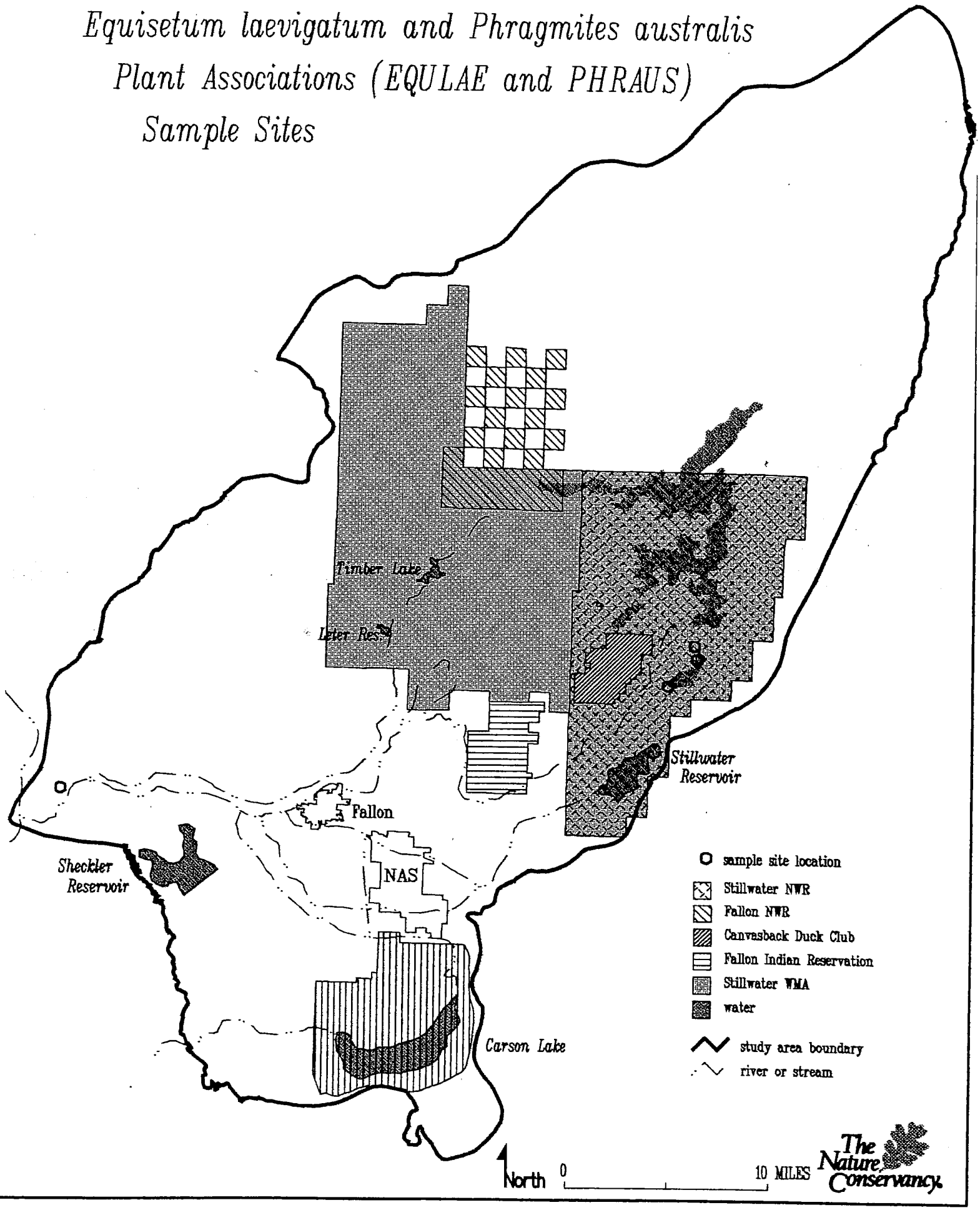
Eleocharis parishii Plant Association (ELEPAR): Sample Sites



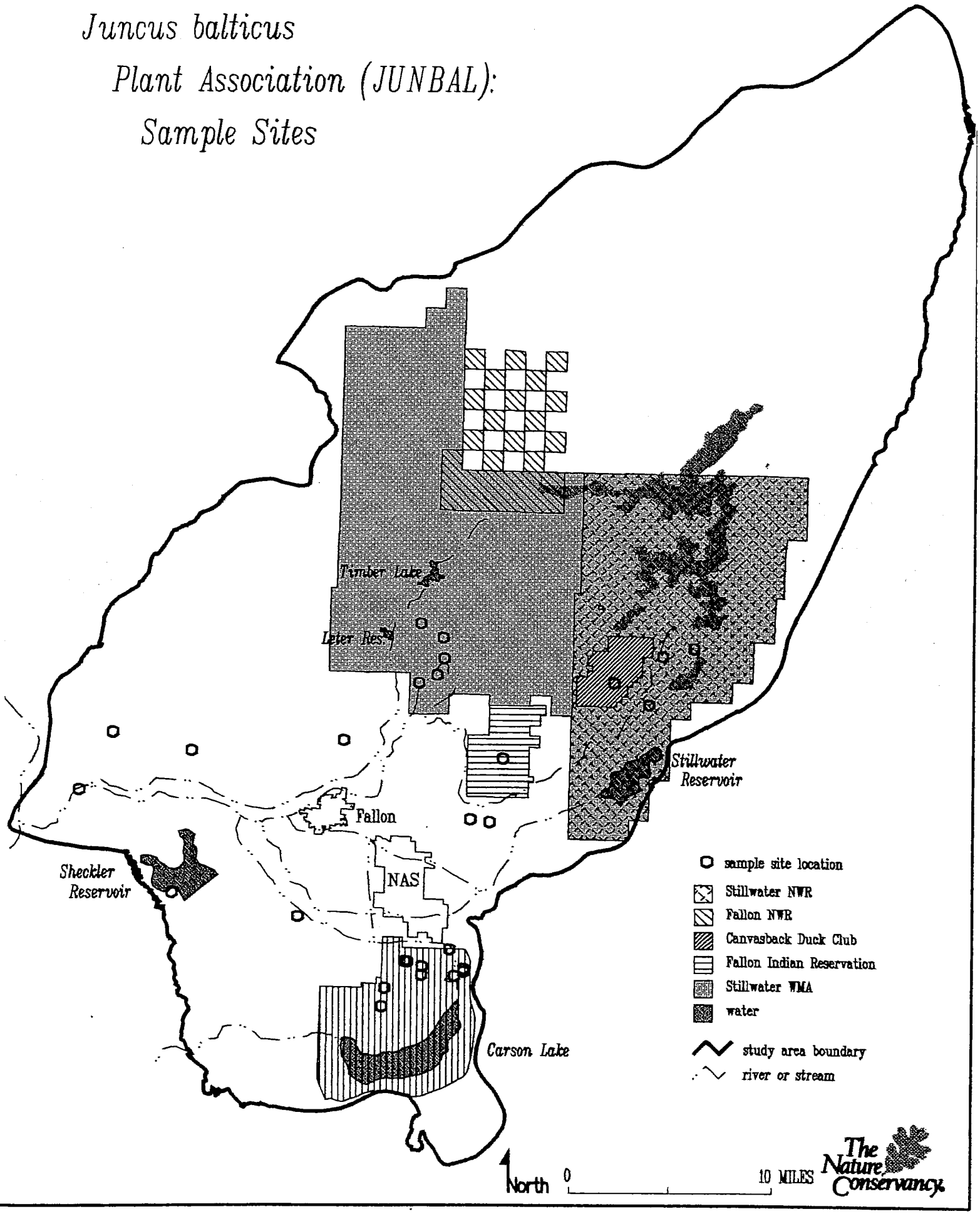
Elymus triticoides and Muhlenbergia asperifolia Plant Associations (ELYTRI and MUHASP): Sample Sites



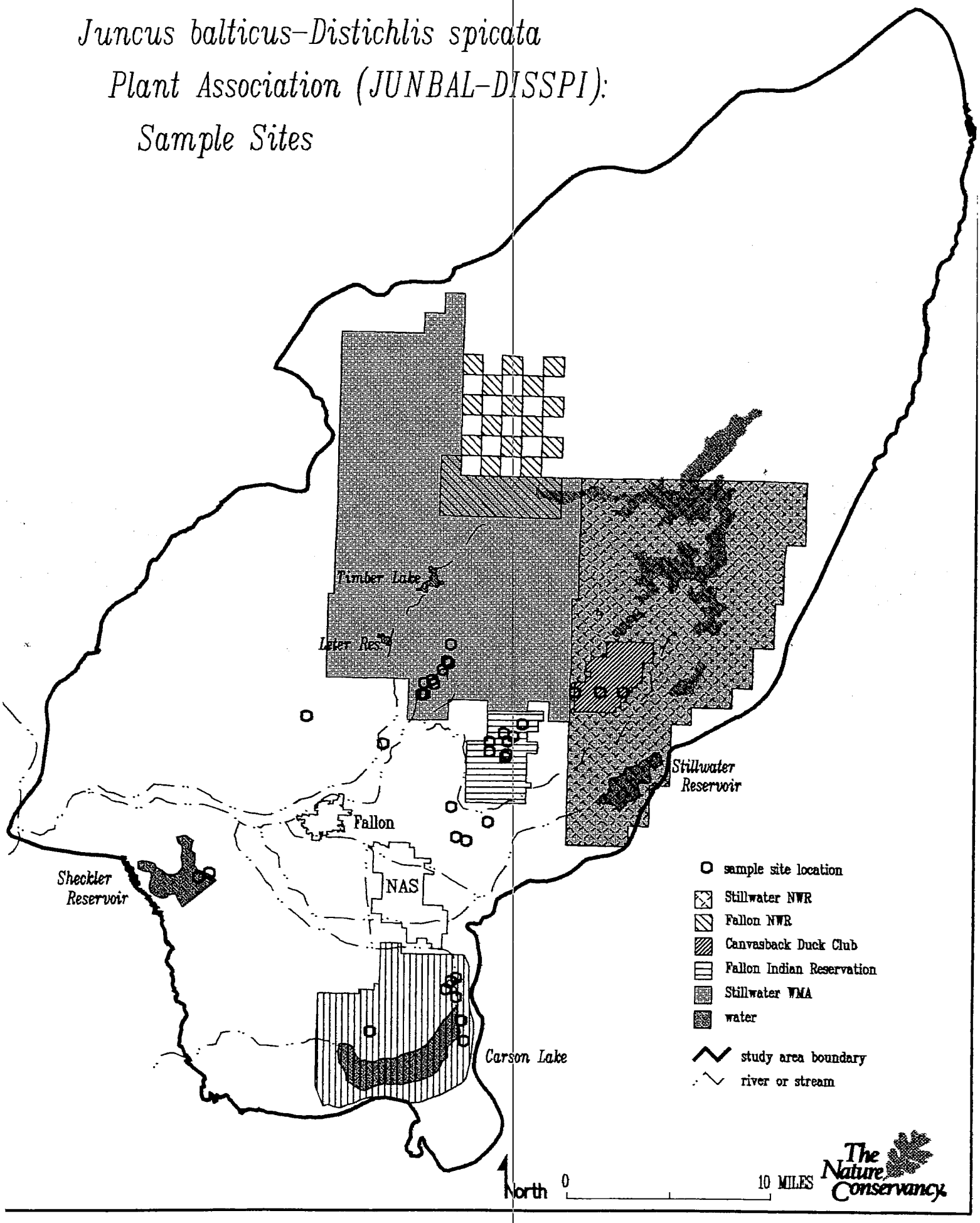
Equisetum laevigatum and Phragmites australis Plant Associations (EQULAE and PHRAUS) Sample Sites



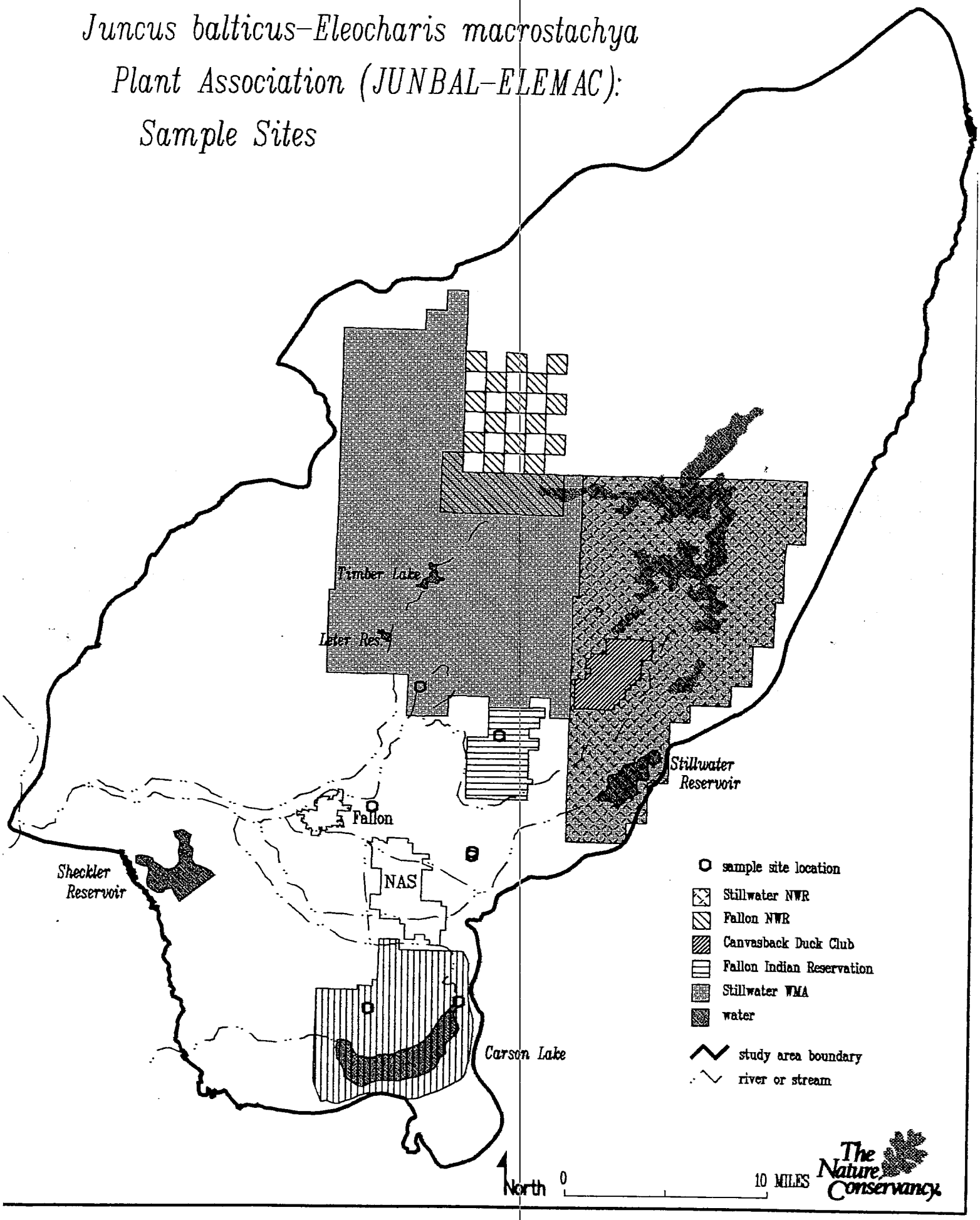
Juncus balticus Plant Association (JUNBAL): Sample Sites



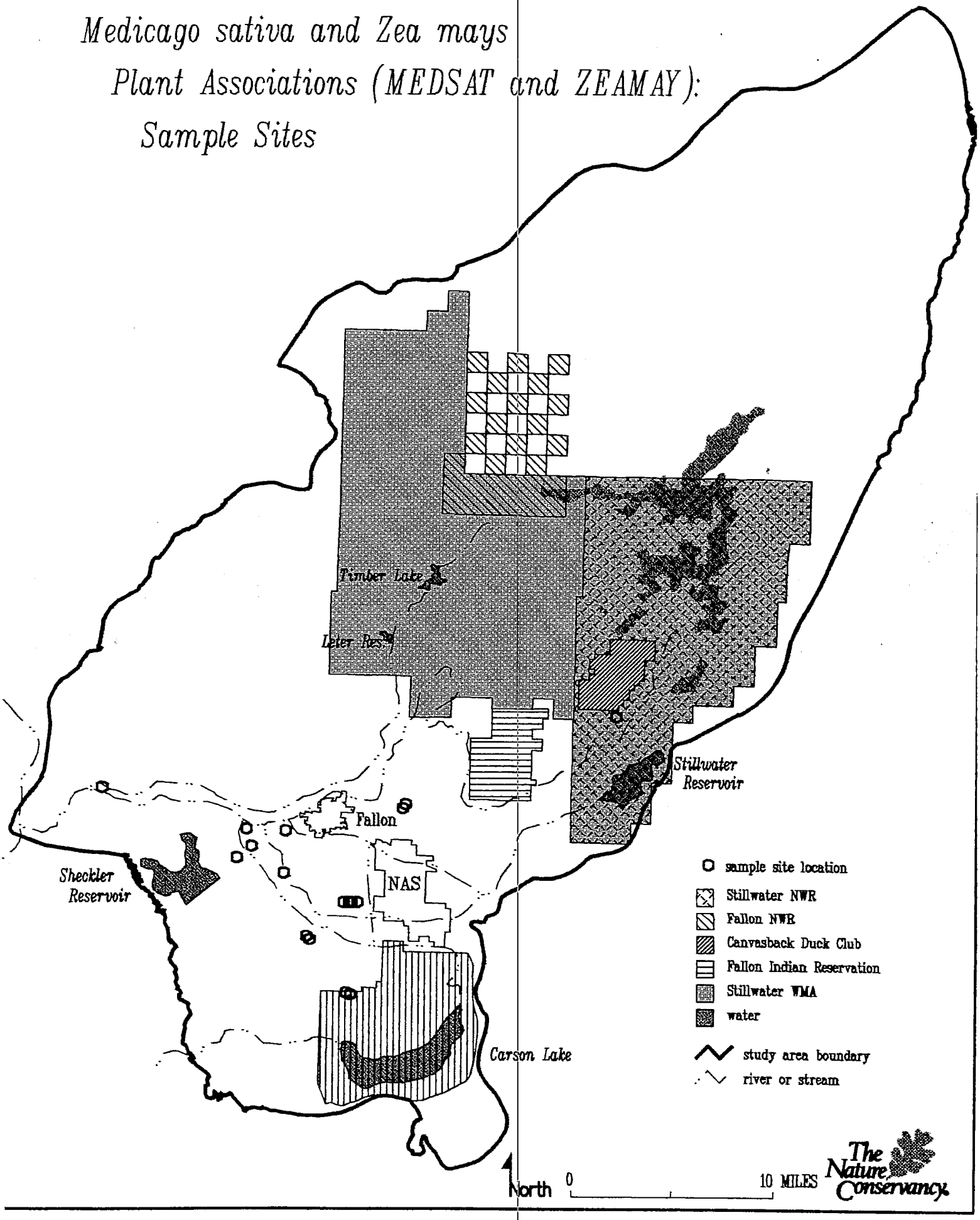
Juncus balticus–Distichlis spicata Plant Association (JUNBAL–DISSPI): Sample Sites



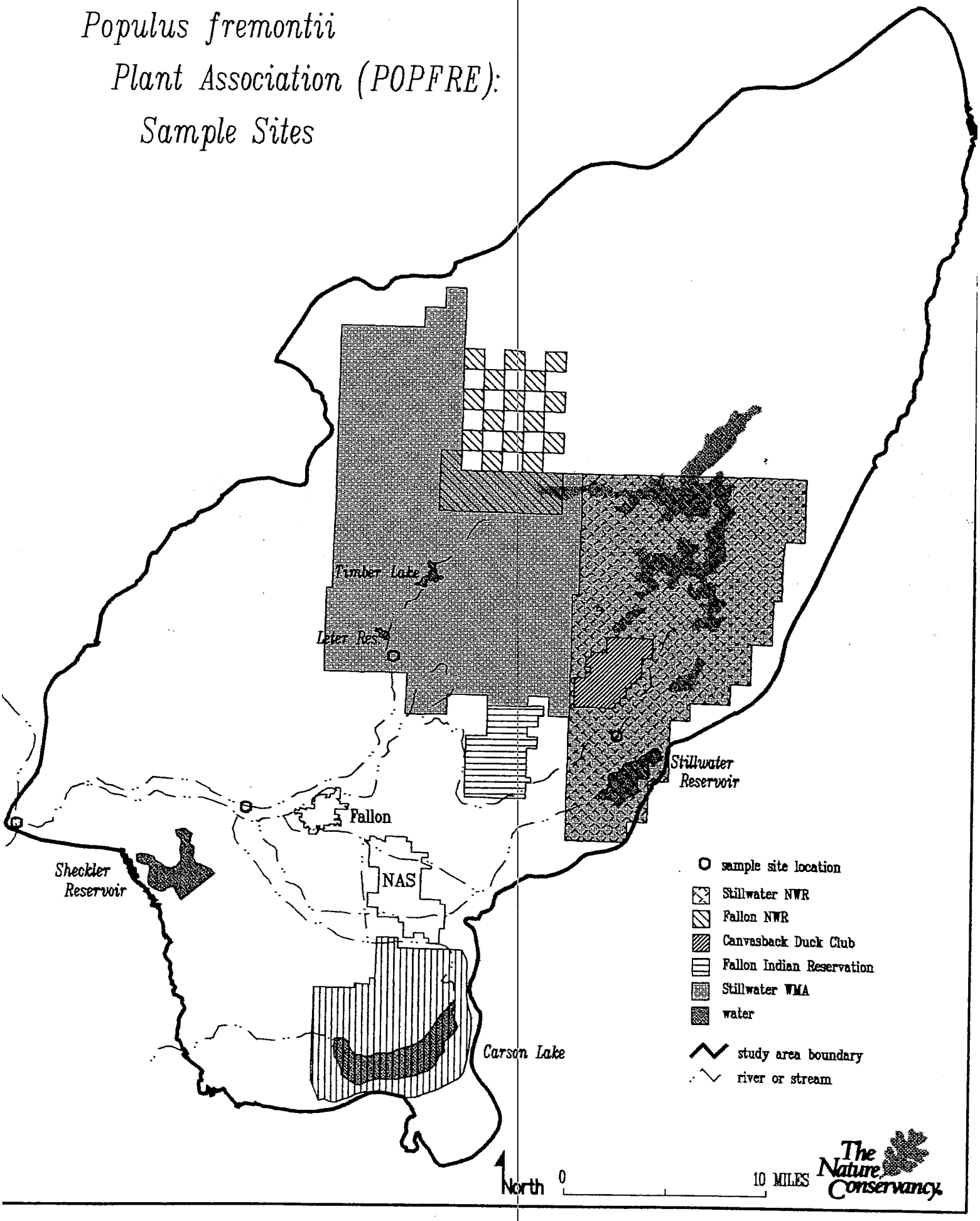
Juncus balticus–Eleocharis macrostachya Plant Association (JUNBAL–ELEMAC): Sample Sites



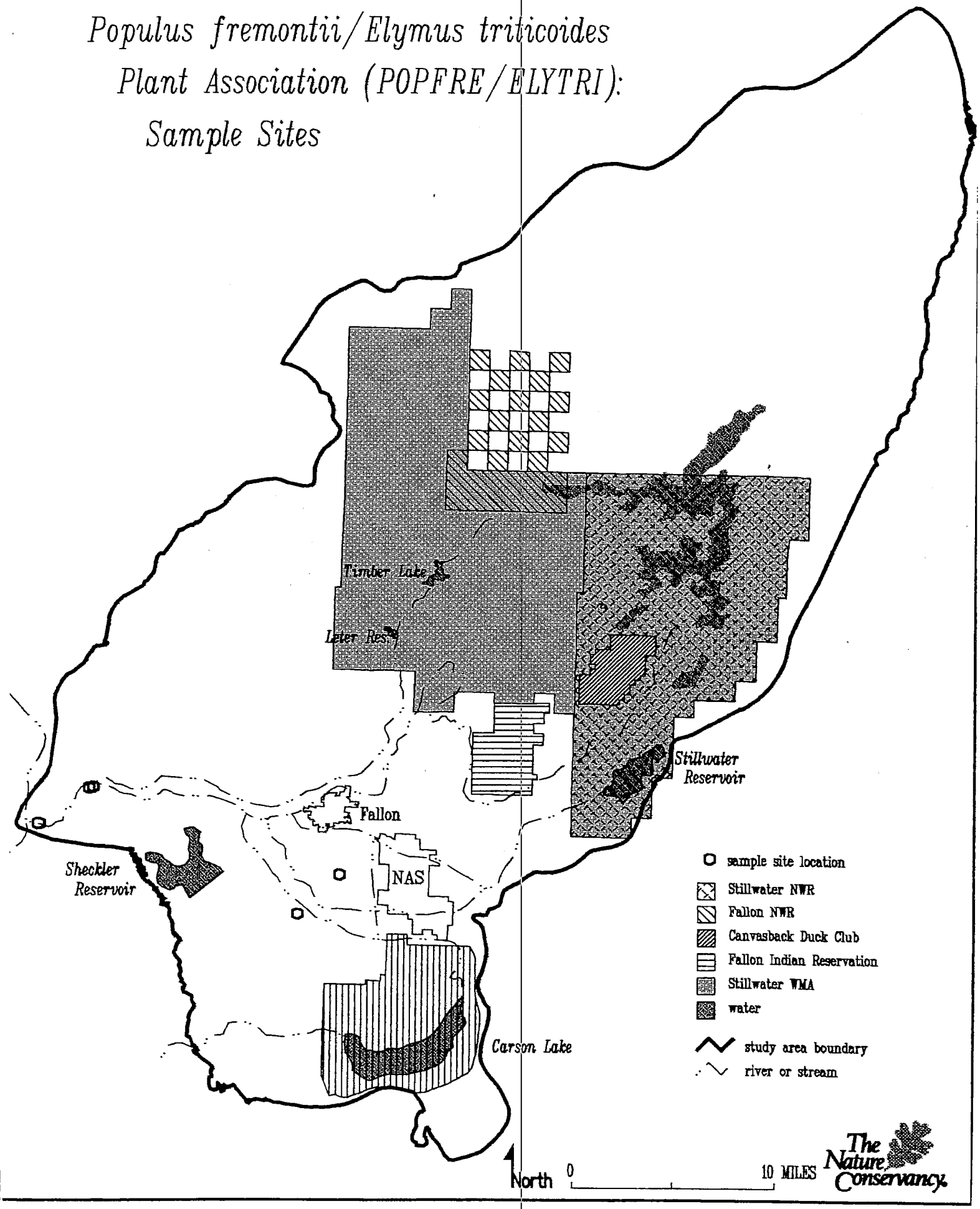
Medicago sativa and *Zea mays* Plant Associations (MEDSAT and ZEAMAY): Sample Sites



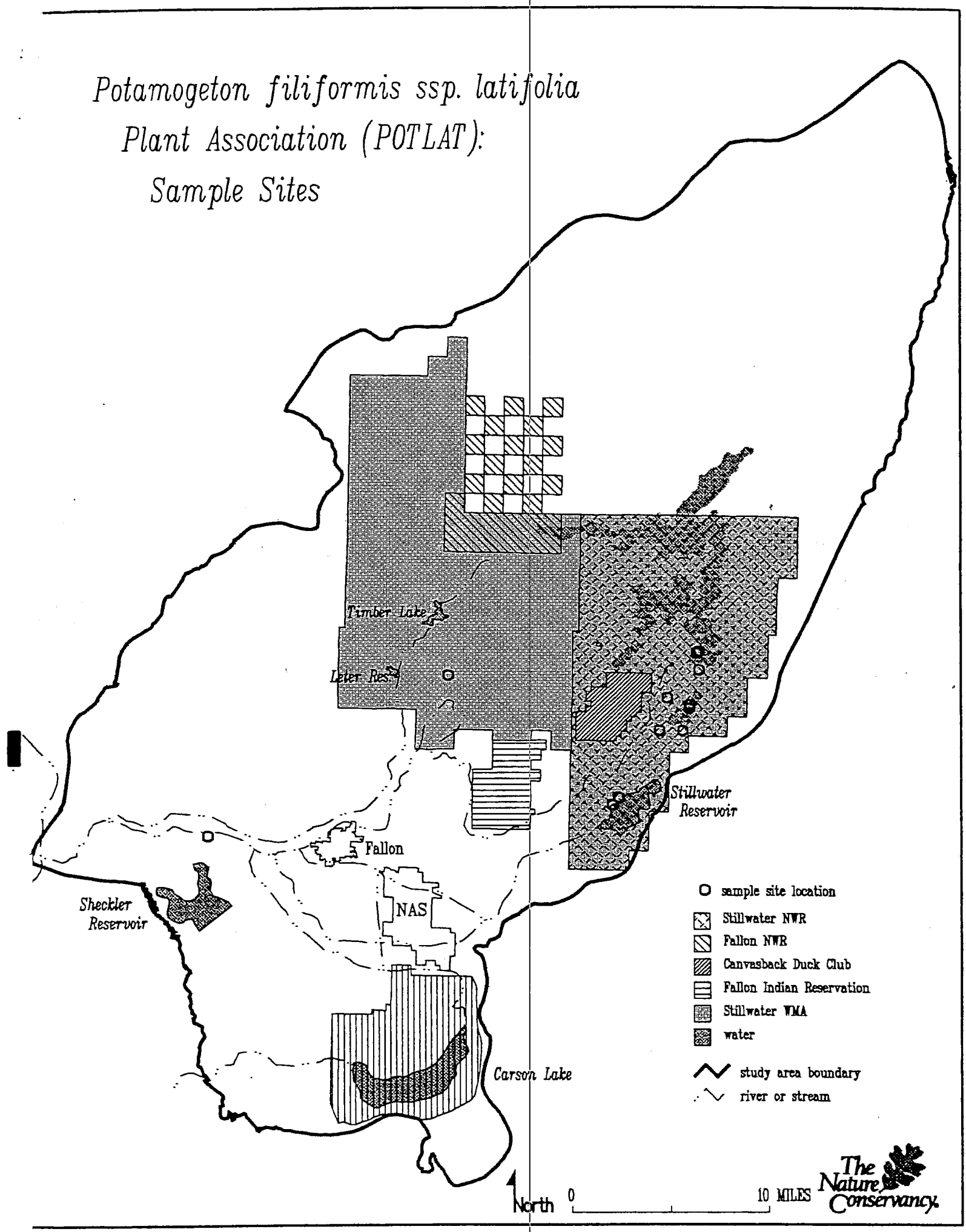
Populus fremontii Plant Association (POPFRE): Sample Sites



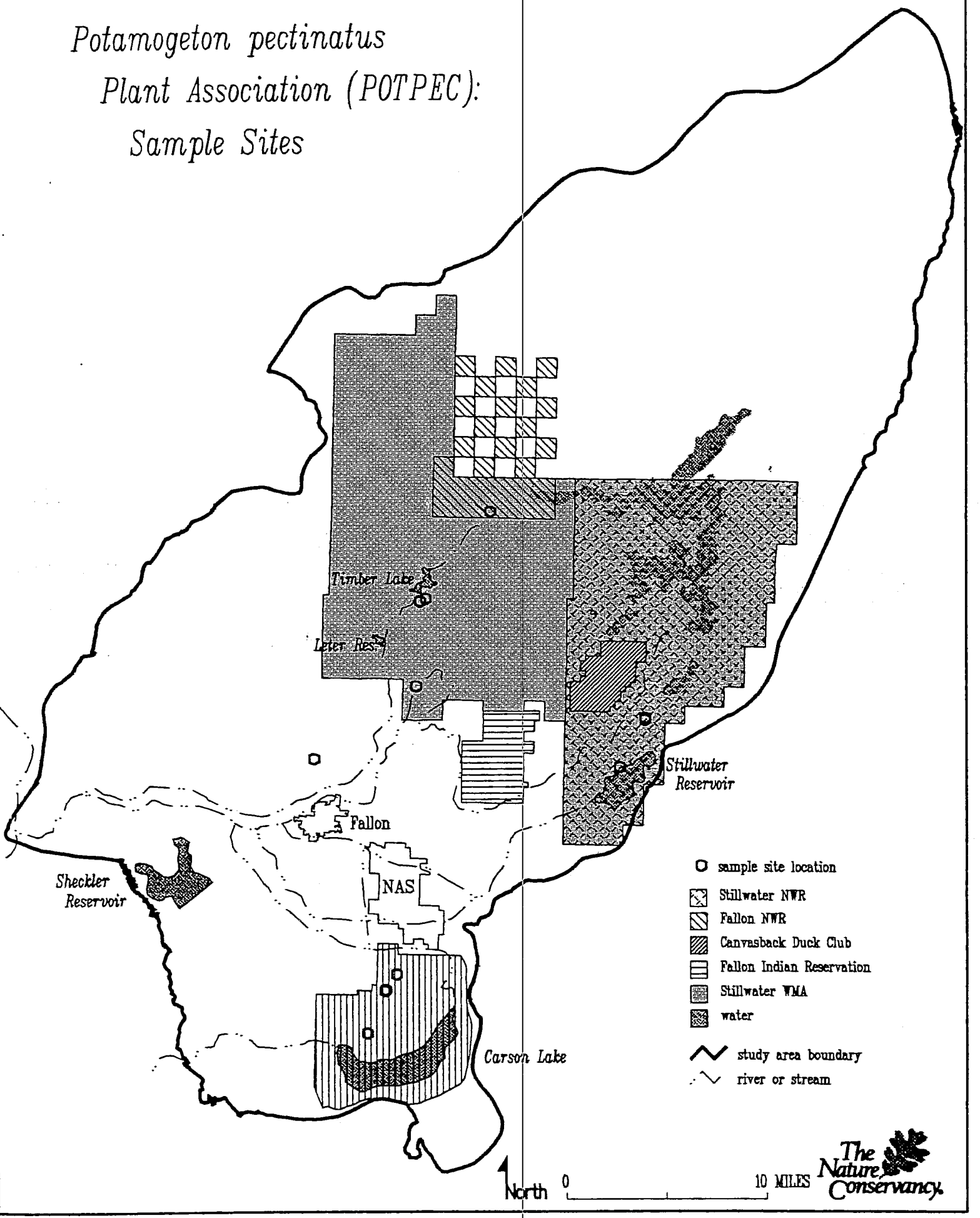
Populus fremontii/Elymus triticoides Plant Association (POPFRE/ELYTRI): Sample Sites



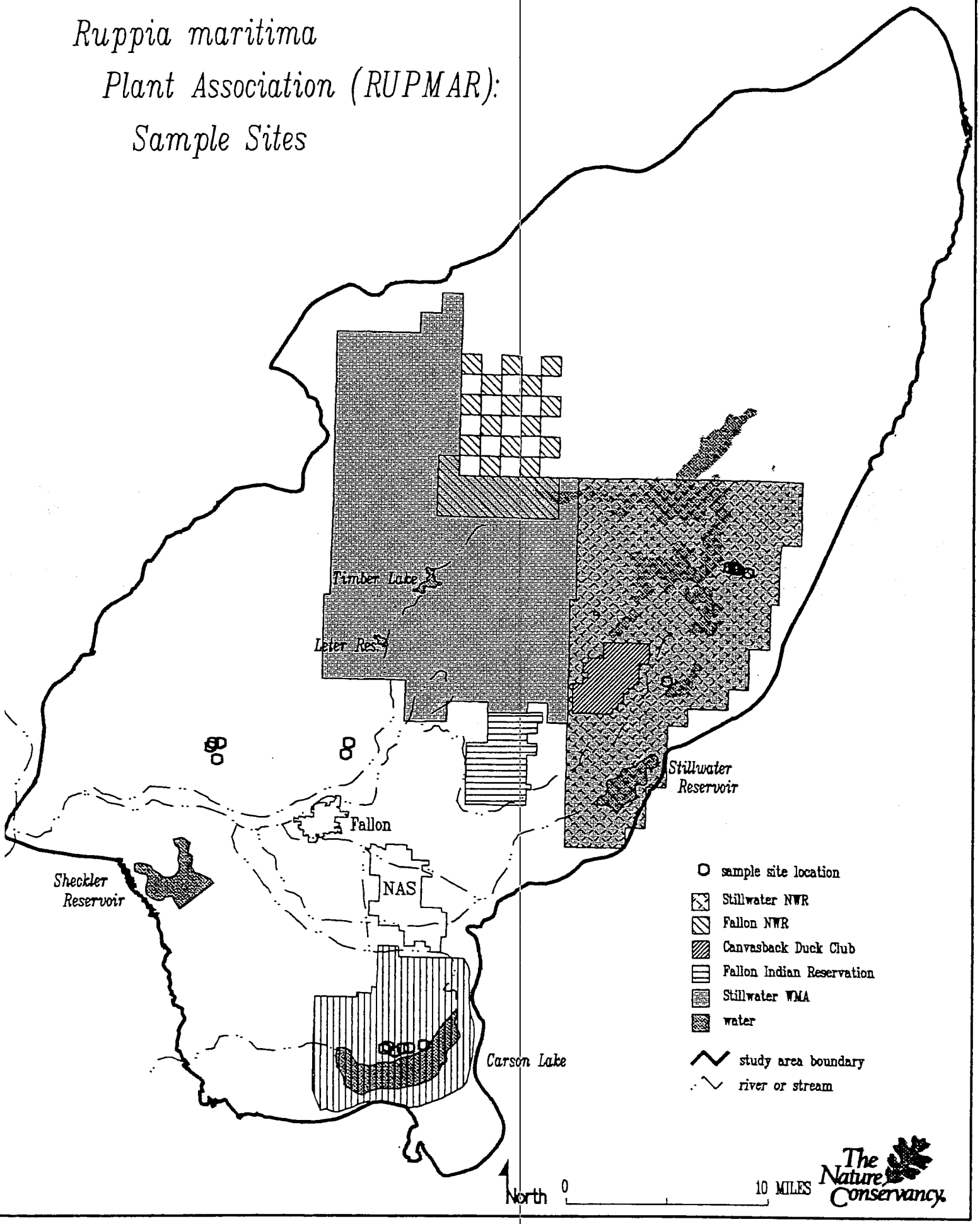
Potamogeton filiformis ssp. latifolia Plant Association (POTLAT): Sample Sites



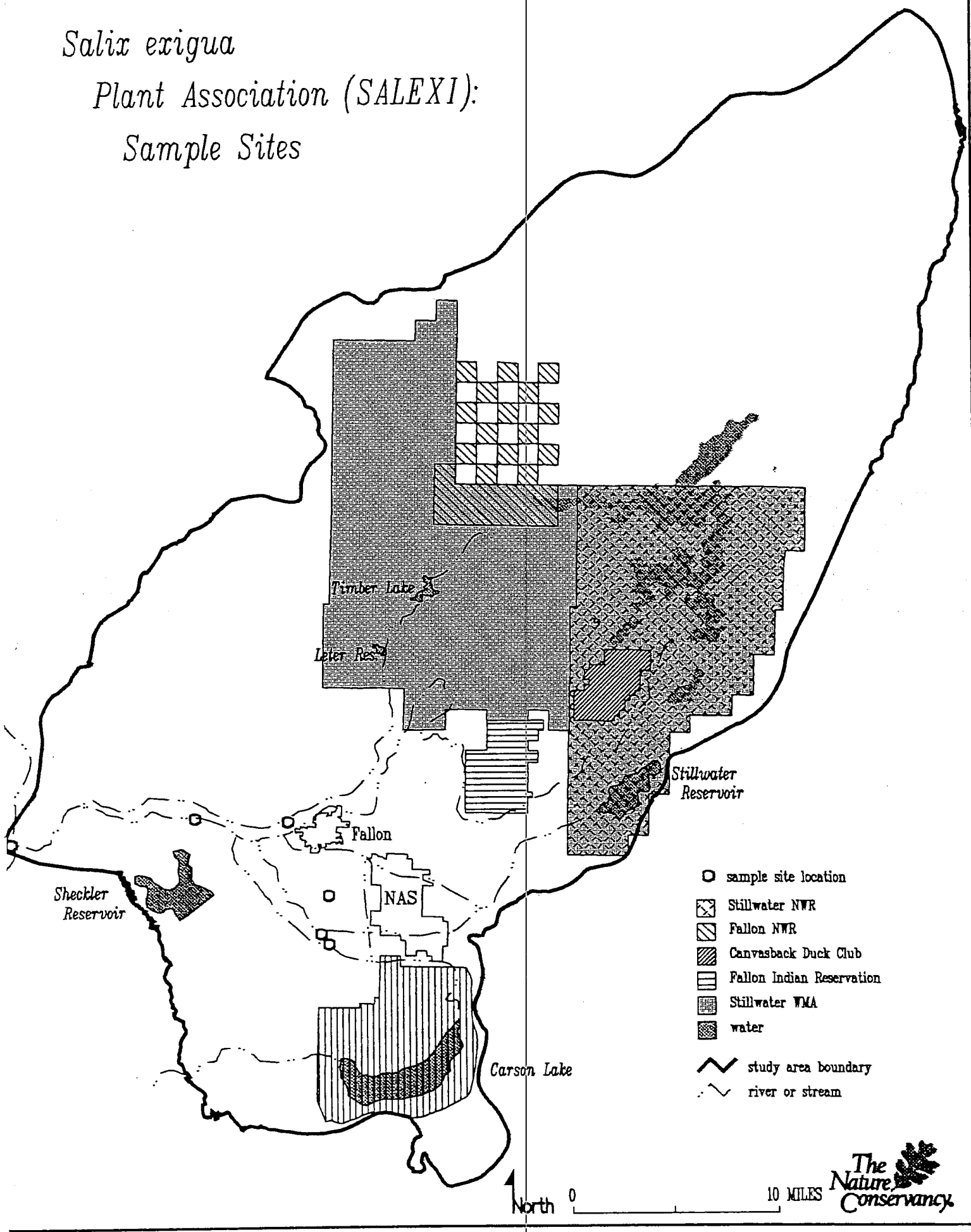
Potamogeton pectinatus Plant Association (POTPEC): Sample Sites



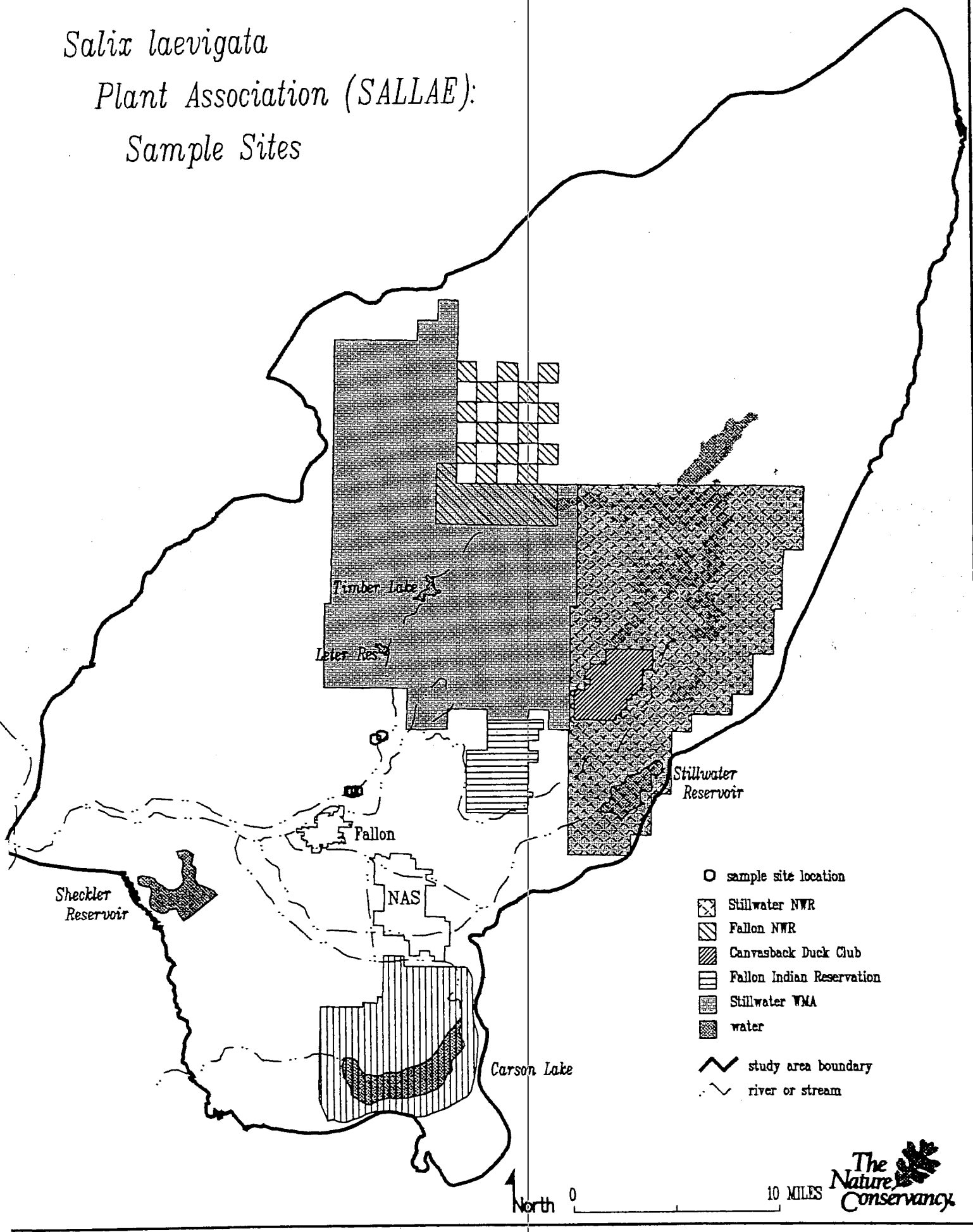
Ruppia maritima Plant Association (RUPMAR): Sample Sites



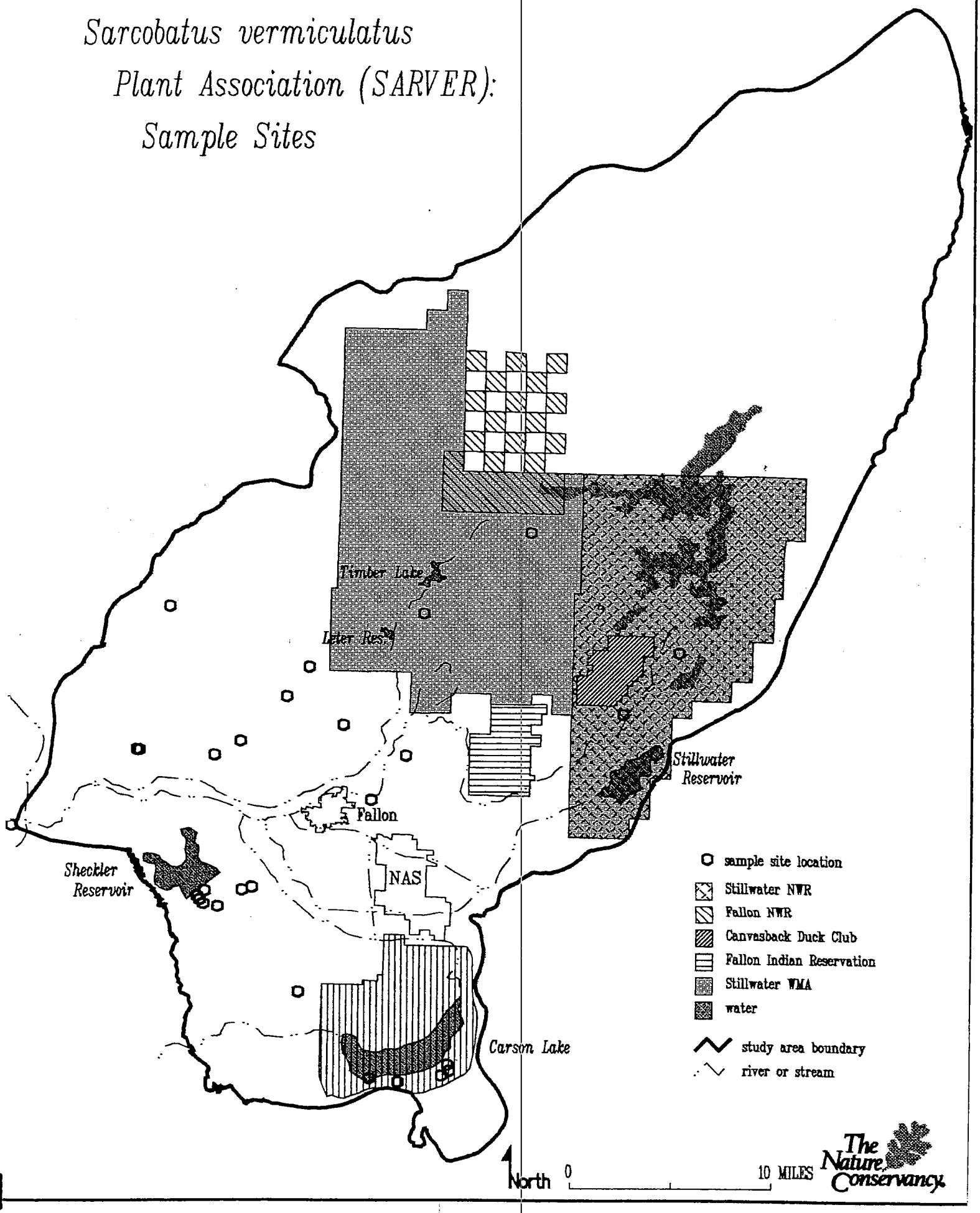
Salix exigua Plant Association (SALEXI): Sample Sites



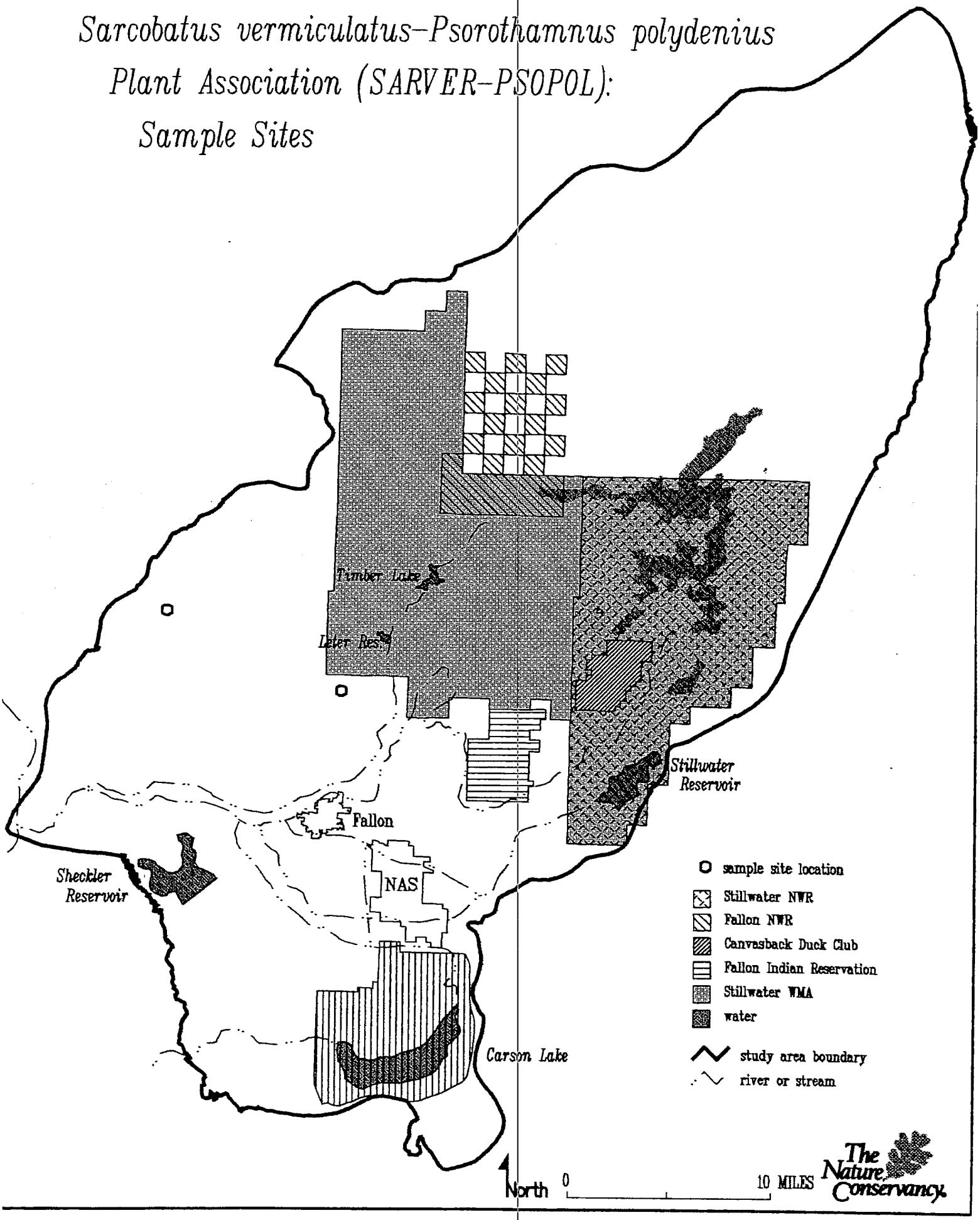
Salix laevigata Plant Association (SALLAE): Sample Sites



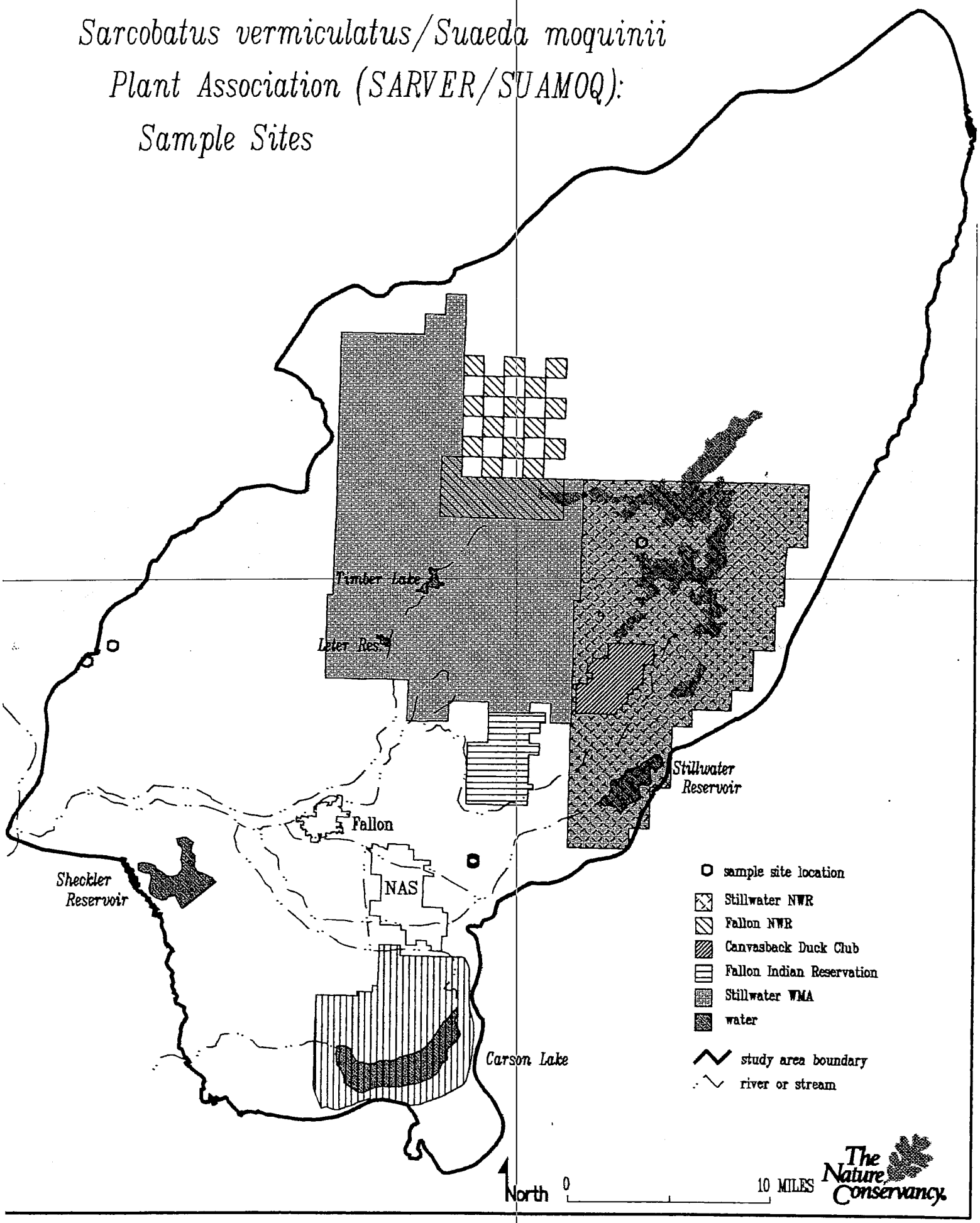
Sarcobatus vermiculatus Plant Association (SARVER): Sample Sites



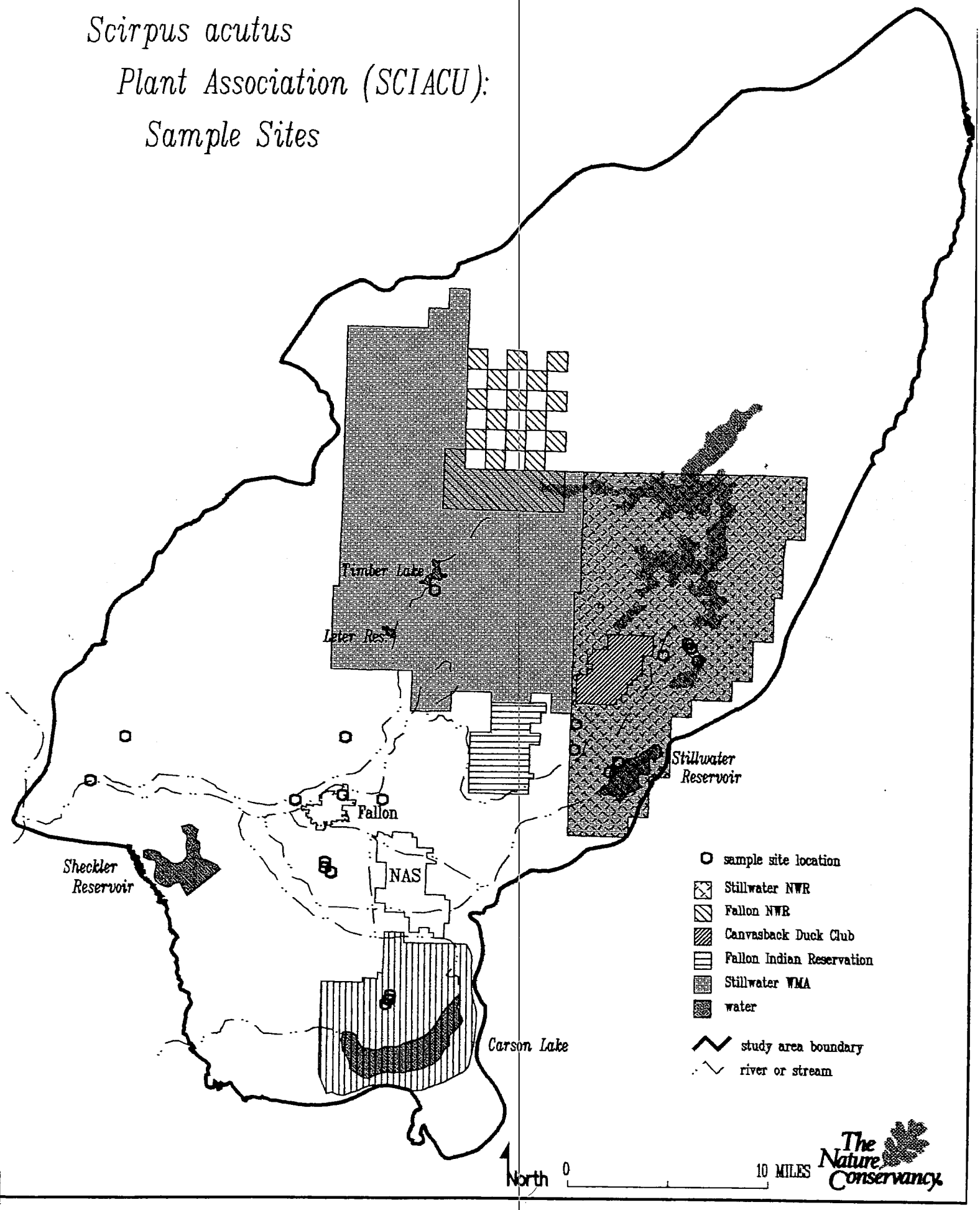
Sarcobatus vermiculatus–Psorothamnus polydenius Plant Association (SARVER–PSOPOL): Sample Sites



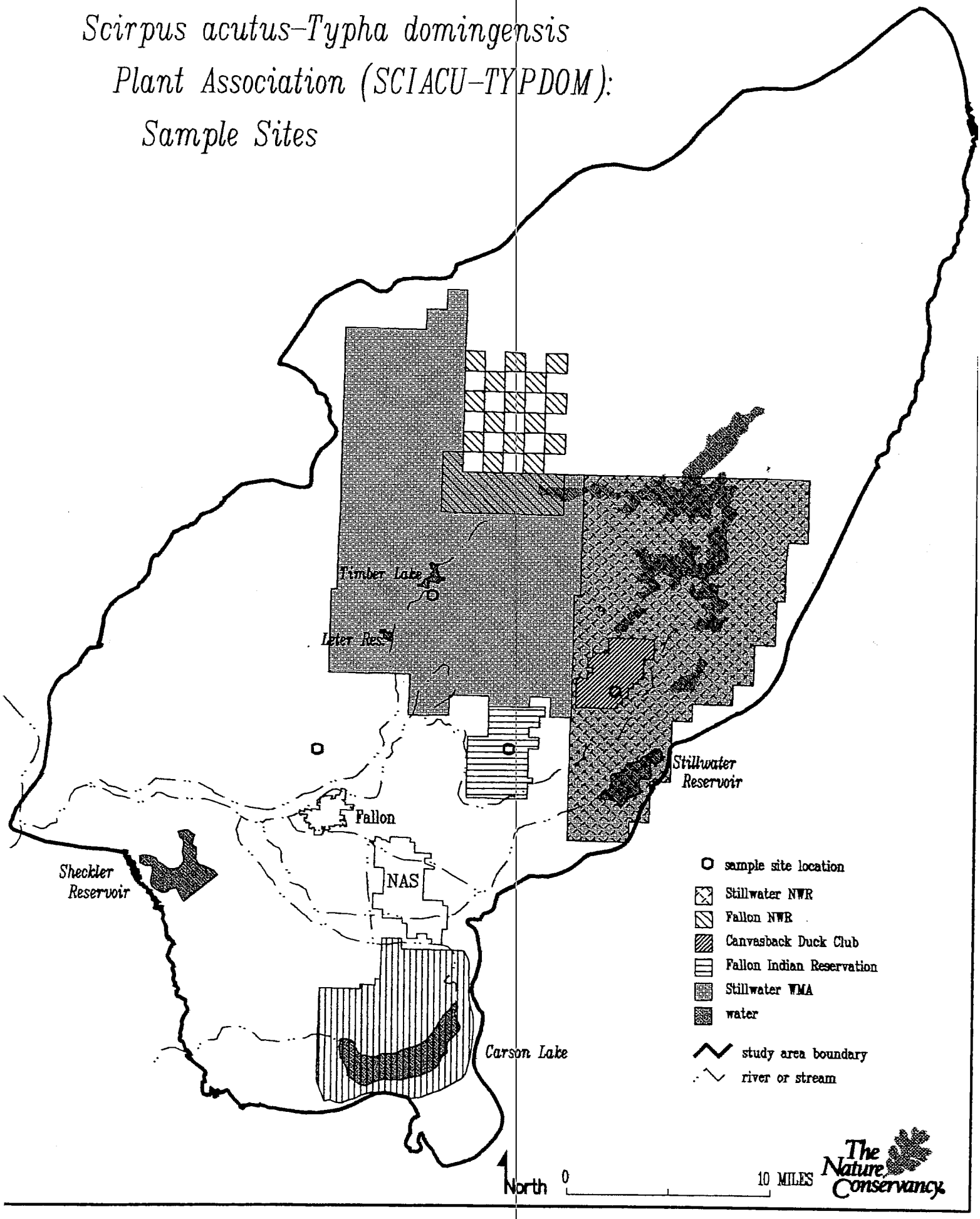
Sarcobatus vermiculatus/Suaeda moquinii Plant Association (SARVER/SUAMOQ): Sample Sites



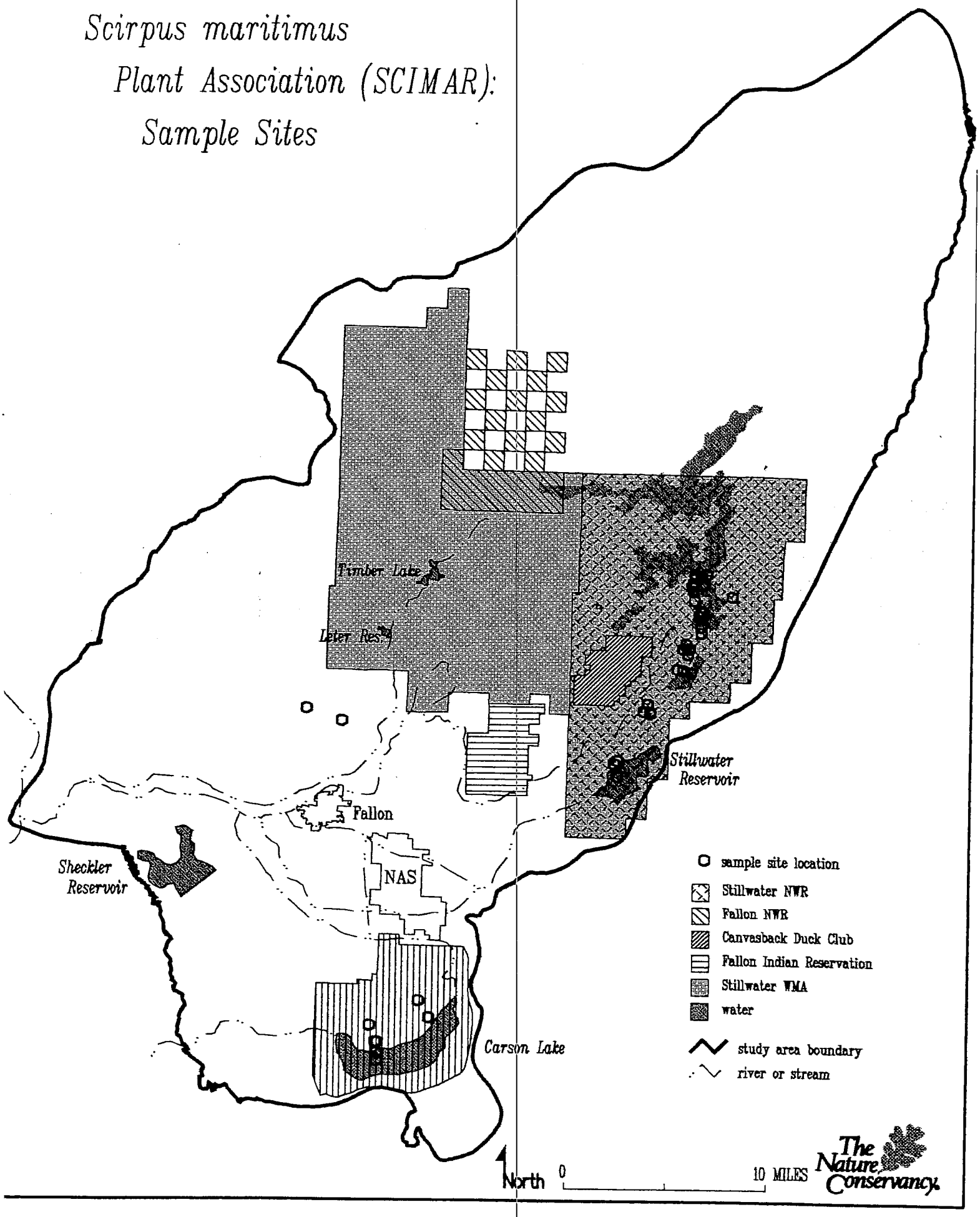
Scirpus acutus Plant Association (SCIACU): Sample Sites



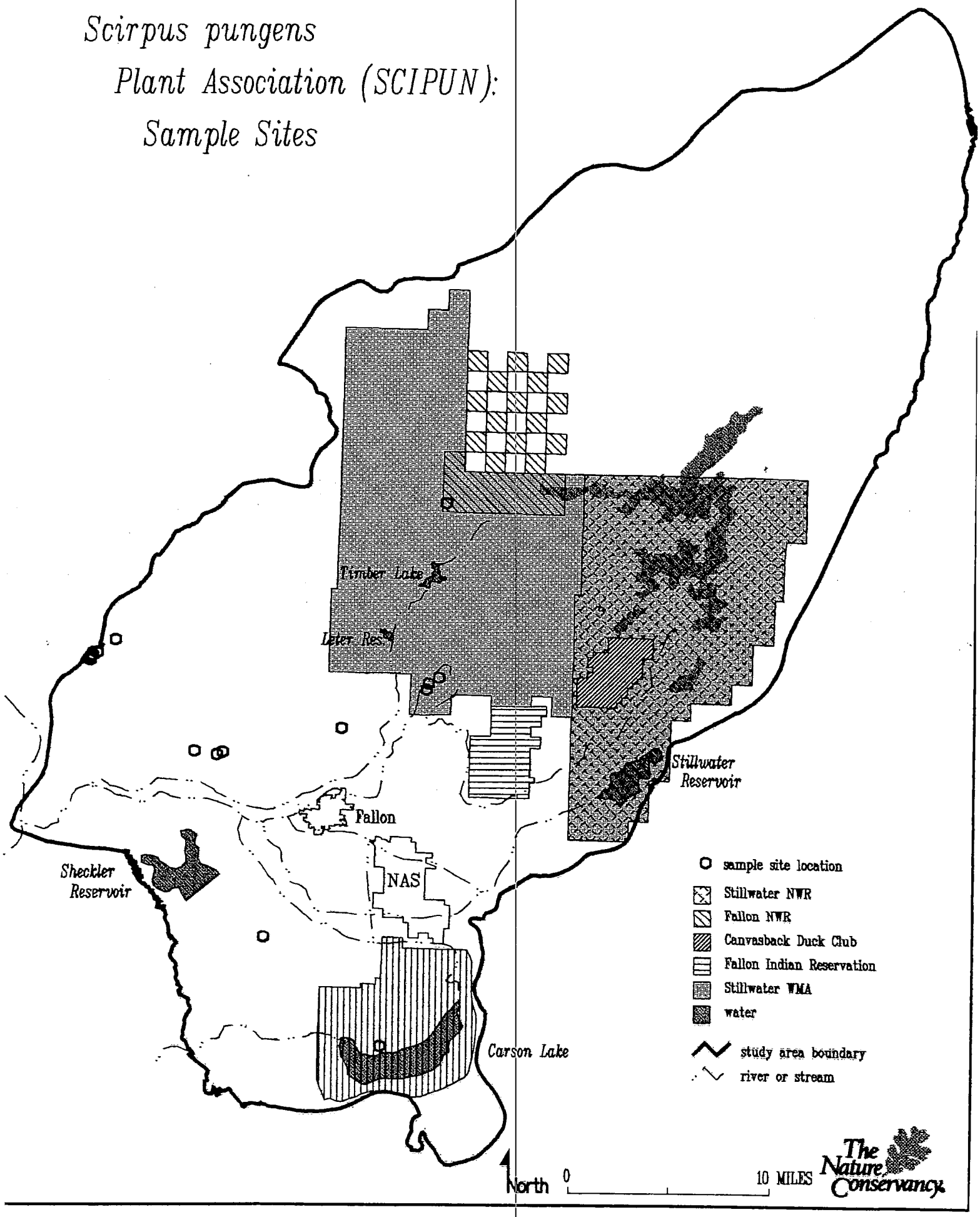
Scirpus acutus–Typha domingensis Plant Association (SCIACU–TYPDOM): Sample Sites



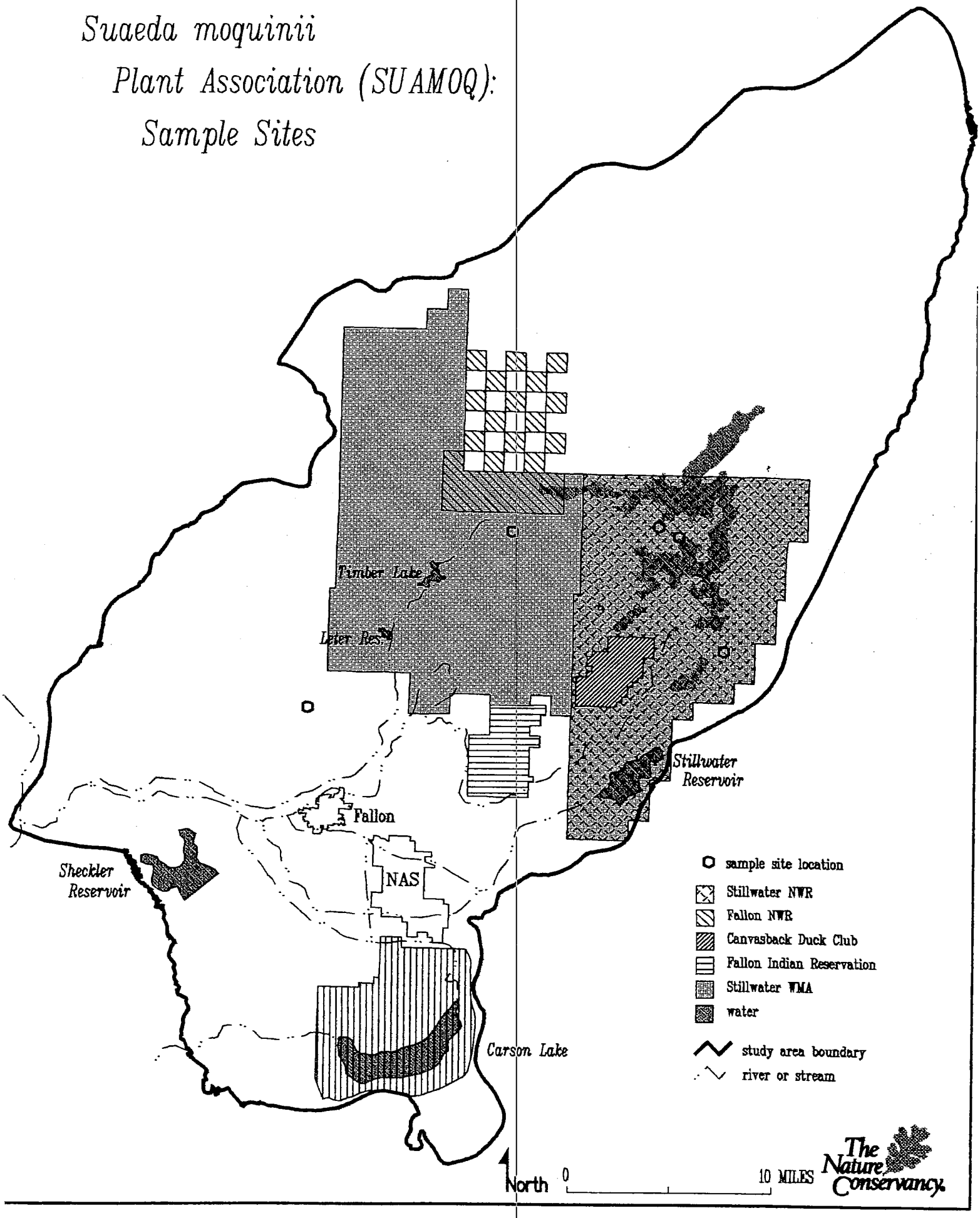
Scirpus maritimus Plant Association (SCIMAR): Sample Sites



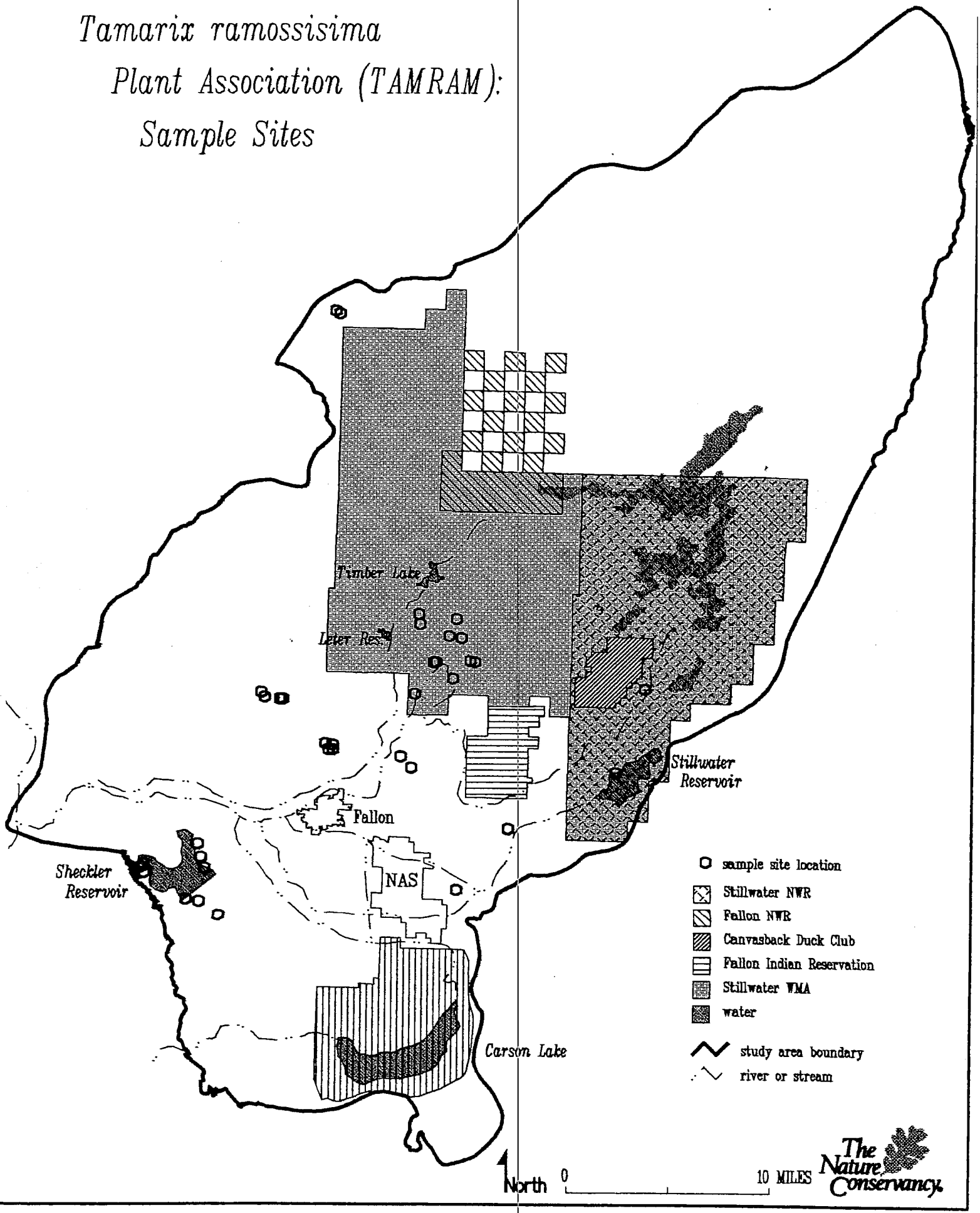
Scirpus pungens Plant Association (SCIPUN): Sample Sites



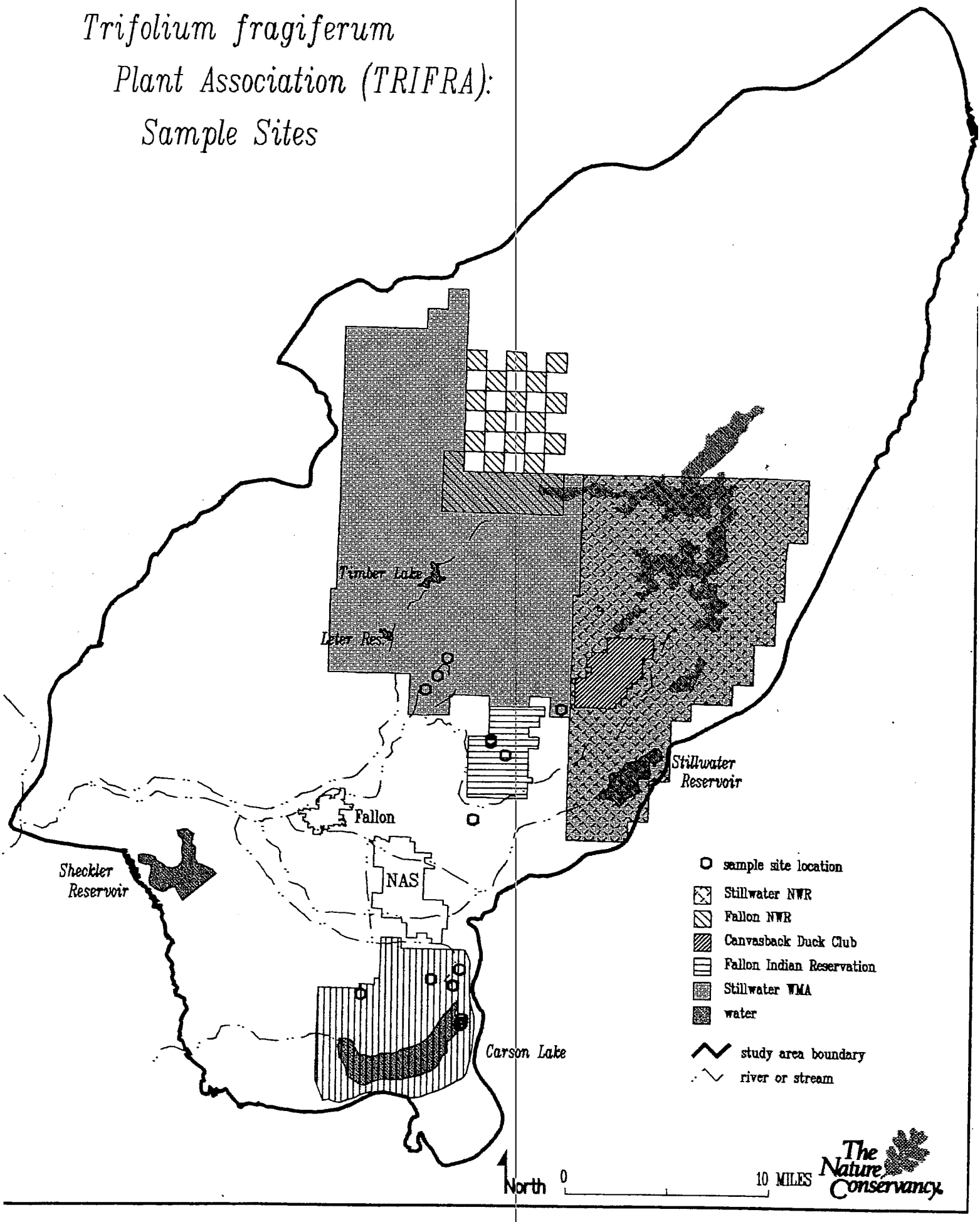
Suaeda moquinii Plant Association (SUAMOQ): Sample Sites



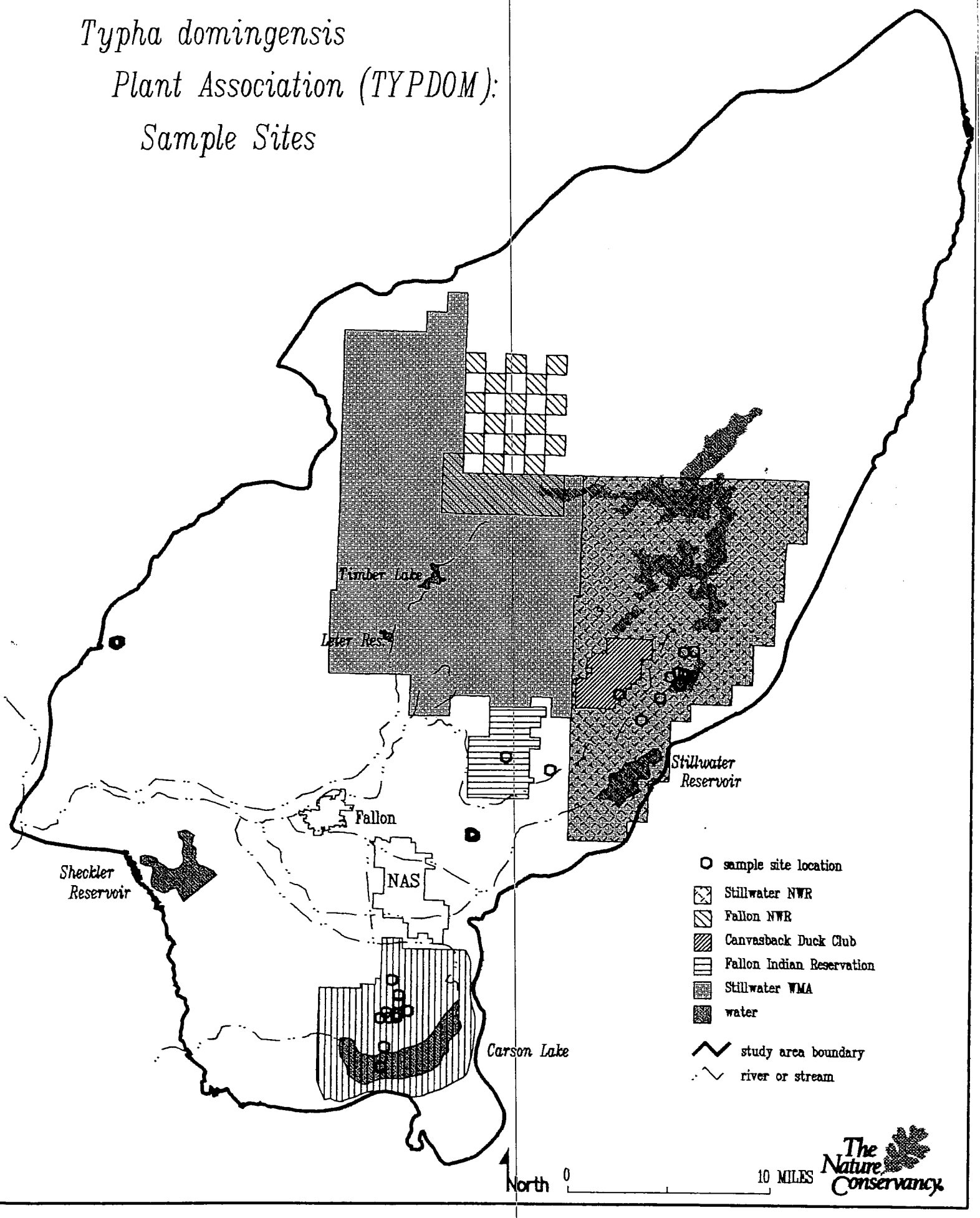
Tamarix ramossisima Plant Association (TAMRAM): Sample Sites



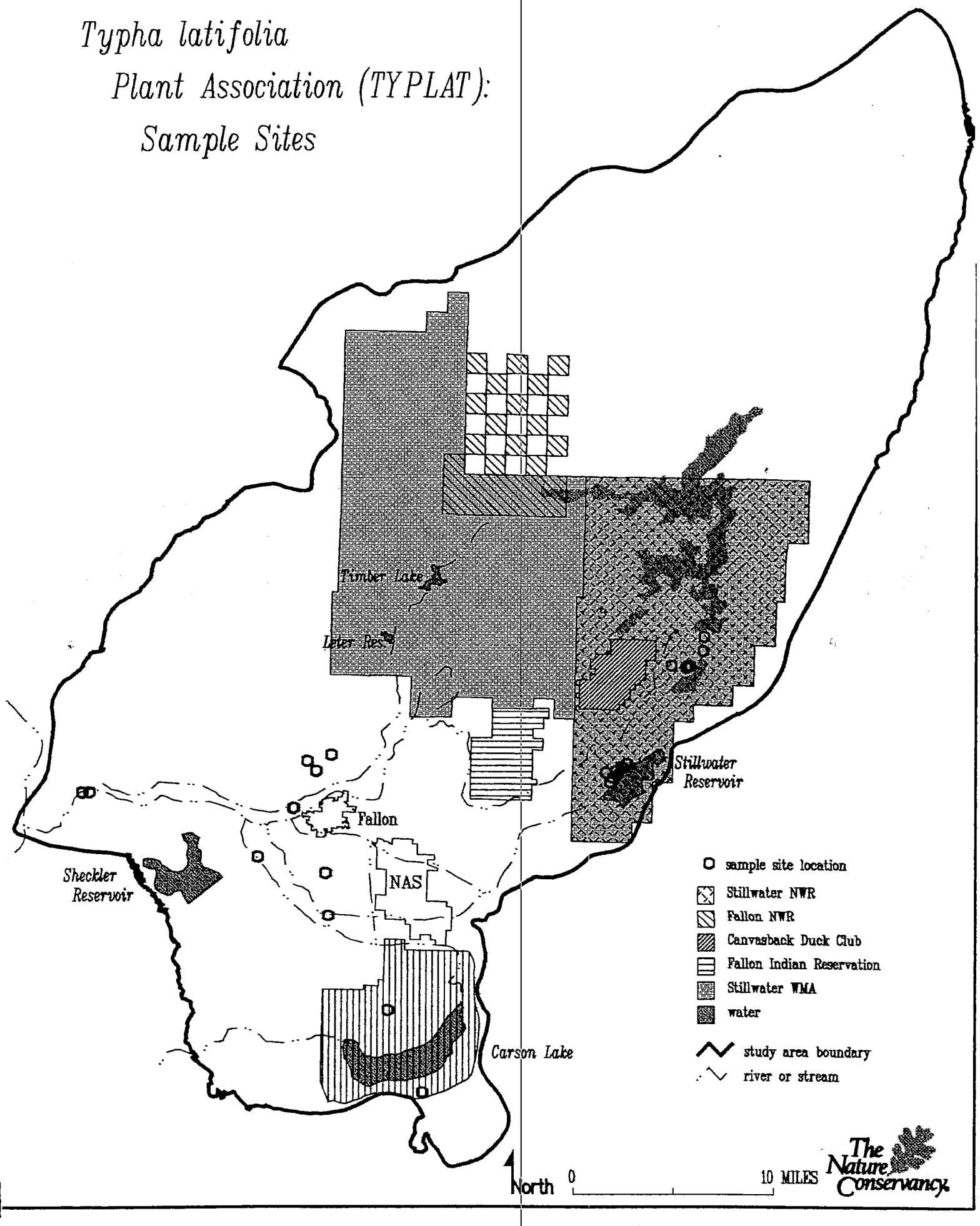
Trifolium fragiferum Plant Association (TRIFRA): Sample Sites



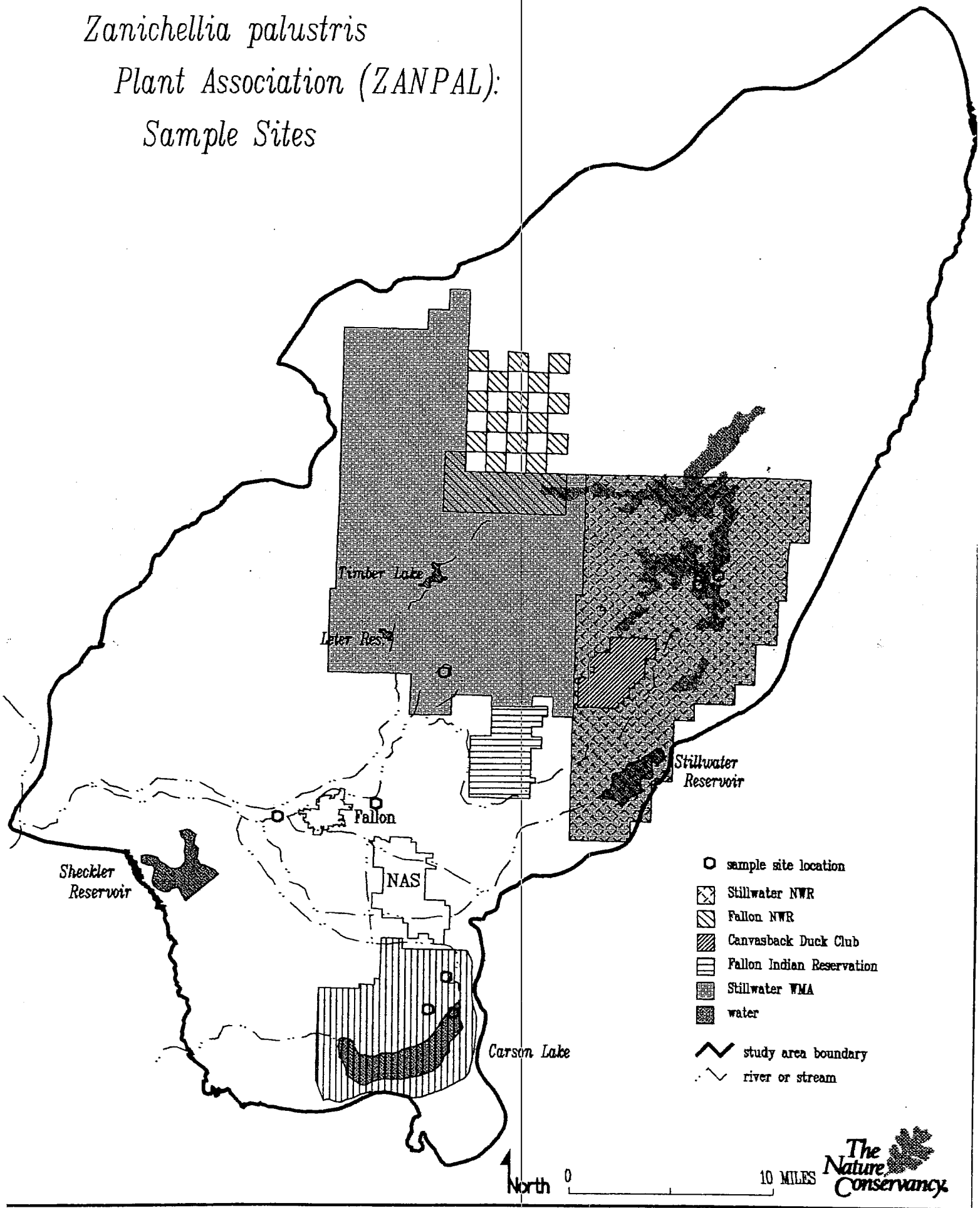
Typha domingensis Plant Association (TYPDOM): Sample Sites



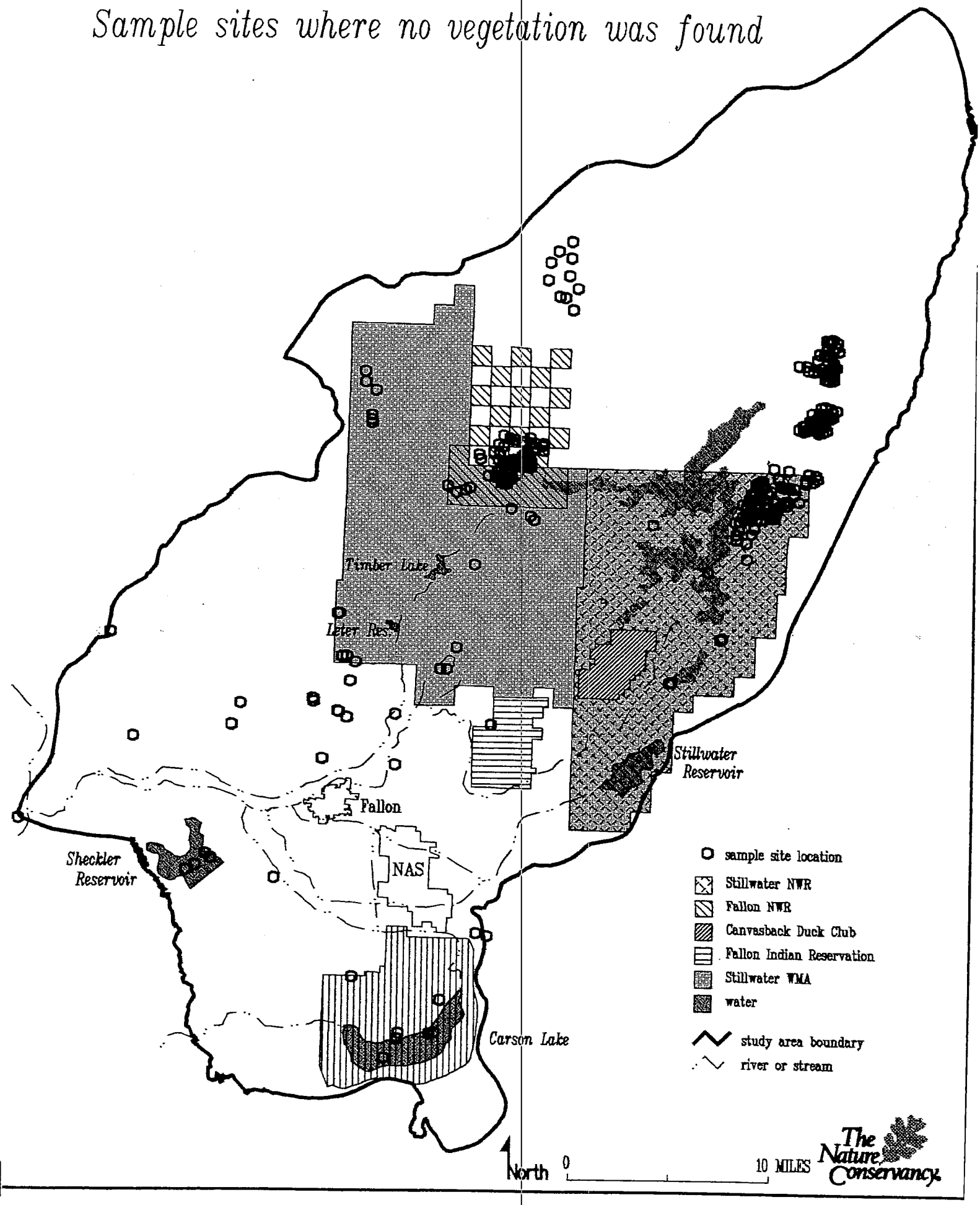
Typha latifolia Plant Association (TYPLAT): Sample Sites



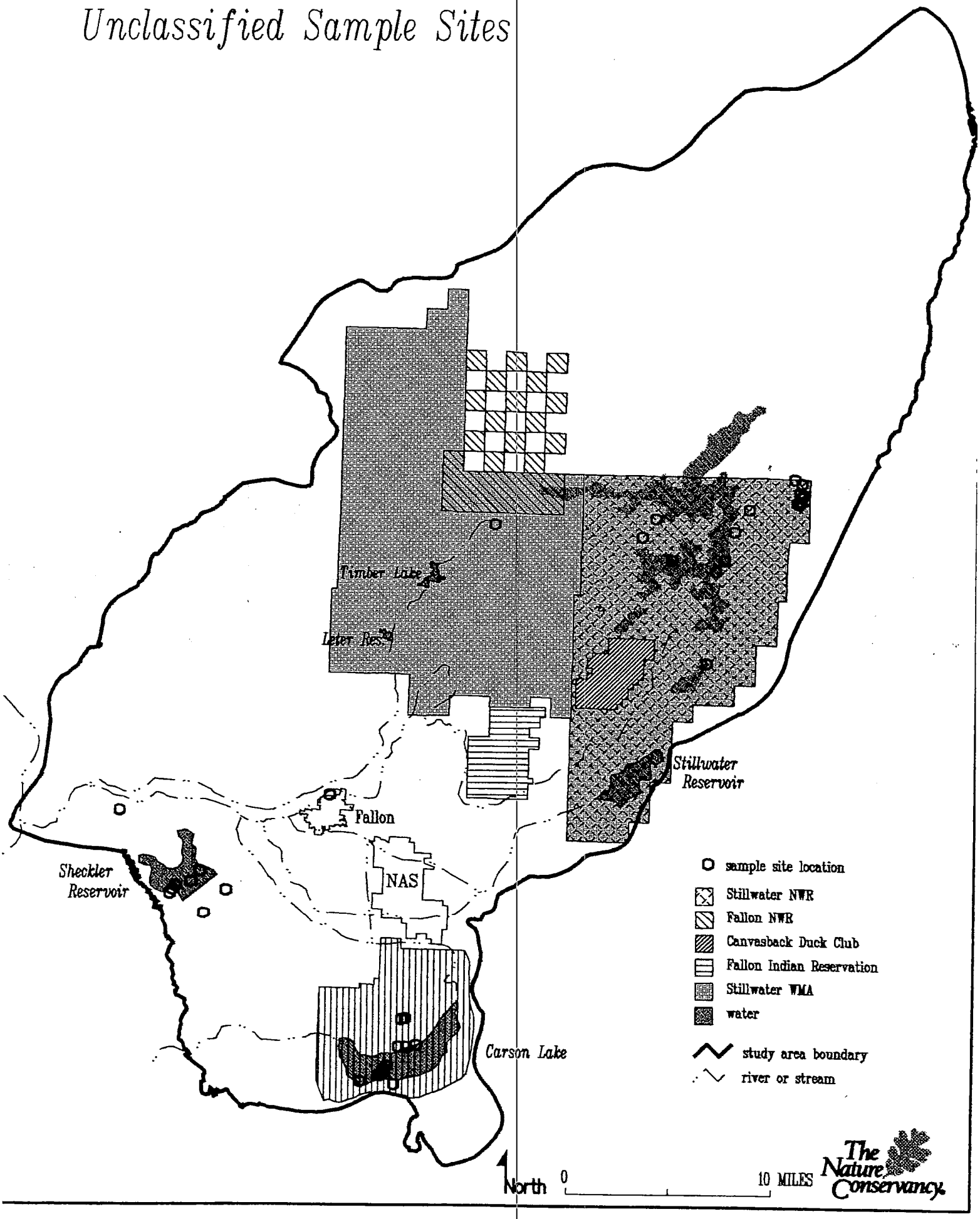
Zanichellia palustris Plant Association (ZANPAL): Sample Sites



Sample sites where no vegetation was found



Unclassified Sample Sites



Appendix G

Preliminary Dichotomous Field Key to the Major Wetland Plant Associations in the Lahontan Valley

A field guide to the 44 plant community types described in the wetland plant community classification for the Lahontan Valley (Appendix E) is presented. The diagnostic key, based on indicator species and environmental characteristics, is provided for field identification of the plant community types.

Steps to identify the plant community type represented by a stand of vegetation include:

1) Locate a 50 m^2 (10 x 5 m) sample plot in a representative portion of the vegetation stand to be keyed. Identify and record canopy coverage for all species. Plants with nominal or trace coverage can be omitted.

2) Check plot data in the field and calculate canopy cover classes for the dominant species. Canopy cover classes are presented in Table 1. Make sure that you use recorded canopy cover classes and the plot is representative of the stand as a whole. If not, locate another plot.

3) Identify the wetland community type by following the key literally. The key process has two steps: first, based on vegetation stature, identify to which one of five major Dominance Groups the sample vegetation stand belongs; second, within the appropriate dominance group, identify the community type description that matches the sample vegetation stand. The five Dominance Groups, and the community types within each, include:

<u>Tree and Tall Shrub Plant Associations</u>

Elaeagnus angustifolia
Populus fremontii
Populus fremontii-Elymus triticoides
Salix laevigata
Salix exigua
Tamarix ramosissima

<u>Low Shrub Plant Associations</u>

Allenrolfea occidentalis
Artemisia tridentata ssp. *tridentata*
Atriplex lentiformis
Chrysothamnus nauseosus-Tetradymia tetrameres
Sarcobatus vermiculatus
Sarcobatus vermiculatus-Psorothamnus polydenius
Sarcobatus vermiculatus-Suaeda moquinii
Suaeda moquinii

<u>Graminaceous Plant Associations</u>

Tall Graminaceous Associations

Equisetum laevigatum
Phragmites australis
Scirpus acutus
Typha domingensis
Typha domingensis-Scirpus acutus
Typha latifolia

Medium Height and Short Graminaceous Associations

Distichlis spicata
Eleocharis macrostachya
Eleocharis macrostachya-Bacopa eisenii
Eleocharis parishii
Elymus triticoides
Juncus balticus
Juncus balticus-Eleocharis macrostachya
Juncus balticus-Distichlis spicata
Muhlenbergia asperifolia
Scirpus maritimus
Scirpus pungens

Disturbed Herbaceous Plant Associations

Bassia hyssopifolia
Bidens frondosa
Chenopodium glaucum
Kochia scoparia
Lactuca serriola
Trifolium fragiferum

Aquatic and submergent Plant Associations

Bacopa eisenii
Chara sp.
Lemna minor
Potamogeton filiformis
Potamogeton pectinatus
Ruppia maritima
Zannichelia palustris

4) Validate the determination by comparing the stand's structure, composition, and site characteristics with the description of the "keyed" community type provided in Appendix D (Constancy and Average Cover of Important Plants in Lahontan Valley Wetland Plant Associations) and Appendix E (Wetland Plant Association Classification).

Key To DOMINANCE GROUPS :

1 . Trees or tree-like shrubs (5 to 20 m tall) dominate the overstory with cover usually equal to or exceeding 30 percent . . . . . **Group A**

1′. Trees or tree-like shrubs not dominant in the overstory 2

2 . Low shrubs (less than or equal to 2 m tall) dominate the overstory with cover at least 20 percent . . . . . **Group B**

2′. Shrubs do not dominate the overstory 3

3 . Graminaceous species dominate the community . . . . . **Group C**

3′. Graminaceous species do not dominate the community 4

4 . Herbaceous species dominate the community . . . . . **Group D**

4′. Aquatic or submergent species dominate the community . . . . . **Group E**

Key to PLANT ASSOCIATIONS:

GROUP A. Tree Associations

1. Association is common in the floodplain of the Carson River 2

1'. Association located on the banks of various wetlands and Lakes 4

2. Association dominant is broad leaved with a thick trunk 3

2'. Association dominant is narrow leaved and located directly adjacent to the active river channel . . ***Salix laevigata*** **p.a.**

3. Association contains a dominant tall grass component . . . . . ***Populus fremontii*** **–** ***Elymus triticoides*** **p.a.**

3.' Association does not contain a dominant tall tall grass component . . . . . ***Populus fremontii*** **p.a.**

4. Association occupies areas adjacent to the high water mark of shallow lakes, river benches and irrigation canals 6

4'. Not as above. Association occupies sites within the floodplain or active channel of the Carson River . . . . . ***Salix exigua*** **p.a.**

5. Association dominant is deciduous and thorny ***Elaeagnus angustifolia*** **p.a.**

5'. Community dominant resembles an evergreen or cedar . . . . . ***Tamarix ramossisima*** **p.a.**

GROUP B. Shrub Plant Associations

1. *Sarcobatus vermiculatus* is the dominant overstory species 2

1′. Not as above 4

2. Association is primarily monotypic . . . . ***Sarcobatus vermiculatus*** **p.a.**

2′. Association is comprised of many different shrub species 3

3. Association codominant is thorny . . . . . ***Sarcobatus vermiculatus-Psorothamnus polydenius*** **p.a.**

3′. Not as above. Often located in ephemeral playas and the Carson Sink. Association codominant often has black leaves in fall . . . . . ***Sarcobatus vermiculatus-Suaeda moquinii*** **p.a.**

4. Soil surface is highly exposed and bare of litter or gravel. Saline conditions may be apparent 5

4′. Soil surface contains high vegetative coverage 6

5. Dominant has leaves which often turn black in late summer and fall . . . . . ***Suaeda moquinii*** **p.a.**

5′. Dominant appears leafless and occurs around Playa lakes . . . . . ***Allenrolfea occidentalis*** **p.a.**

6. Association is primarily located on the west side of Lahontan Valley, adjacent to or within the floodplain of the upper Carson River . . . . . ***Artemisia tridentata*** **ssp.** ***tridentata*** **p.a.**

6′. Association not restricted to Carson River 7

7. Association with round leaves and short spines . . . . . ***Atriplex lentiformis*** **p.a.**

7′. Association composed of multiple species one of which contains yellow flowers throughout the growing season . . . . . ***Chrysothamnus nauseosus-Tetradymia tetrameres*** **p.a.**

GROUP C. Graminaceous Plant Associations

1. Graminaceous community is tall (generally > 1 m) . . . . . **Group C1**

1′. Graminaceous community is generally shorter than 1 m . . . . . **Group C2**

Group C1. Tall Graminaceous Associations

1. Leaf blade cylindric, rounded or absent. Association occupies sites within shallow lakes, ponds or river corridor 2

1′. Leaf blade flat 3

2. Stem appears segmented . . . . . ***Equisetum laevigata* p.a.**

2′. Stem appears smooth . . . . . ***Scirpus acutus* p.a.**

2. Stem is bamboo-like. Association located adjacent to shallow ponds . . . . . ***Phragmites australis* p.a.**

2′. Not as above, stem is solid 3

3. Association is monotypic and is located adjacent to shallow lake, pond, or spring. Wetland habitat may periodically dry out . . . . . ***Typha domingensis* p.a.**

3′. Asociation contains many diognostic species 4

4. Association is equally comprised of *Typha domingensis* and *Scirpus acutus*. Association may occupy sites adjacent to shallow lakes or ponds. Wetland habitat may periodically dry out . . . ***Typha domingensis* - *Scirpus acutus* p.a.**

4′. Not as above. Association located within the active channel of the Carson River or irrigation canals. Association occupies sites with fresh, slow moving water . . . . . ***Typha latifolia* p.a.**

Group C2. Medium-Height and Short Graminaceous Associations

1. Association dominant > 25 cm tall 2

1'. Association dominant < 25 cm tall 8

2. Leaf blade cylindric or rounded 3

2'. Leaf blade flat 6

3. Leaf blade is soft and pliable. Association is monotypic and located in shallow water (5 cm) at the edge of a marsh, pond margin, or vernal depression . . . . . ***Eleocharis macrostachya*** **p.a.**

3'. Association also contains an aquatic element; surface water is perennial ranging form 5 - 15 cm. . . . . ***Eleocharis macrostachya-Bacopa eisenii*** **p.a.**

4. Leaf blade is stiff. Association is generally monotypic and may occupy sites at the edge of a marsh, shallow channel, or in a vernal depression. May also be found in drier sites that periodically desiccate . . . . ***Juncus balticus*** **p.a.**

4'. Association dominant is grass-like or has triangular stem 5

5. Association is located adjacent to marsh or channel in shallow water 5 to 10 cm deep. *Juncus balticus* and *Eleocharis macrostachya* are equal dominants within the community . . ***Juncus balticus-Eleocharis macrostachya*** **p.a.**

5'. Association is comprised of both *Juncus balticus* and *Distichlis spicata*, and occupies sites in wetland habitats that periodically desiccate . . . . ***Juncus balticus-Distichlis spicata*** **p.a.**

6. Association located at the edge of marshes, small ponds or channels, stem is triangular 7

6'. Not as above. Association found in drier habitats within the floodplain of the Carson River or in vernal depressions . . . . . ***Elymus triticoides*** **p.a.**

7. A single leaf (bract) is higher than the seed head . . . . . ***Scirpus pungens*** **p.a.**

7'. Three leaves (bracts) surround the seed head . . . . . ***Scirpus maritimus*** **p.a.**

Short Graminaceous Associations

8. Association dominant appears as a single projection . . . . . *Eleocharis parishii* p.a.

8'. Association dominated by grasses 9

9. Association monotypic and dominated by *Distichlis spicata* . . . . . *Distichlis spicata* p.a.

9'. Association contains many grasses and found on dry sandy soils . . . . . *Muhlenbergia asperifolia* p.a.

GROUP D. Disturbed Herbaceous Plant Associations

1. Association is dominated by a clover, and is primarily distributed in pasturelands within the historical Carson Lake area . . . *Trifolium fragiferum* p.a.

1′. Association dominant not clover; widespread distribution 2

2. Association is distributed on dry lakebeds and along the high water mark of shallow lakes and ponds . . . . . *Bassia hyssopifolia* p.a.

2′. Association is distributed primarily along irrigation ditches 3

3. Association dominant has spiny leaves . . . . . *Lactuca serriola* p.a.

3′. Association dominant does not have spiny leaves 4

4. Leaves are triangular . . . . . *Chenopodium glaucum* p.a.

4′. Leaves are not triangular 5

5. Leaves are long, slender, and rough edged. Yellow flowers apparent in fall . . . . . *Bidens frondosa* p.a.

5′. Dominant is tall (1 m) and bushy . . . . . *Kochia scoparia* p.a.

GROUP E. Aquatic or Submergent Plant Associations

1. Association floating on top of the water 2

1′. Not as above. Association partially or completely submerged 5

2. Association occupies deep, freshwater habitats. Dominant species is small and not rooted in soil . . . . . *Lemna minor* p.a.

2′. Not as above 3

3. Association contains broad leaves and has white flowers. Surface water is shallow (5 to 10 cm). Dominant plant is rooted in the soil . . . . . *Bacopa eisenii* p.a.

3. Submergent community filament-like. No floating leaves on the water surface 4

4. Dominant has small forks where leaf meets stem. Associations found in shallow lakes with clear water . . . . . *Zannichellia palustris* p.a.

4′. Not as above 5

5. Dominant has spiraling leaves along with filamentous leaves. Commonly found in highly saline water . . . . . *Ruppia maritima* p.a.

5′. Not as above 6

6. Association has large whitish-pink seeds. Associations occupy shallow lakes with slightly turbid water . . . . . *Potamogeton pectinatus* p.a.

6′. Not as above 7

7. Association has leaf clusters along the stem . . . . . *Chara* sp. p.a.

7′. Association not as above . . . . . *Potamogeton filiformis* p.a.

Appendix H

Sample site locations and associated data presented in Figure 4

EXPLANATIONS OF COLUMN HEADINGS:

SAMPLE NUMBER: corresponds to the number used for the sample on Figure 4.

SAMPLE ID CODE: a unique code with the initials of the field observer, year, and a sequential number for the sample; assigned in the field and corresponding to field forms.

SAMPLE TYPE: refers to the level of data collected for the sample. See text for further information.

UTM COORDINATES: obtained in 2 ways: for 1993 samples by digitizing sample sites from locations mapped in the field; for 1995 samples, by utilizing a Global Positioning System (GPS).

WETLAND TYPE & SOIL SERIES: for definitions see text and Table 1.

MANAGED AREA: for explanation of codes see text and Table 8.

PLANT ASSOCIATION OR GROUPING: for associations a six-letter acronym is used for the species used in the name. The complete association names are as follows:

ACRONYM	ASSOCIATION FULL NAME
ALLOCC	*Allenrolfea occidentalis Association*
ARTTRI	*Artemisia tridentata ssp. tridentata Association*
ATRLEN	*Atriplex lentiformis Association*
BACEIS	*Bacopa eisenii Association*
BASHYS	*Bassia hyssopifolia Association*
BIDFRO	*Bidens frondosa Association*
CHARA	*Chara sp. Association*
CHEGLA	*Chenopodium glaucum Association*
CHRCON-TETTET	*Chrysothamnus nauseosus ssp. consimilus-* Tetradymia tetrameres Association
DISSPI	*Distichlis spicata Association*
ELAANG	*Elaeagnus angustifolia Association*
ELEMAC	*Eleocharis macrostachya Association*
ELEMAC-BACEIS	*Eleocharis macrostachya-Bacopa eiseniii Association*
ELEPAR	*Eleocharis parishii Association*
ELYTRI	*Elymus tricoides Association*
EQULAE	*Equisetum laevigatum Association*
JUNBAL	*Juncus balticus Association*
JUNBAL-DISSPI	*Juncus balticus-Distichlis spicata Association*
KOCSCO	*Kochia scoparia Association*
LACSER	*Lactuca serriola Association*
LEMMIN	*Lemna minor Association*
MEDSAT	*Medicago sativa Agricultural Field*
MUHASP	*Muhlenbergia asperifolia Association*
PHRAUS	*Phragmites australis Association*
POPFRE	*Populus fremontii Association*
POPFRE/ELYTRI	*Populus fremontii/Elymus triticoides Association*
POTLAT	*Potamogeton latifolia Association*
POTPEC	*Potamogeton pectinata Association*
RUPMAR	*Ruppia maritima Association*
SALEXI	*Salix exigua a*
SALLAE	*Salix laevigata Association*
SARVER	*Sarcobatus vermiculatus Association*
SARVER-PSOPOL	*Sarcobatus vermiculatus-Psorothamnus polydenius Association*
SARVER/SUAMOQ	*Sarcobatus vermiculatus/Suaeda moquinii Association*
SCIACU	*Scirpus acutus Association*
SCIACU-TYPDOM	*Scirpus acutus-Typha domingensis Association*
SCIMAR	*Scirpus maritimus Association*
SCIPUN	*Scirpus pungens Association*
SUAMOQ	*Suaeda moquinii Association*
TAMRAM	*Tamatix ramossisima Association*
TRIFRA	*Trifolium fragiferum Association*
TYPDOM	*Typha domingensis Association*
TYPLAT	*Typha latifolia Association*
ZANPAL	*Zannichellia palustris Association*
ZEAMAY	*Zea mays Agricultural Field*
NO VEGETATION	Samples with no vegetation found
UNCLASSIFIED	Samples not classifiable

TABLE H1: Data for each sample site visited in the Lahontan Valley during the 1993 and 1995 field seasons. For each sample site the following information is provided: a unique code assigned in the field (SAMPLE ID CODE), the year of sampling, the sample type, the UTM coordinates, the wetland type and soil series which together indicate the BIOE of the site, the plant association or other grouping found, and the managed area where the sample was found. Explanation of each column heading is given at the end of the table, as well as full names for the plant associations. See Fig. 4 for locations of samples.

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
1	95EJ409	1995	POINT	365726	4416282	LNe	P3	NO VEGETATION	OUT
2	95EJ434	1995	POINT	364662	4415514	LNe	P3	NO VEGETATION	OUT
3	95JL224	1995	POINT	365693	4414966	LNe	P3	NO VEGETATION	OUT
4	95EJ435	1995	POINT	364008	4414624	LNe	P3	NO VEGETATION	OUT
5	95JL220	1995	POINT	365547	4413562	LNe	P3	NO VEGETATION	OUT
6	95EJ436	1995	POINT	363821	4413217	LNe	P3	NO VEGETATION	OUT
7	95JL221	1995	POINT	366225	4412548	LNe	P3	NO VEGETATION	OUT
8	95EJ437	1995	POINT	364779	4411918	LNe	P3	NO VEGETATION	OUT
9	95JL222	1995	POINT	365256	4411824	LNe	P3	NO VEGETATION	OUT
10	95RB077	1995	POINT	347481	4411052	RN	P3	TAMRAM	OUT
11	95JL223	1995	POINT	365896	4410852	LNe	P3	NO VEGETATION	OUT
12	95RB078	1995	POINT	347786	4410831	RN	P3	TAMRAM	OUT
13	95JL038	1995	POINT	386756	4408756	LNe	P3	NO VEGETATION	OUT
14	95JL036	1995	POINT	386286	4408675	LNe	P3	NO VEGETATION	OUT
15	95JL040	1995	POINT	387091	4408542	LNe	P3	NO VEGETATION	OUT
16	95JL037	1995	POINT	386534	4408522	LNe	P3	NO VEGETATION	OUT
17	95JL039	1995	POINT	386983	4408176	LNe	P3	NO VEGETATION	OUT
18	95EJ226	1995	POINT	386323	4407907	LNe	P3	NO VEGETATION	OUT
19	95EJ224	1995	POINT	386769	4407850	LNe	P3	NO VEGETATION	OUT
20	95JL041	1995	POINT	387218	4407809	LNe	P3	NO VEGETATION	OUT
21	95EJ225	1995	POINT	386164	4407592	LNe	P3	NO VEGETATION	OUT
22	95EJ228	1995	POINT	385729	4407580	LNe	P3	NO VEGETATION	OUT
23	95EJ227	1995	POINT	386122	4407513	LNe	P3	NO VEGETATION	OUT
24	95EJ229	1995	POINT	385563	4407102	LNe	P3	NO VEGETATION	OUT
25	95JL026	1995	POINT	386806	4406900	LNe	P3	NO VEGETATION	OUT
26	95EJ232	1995	POINT	386781	4406695	LNe	P3	NO VEGETATION	OUT
27	95EJ237	1995	POINT	384116	4406618	LNe	P3	NO VEGETATION	OUT
28	95EJ236	1995	POINT	384694	4406605	LNe	P3	NO VEGETATION	OUT
29	95JL027	1995	POINT	387005	4406501	LNe	P3	NO VEGETATION	OUT
30	95JL029	1995	POINT	386545	4406447	LNe	P3	NO VEGETATION	OUT
31	95EJ230	1995	POINT	385912	4406428	LNe	P3	NO VEGETATION	OUT
32	95EJ235	1995	POINT	384845	4406241	LNe	P3	NO VEGETATION	OUT

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
33	95EJ231	1995	POINT	385577	4406220	LNe	P3	NO VEGETATION	OUT
34	95EJ233	1995	POINT	385644	4406208	LNe	P3	NO VEGETATION	OUT
35	95EJ234	1995	POINT	385239	4406196	LNe	P3	NO VEGETATION	OUT
36	95JL029	1995	POINT	386211	4406150	LNe	P3	NO VEGETATION	OUT
37	95JL030	1995	POINT	386475	4406037	LNe	P3	NO VEGETATION	OUT
38	95JL035	1995	POINT	386182	4405907	LNe	P3	NO VEGETATION	OUT
39	95JL031	1995	POINT	386809	4405862	LNe	P3	NO VEGETATION	OUT
40	95RB080	1995	POINT	349143	4405837	LAP	P3	NO VEGETATION	SWMA
41	95JL034	1995	POINT	386198	4405562	LNe	P3	NO VEGETATION	OUT
42	95JL032	1995	POINT	386790	4405505	LNe	P3	NO VEGETATION	OUT
43	95JL033	1995	POINT	386483	4405490	LNe	P3	NO VEGETATION	OUT
44	95RB079	1995	POINT	349183	4404979	LAP	P3	NO VEGETATION	SWMA
45	95RB081	1995	POINT	349967	4404308	RA	P3	NO VEGETATION	SWMA
46	95EJ244	1995	POINT	386228	4403323	LNe	P3	NO VEGETATION	OUT
47	95EJ243	1995	POINT	385898	4403225	LNe	P3	NO VEGETATION	OUT
48	95EJ245	1995	POINT	386669	4403181	LNe	P3	NO VEGETATION	OUT
49	95EJ247	1995	POINT	387080	4403039	LNe	P3	NO VEGETATION	OUT
50	95EJ246	1995	POINT	386763	4402887	LNe	P3	NO VEGETATION	OUT
51	95EJ241	1995	POINT	385735	4402808	LNe	P3	NO VEGETATION	OUT
52	95EJ240	1995	POINT	385206	4402792	LNe	P3	NO VEGETATION	OUT
53	95EJ242	1995	POINT	386033	4402786	LNe	P3	NO VEGETATION	OUT
54	95JL046	1995	POINT	386798	4402517	LNe	P3	NO VEGETATION	OUT
55	95JL045	1995	POINT	386656	4402431	LNe	P3	NO VEGETATION	OUT
56	95JL044	1995	POINT	386471	4402371	LNe	P3	NO VEGETATION	OUT
57	95EJ248	1995	POINT	385598	4402361	LNe	P3	NO VEGETATION	OUT
58	95RB082	1995	POINT	349698	4402298	RA	P3	NO VEGETATION	SWMA
59	95JL043	1995	POINT	386223	4402252	LNe	P3	NO VEGETATION	OUT
60	95JL042	1995	POINT	386072	4402223	LNe	P3	NO VEGETATION	OUT
61	95EJ238	1995	POINT	385841	4402190	LNe	P3	NO VEGETATION	OUT
62	95EJ239	1995	POINT	385039	4402186	LNe	P3	NO VEGETATION	OUT
63	95JL047	1995	POINT	385363	4402178	LNe	P3	NO VEGETATION	OUT
64	95JL049	1995	POINT	385137	4402137	LNe	P3	NO VEGETATION	OUT
65	95JL048	1995	POINT	385163	4402137	LNe	P3	NO VEGETATION	OUT
66	95RB083	1995	POINT	349698	4401952	RA	P3	NO VEGETATION	SWMA
67	95EJ249	1995	POINT	385761	4401943	LNe	P3	NO VEGETATION	OUT
68	95JL050	1995	POINT	384695	4401830	LNe	P3	NO VEGETATION	OUT
69	95EJ250	1995	POINT	386176	4401815	LNe	P3	NO VEGETATION	OUT

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
70	95JL051	1995	POINT	384493	4401762	LNe	P3	NO VEGETATION	OUT
71	95RB084	1995	POINT	349706	4401673	RA	P3	NO VEGETATION	SWMA
72	95EJ255	1995	POINT	385142	4401602	LNe	P3	NO VEGETATION	OUT
73	95EJ258	1995	POINT	384178	4401487	LNe	P3	NO VEGETATION	OUT
74	95EJ254	1995	POINT	385438	4401461	LNe	P3	NO VEGETATION	OUT
75	95EJ256	1995	POINT	384822	4401458	LNe	P3	NO VEGETATION	OUT
76	95EJ251	1995	POINT	386301	4401445	LNe	P3	NO VEGETATION	OUT
77	95EJ257	1995	POINT	384532	4401358	LNe	P3	NO VEGETATION	OUT
78	95EJ252	1995	POINT	386034	4401310	LNe	P3	NO VEGETATION	OUT
79	95EJ253	1995	POINT	385738	4401219	LNe	P3	NO VEGETATION	OUT
80	95EJ361	1995	POINT	360391	4400715	LNe	P3	NO VEGETATION	OUT
81	95EJ366	1995	POINT	362586	4400521	LNe	P3	NO VEGETATION	OUT
82	95EJ362	1995	POINT	360904	4400505	LNe	P3	NO VEGETATION	FNWR
83	95EJ363	1995	POINT	361403	4400390	LNe	P3	NO VEGETATION	FNWR
84	95EJ364	1995	POINT	361940	4400206	LNe	P3	NO VEGETATION	FNWR
85	95EJ367	1995	POINT	362613	4400119	LNe	P3	NO VEGETATION	OUT
86	95EJ368	1995	POINT	362995	4400087	LNe	P3	NO VEGETATION	OUT
87	95EJ371	1995	POINT	363715	4400062	LNe	P3	NO VEGETATION	OUT
88	95EJ359	1995	POINT	359975	4399982	LNe	P3	NO VEGETATION	OUT
89	95EJ370	1995	POINT	363582	4399871	LNe	P3	NO VEGETATION	OUT
90	95EJ360	1995	POINT	360396	4399805	LNe	P3	NO VEGETATION	OUT
91	95EJ369	1995	POINT	363006	4399723	LNe	P3	NO VEGETATION	OUT
92	95EJ372	1995	POINT	363661	4399511	LNe	P3	NO VEGETATION	FNWR
93	95EJ358	1995	POINT	359592	4399389	LNe	P3	NO VEGETATION	FNWR
94	95EJ357	1995	POINT	360093	4399226	LNe	P3	NO VEGETATION	FNWR
95	95JL161	1995	POINT	362243	4399225	LNe	P3	NO VEGETATION	OUT
96	95JL160	1995	POINT	362111	4399193	LNe	P3	NO VEGETATION	OUT
97	95EJ339	1995	POINT	358405	4399177	PAe	P2	NO VEGETATION	OUT
98	95JL162	1995	POINT	362405	4399068	LNe	P3	NO VEGETATION	OUT
99	95JL159	1995	POINT	361924	4399047	LNe	P3	NO VEGETATION	OUT
100	95JL163	1995	POINT	362575	4398961	LNe	P3	NO VEGETATION	FNWR
101	95JL158	1995	POINT	362042	4398879	LNe	P3	NO VEGETATION	OUT
102	95EJ338	1995	POINT	358544	4398808	PAe	P2	NO VEGETATION	OUT
103	95JL155	1995	POINT	361319	4398764	LNe	P3	NO VEGETATION	OUT
104	95JL157	1995	POINT	361851	4398755	LNe	P3	NO VEGETATION	OUT
105	95EJ356	1995	POINT	359983	4398734	LNe	P3	NO VEGETATION	FNWR
106	95JL154	1995	POINT	361039	4398725	LNe	P3	NO VEGETATION	OUT

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
107	95JL164	1995	POINT	362579	4398724	LNe	P3	NO VEGETATION	FNWR
108	95JL151	1995	POINT	360700	4398579	LNe	P3	NO VEGETATION	FNWR
109	95JL152	1995	POINT	360953	4398579	LNe	P3	NO VEGETATION	OUT
110	95JL165	1995	POINT	362664	4398575	LNe	P3	NO VEGETATION	FNWR
111	95EJ365	1995	POINT	362664	4398575	LNe	P3	NO VEGETATION	FNWR
112	95JL156	1995	POINT	361635	4398560	LNe	P3	NO VEGETATION	OUT
113	95JL173	1995	POINT	361329	4398504	LNe	P3	NO VEGETATION	OUT
114	95EJ355	1995	POINT	360328	4398445	LNe	P3	NO VEGETATION	FNWR
115	95JL150	1995	POINT	360545	4398374	LN3	P3	NO VEGETATION	FNWR
116	95JL172	1995	POINT	361619	4398370	LNe	P3	NO VEGETATION	OUT
117	95JL166	1995	POINT	362679	4398361	LNe	P3	NO VEGETATION	FNWR
118	95JL171	1995	POINT	361852	4398293	LNe	P3	NO VEGETATION	OUT
119	95JL016	1995	POINT	382204	4398282	LNe	P3	NO VEGETATION	OUT
120	95JL170	1995	POINT	362073	4398275	LNe	P3	NO VEGETATION	OUT
121	95EJ373	1995	POINT	361265	4398210	LNe	P3	NO VEGETATION	OUT
122	95JL168	1995	POINT	362447	4398183	LNe	P3	NO VEGETATION	FNWR
123	95JL169	1995	POINT	362279	4398177	LNe	P3	NO VEGETATION	OUT
124	95JL015	1995	POINT	383411	4398149	LNe	P3	NO VEGETATION	OUT
125	95JL167	1995	POINT	362645	4398131	LNe	P3	NO VEGETATION	FNWR
126	95EJ337	1995	POINT	358713	4397993	PAe	P2	DISSPI	FNWR
127	95EJ336	1995	POINT	353590	4397955	PAe	P2	DISSPI	SWMA
128	95EJ374	1995	POINT	361041	4397896	LNe	P3	NO VEGETATION	FNWR
129	95EJ213	1995	POINT	385010	4397870	LNe	P3	NO VEGETATION	OUT
130	95JL014	1995	POINT	383815	4397851	LNe	P3	UNCLASSIFIED	OUT
131	95EJ214	1995	POINT	385547	4397790	LNe	P3	NO VEGETATION	OUT
132	95EJ378	1995	POINT	359920	4397782	LNe	D3	NO VEGETATION	FNWR
133	95JL013	1995	POINT	384361	4397528	LNe	P3	UNCLASSIFIED	SNWR
134	95EJ375	1995	POINT	361487	4397521	LNe	P3	NO VEGETATION	FNWR
135	95EJ215	1995	POINT	385668	4397491	LNe	P3	NO VEGETATION	OUT
136	95JL174	1995	POINT	359972	4397472	LNe	D3	NO VEGETATION	FNWR
137	95JL017	1995	POINT	382560	4397463	LNe	P3	NO VEGETATION	SNWR
138	95EJ376	1995	POINT	359192	4397449	LNe	D3	NO VEGETATION	FNWR
139	95EJ377	1995	POINT	359718	4397362	LNe	D3	NO VEGETATION	FNWR
140	95EJ212	1995	POINT	384750	4397362	LNe	P3	NO VEGETATION	SNWR
141	95EJ195	1995	POINT	381303	4397310	LNe	L2	NO VEGETATION	SNWR
142	95JL175	1995	POINT	360265	4397302	LNe	D3	NO VEGETATION	FNWR
143	95EJ340	1995	POINT	357498	4397293	PAe	P2	DISSPI	FNWR

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
144	95JL176	1995	POINT	360477	4397275	LNe	D3	NO VEGETATION	FNWR
145	95EJ216	1995	POINT	385341	4397275	LNe	P3	NO VEGETATION	OUT
146	95EJ379	1995	POINT	361118	4397262	LNe	P3	NO VEGETATION	FNWR
147	95EJ196	1995	POINT	381049	4397158	LNe	L2	NO VEGETATION	SNWR
148	95EJ217	1995	POINT	384788	4397119	LNe	P3	NO VEGETATION	SNWR
149	95JL177	1995	POINT	360869	4397116	LNe	D3	NO VEGETATION	FNWR
150	95EJ223	1995	POINT	380782	4396976	LNe	L2	NO VEGETATION	SNWR
151	95EJ194	1995	POINT	381377	4396953	LNe	L2	NO VEGETATION	SNWR
152	95JL001	1995	POINT	382788	4396923	LNe	P3	NO VEGETATION	SNWR
153	95JL180	1995	POINT	360254	4396882	LNe	D3	NO VEGETATION	FNWR
154	95JL179	1995	POINT	360476	4396823	LNe	D3	NO VEGETATION	FNWR
155	95JL004	1995	POINT	383468	4396804	LNe	P3	NO VEGETATION	SNWR
156	95JL178	1995	POINT	360710	4396801	LNe	D3	NO VEGETATION	FNWR
157	95JL006	1995	POINT	384207	4396787	LNe	P3	UNCLASSIFIED	SNWR
158	95JL003	1995	POINT	383223	4396780	LNe	P3	NO VEGETATION	SNWR
159	95JL002	1995	POINT	383008	4396752	LNe	P3	NO VEGETATION	SNWR
160	95JL005	1995	POINT	383855	4396707	LNe	P3	NO VEGETATION	SNWR
161	95EJ222	1995	POINT	381419	4396705	LNe	L2	NO VEGETATION	SNWR
162	95EJ345	1995	POINT	355883	4396645	LNe	P2	NO VEGETATION	SWMA
163	95EJ344	1995	POINT	357371	4396643	PAe	P2	BASHYS	FNWR
164	95JL007	1995	POINT	384522	4396627	LNe	P3	UNCLASSIFIED	SNWR
165	95EJ349	1995	POINT	357712	4396482	PAe	P2	NO VEGETATION	FNWR
166	95EJ221	1995	POINT	381981	4396442	LNe	L2	NO VEGETATION	SNWR
167	95JL008	1995	POINT	384370	4396416	LNe	P3	UNCLASSIFIED	SNWR
168	95EJ350	1995	POINT	357362	4396305	PAe	P2	NO VEGETATION	FNWR
169	95EJ351	1995	POINT	359150	4396290	PAe	D3	BASHYS	FNWR
170	95EJ220	1995	POINT	381689	4396259	LNe	L2	NO VEGETATION	SNWR
171	95JL024	1995	POINT	380422	4396192	LNe	L2	NO VEGETATION	SNWR
172	95JL011	1995	POINT	383828	4396187	LNe	P3	NO VEGETATION	SNWR
173	95EJ218	1995	POINT	380716	4396145	LNe	P3	NO VEGETATION	SNWR
174	95EJ348	1995	POINT	356609	4396114	PAe	P2	NO VEGETATION	FNWR
175	95JL009	1995	POINT	384338	4396084	LNe	P3	UNCLASSIFIED	SNWR
176	95JL018	1995	POINT	380525	4396031	LNe	L2	NO VEGETATION	SNWR
177	95JL010	1995	POINT	384006	4395956	LNe	P3	UNCLASSIFIED	SNWR
178	95JL012	1995	POINT	384174	4395875	LNe	P3	UNCLASSIFIED	SNWR
179	95EJ219	1995	POINT	381445	4395828	LNe	L2	NO VEGETATION	SNWR
180	95JL019	1995	POINT	380776	4395776	LNe	L2	NO VEGETATION	SNWR

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
181	95EJ346	1995	POINT	356207	4395758	PAe	P2	DISSPI	FNWR
182	95EJ347	1995	POINT	356207	4395758	PAe	P2	SCIPUN	FNWR
183	95EJ199	1995	POINT	380239	4395756	LNe	L2	NO VEGETATION	SNWR
184	95JL066	1995	POINT	380371	4395754	LNe	L2	NO VEGETATION	SNWR
185	95EJ210	1995	POINT	383363	4395646	LNe	P3	NO VEGETATION	SNWR
186	95EJ211	1995	POINT	384219	4395590	LNe	P3	NO VEGETATION	SNWR
187	95JL023	1995	POINT	380404	4395560	LNe	L2	NO VEGETATION	SNWR
188	95EJ201	1995	POINT	382241	4395528	LNe	P3	NO VEGETATION	SNWR
189	95EJ208	1995	POINT	383048	4395523	LNe	P3	NO VEGETATION	SNWR
190	95JL052	1995	POINT	381683	4395474	LNe	L2	NO VEGETATION	SNWR
191	95JL065	1995	POINT	381004	4395468	LNe	L2	NO VEGETATION	SNWR
192	95EJ341	1995	POINT	360463	4395465	LNP	P3	POTPEC	FNWR
193	95EJ342	1995	POINT	360463	4395465	LNP	P3	DISSPI	FNWR
194	95JL067	1995	POINT	380255	4395378	LNe	L2	UNCLASSIFIED	SNWR
195	95EJ197	1995	POINT	379727	4395350	LNe	L2	NO VEGETATION	SNWR
196	95EJ343	1995	POINT	360013	4395335	PNe	D3	BASHYS	FNWR
197	95EJ209	1995	POINT	383252	4395308	LNe	P3	NO VEGETATION	SNWR
198	95JL020	1995	POINT	380984	4395270	LNe	L2	NO VEGETATION	SNWR
199	95EJ207	1995	POINT	382722	4395212	LNe	P3	NO VEGETATION	SNWR
200	95EJ198	1995	POINT	380106	4395203	LNe	L2	NO VEGETATION	SNWR
201	95JL182	1995	PLOT	359269	4395199	PAe	P3	DISSPI	FNWR
202	95JL053	1995	POINT	381493	4395185	LNe	L2	NO VEGETATION	SNWR
203	95EJ352	1995	POINT	359537	4395158	PNP	D3	BASHYS	FNWR
204	95JL022	1995	POINT	380392	4395099	LNe	L2	NO VEGETATION	SNWR
205	95JL064	1995	POINT	381055	4395082	LNe	L2	NO VEGETATION	SNWR
206	95EJ206	1995	POINT	382538	4395056	LNe	P3	NO VEGETATION	SNWR
207	95JL068	1995	POINT	380055	4394991	LNe	L2	NO VEGETATION	SNWR
208	95EJ353	1995	POINT	360016	4394987	RN	D3	BASHYS	FNWR
209	95EJ202	1995	POINT	382281	4394968	LNe	P3	NO VEGETATION	SNWR
210	95JL069	1995	POINT	380426	4394892	LNe	L2	NO VEGETATION	SNWR
211	95EJ205	1995	POINT	382445	4394835	LNe	P3	NO VEGETATION	SNWR
212	95JL153	1995	POINT	361093	4394800	LNe	P3	NO VEGETATION	SWMA
213	95JL183	1995	POINT	359097	4394791	PAe	P3	BASHYS	SWMA
214	95JL062	1995	POINT	380546	4394743	LNe	L2	NO VEGETATION	SNWR
215	95JL021	1995	POINT	380665	4394735	LNe	L2	NO VEGETATION	SNWR
216	95JL054	1995	POINT	381385	4394727	LNe	L2	NO VEGETATION	SNWR
217	95JL063	1995	POINT	380968	4394703	LNe	L2	NO VEGETATION	SNWR

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
218	95JL055	1995	POINT	381672	4394611	LNe	L2	NO VEGETATION	SNWR
219	95JL192	1995	POINT	372908	4394566	LNe	D3	UNCLASSIFIED	SNWR
220	95JL070	1995	POINT	380227	4394551	LNe	L2	NO VEGETATION	SNWR
221	95JL056	1995	POINT	382008	4394515	LNe	L2	NO VEGETATION	SNWR
222	95EJ203	1995	POINT	382031	4394462	LNe	P3	NO VEGETATION	SNWR
223	95JL061	1995	POINT	380447	4394357	LNe	L2	NO VEGETATION	SNWR
224	95JL072	1995	POINT	379727	4394337	LNe	L2	NO VEGETATION	SNWR
225	95JL058	1995	POINT	381949	4394267	LNe	L2	NO VEGETATION	SNWR
226	95JL057	1995	POINT	381949	4394267	LNe	L2	NO VEGETATION	SNWR
227	95EJ204	1995	POINT	382287	4394229	LNe	P3	NO VEGETATION	SNWR
228	95JL071	1995	POINT	380043	4394199	LNe	L2	NO VEGETATION	SNWR
229	95JL186	1995	PLOT	362667	4394196	LNe	D3	NO VEGETATION	SWMA
230	95JL060	1995	POINT	380856	4394159	LNe	L2	NO VEGETATION	SNWR
231	95JL059	1995	POINT	381189	4394114	LNe	L2	NO VEGETATION	SNWR
232	95JL184	1995	POINT	360178	4394036	LNP	D3	UNCLASSIFIED	SWMA
233	95JL073	1995	POINT	379516	4393981	LNe	L2	NO VEGETATION	SNWR
234	95EJ354	1995	POINT	360396	4393882	LNP	P3	BASHYS	SWMA
235	95JL194	1995	PLOT	373187	4393878	LNe	D3	SUAMOQ	SNWR
236	95JL074	1995	POINT	379164	4393874	LNe	L2	NO VEGETATION	SNWR
237	95JL187	1995	POINT	363003	4393865	LNe	D3	NO VEGETATION	SWMA
238	95JL193	1995	POINT	372535	4393586	LNe	D3	NO VEGETATION	SNWR
239	95JL075	1995	POINT	379123	4393575	LNe	L2	UNCLASSIFIED	SNWR
240	95JL185	1995	POINT	361549	4393408	LNe	D3	SUAMOQ	SWMA
241	95JL081	1995	POINT	380662	4393400	LNe	L2	NO VEGETATION	SNWR
242	95JL188	1995	POINT	363020	4393316	LNe	D3	SARVER	SWMA
243	95JL076	1995	POINT	379436	4393260	LNe	L2	NO VEGETATION	SNWR
244	95JL200	1995	PLOT	375467	4393134	PNe	C3	BASHYS	SNWR
245	95JL195	1995	POINT	371856	4393110	LNe	D3	UNCLASSIFIED	SNWR
246	95JL196	1995	PLOT	371856	4393110	LNe	D3	SARVER/SUAMOQ	SNWR
247	95JL199	1995	POINT	374776	4393070	LNe	C3	SUAMOQ	SNWR
248	95JL123	1995	POINT	377950	4392980	PAe	L2	BASHYS	SNWR
249	95JL080	1995	POINT	380465	4392936	LNe	L2	NO VEGETATION	SNWR
250	95EJ425	1995	POINT	341045	4392885	RN	T1	BASHYS	OUT
251	95JL077	1995	POINT	379256	4392885	LNe	L2	NO VEGETATION	SNWR
252	95JL197	1995	POINT	372267	4392868	LNe	D3	BASHYS	SNWR
253	95JL078	1995	POINT	379269	4392444	LNe	L2	NO VEGETATION	SNWR
254	95JL079	1995	POINT	380093	4392188	LNe	L2	NO VEGETATION	SNWR

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
255	95JL122	1995	POINT	377821	4391984	PAe	L2	BASHYS	SNWR
256	95JL198	1995	POINT	374172	4391291	LNe	C3	UNCLASSIFIED	SNWR
257	95JL113	1995	POINT	378370	4391284	LAP	M1	UNCLASSIFIED	SNWR
258	95JL112	1995	POINT	379305	4391048	LAP	L2	RUPMAR	SNWR
259	95JL121	1995	POINT	378060	4391045	LAP	L2	BASHYS	SNWR
260	95JL110	1995	POINT	379831	4391042	LAP	L2	RUPMAR	SNWR
261	95JL120	1995	POINT	378102	4391011	LAe	M1	BASHYS	SNWR
262	95JL111	1995	POINT	379650	4390957	LAP	L2	RUPMAR	SNWR
263	95JL109	1995	POINT	379987	4390895	LAP	L2	RUPMAR	SNWR
264	95JL108	1995	POINT	380134	4390878	LAP	L2	NO VEGETATION	SNWR
265	95JL119	1995	POINT	377672	4390748	LAP	L2	BASHYS	SNWR
266	95JL107	1995	POINT	380840	4390618	LAP	L2	RUPMAR	SNWR
267	95JL125	1995	POINT	377270	4390474	LAP	L2	BASHYS	SNWR
268	95JL124	1995	POINT	377480	4390451	LAP	L2	BASHYS	SNWR
269	95JL117	1995	POINT	377680	4390407	LAP	M1	UNCLASSIFIED	SNWR
270	95JL189	1995	POINT	358175	4390216	RN	L1	NO VEGETATION	SWMA
271	95JL219	1995	POINT	358175	4390216	RN	L1	DISSPI	SWMA
272	95JL217	1995	POINT	374160	4390117	LAe	C3	BASHYS	SNWR
273	95JL118	1995	POINT	377858	4390081	PAP	M1	ZANPAL	SNWR
274	95EJ278	1995	POINT	376383	4390019	LAP	L2	ZANPAL	SNWR
275	95EJ277	1995	POINT	376383	4390019	LAP	L2	SCIMAR	SNWR
276	95JL116	1995	POINT	377280	4389991	PAP	M1	SCIMAR	SNWR
277	95JL114	1995	POINT	376812	4389806	PAP	M1	SCIMAR	SNWR
278	95JL115	1995	POINT	377006	4389779	PAP	M1	NO VEGETATION	SNWR
279	95EJ280	1995	POINT	376201	4389304	LAP	L2	ZANPAL	SNWR
280	95EJ279	1995	POINT	376201	4389304	LAP	L2	SCIMAR	SNWR
281	95EJ433	1995	POINT	356861	4389187	RN	A2	BASHYS	SWMA
282	95EJ432	1995	PLOT	356861	4389187	RN	A2	ELEPAR	SWMA
283	95EJ282	1995	POINT	376904	4389112	PAP	L2	DISSPI	SNWR
284	95EJ283	1995	POINT	376904	4389112	PAP	L2	SCIMAR	SNWR
285	95EJ281	1995	POINT	378457	4389038	PAe	L2	DISSPI	SNWR
286	95EJ285	1995	POINT	376097	4389017	LAe	L2	SCIMAR	SNWR
287	95JL128	1995	POINT	376484	4388926	LAe	P3	DISSPI	SNWR
288	95JL129	1995	POINT	376484	4388926	LAe	P3	BASHYS	SNWR
289	95JL127	1995	PLOT	376484	4388926	LAe	P3	LACSER	SNWR
290	95EJ284	1995	POINT	376176	4388671	LAe	L2	SCIMAR	SNWR
291	BD93171	1993	PLOT	355363	4388547	PNe	T1	ATRLEN	SWMA

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
292	BD93169	1993	PLOT	355313	4388528	PNP	T1	SCIACU	SWMA
293	BD93170	1993	PLOT	355325	4388496	LNP	T1	POTPEC	SWMA
294	95RB088	1995	POINT	356201	4388373	RN	C2	DISSPI	SWMA
295	BD93168	1993	PLOT	355271	4388342	PNP	T1	SCIACU-TYPDOM	SWMA
296	BD93167	1993	PLOT	355196	4388309	PNP	T1	ELEMAC-BACEIS	SWMA
297	BD93166	1993	PLOT	354890	4388276	LNP	T1	POTPEC	SWMA
298	BD93165	1993	PLOT	354941	4388268	PNP	T1	ELEMAC	SWMA
299	BD93164	1993	PLOT	354937	4388239	PNe	T1	CHRCON-TETTET	SWMA
300	95JL082	1995	PLOT	379328	4388218	PAP	L2	SCIMAR	SNWR
301	95JL083	1995	PLOT	379846	4388210	LAe	P3	BASHYS	SNWR
302	95JL126	1995	POINT	375820	4387901	PAe	C3	DISSPI	SNWR
303	95EJ287	1995	POINT	376292	4387892	LAe	L2	SCIMAR	SNWR
304	95EJ286	1995	POINT	376292	4387892	LAe	L2	DISSPI	SNWR
305	95JL130	1995	POINT	376241	4387529	PAe	L2	DISSPI	SNWR
306	BD93105	1993	PLOT	334464	4387433	PNe	T1	SARVER	OUT
307	BD93106	1993	PLOT	334453	4387336	PNe	T1	SARVER-PSOPOL	OUT
308	95JL132	1995	POINT	376845	4387061	LAP	L2	DISSPI	SNWR
309	95JL133	1995	POINT	376845	4387061	LAP	L2	SCIMAR	SNWR
310	95JL131	1995	POINT	376967	4386935	LAP	L2	SCIMAR	SNWR
311	BD93107	1993	PLOT	333293	4386918	PNe	T1	DISSPI	OUT
312	95JL091	1995	POINT	377021	4386817	PAP	M1	DISSPI	SNWR
313	95JL207	1995	POINT	354316	4386800	PNe	R1	TAMRAM	SWMA
314	95RB086	1995	POINT	354541	4386798	RN	L2	SARVER	SWMA
315	95JL092	1995	POINT	376841	4386774	PAP	M1	POTLAT	SNWR
316	BD93108	1993	PLOT	333332	4386766	PNe	P3	DISSPI	OUT
317	95JL094	1995	POINT	376677	4386678	PAP	M1	DISSPI	SNWR
318	95JL096	1995	POINT	376677	4386678	PAP	M1	POTLAT	SNWR
319	95JL095	1995	POINT	376677	4386678	PAP	M1	SCIMAR	SNWR
320	95RB052	1995	PLOT	357306	4386423	PNe	L2	TAMRAM	SWMA
321	95RB008	1995	PLOT	347436	4386246	LNe	P3	NO VEGETATION	SWMA
322	BD93124	1993	PLOT	347328	4386198	LNe	P3	NO VEGETATION	SWMA
323	95JL208	1995	POINT	354416	4386021	RN	R1	JUNBAL	SWMA
324	95JL209	1995	POINT	354416	4386021	RN	R1	TAMRAM	SWMA
325	95JL093	1995	POINT	376841	4385774	PAP	M1	SCIMAR	SNWR
326	95JL191	1995	POINT	372440	4385488	LAP	C3	DISSPI	SNWR
327	95EJ296	1995	POINT	376894	4385290	LAe	L2	TYPLAT	SNWR
328	95EJ298	1995	POINT	376894	4385290	LAe	L2	POTLAT	SNWR

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
329	95EJ297	1995	POINT	376894	4385290	LAe	L2	SCIMAR	SNWR
330	95RB053	1995	POINT	356202	4385217	PNe	T1	DISSPI	SWMA
331	JP93006	1993	PLOT	356757	4385080	PAP	L2	TAMRAM	SWMA
332	95JL190	1995	POINT	371494	4385014	LAP	C3	DISSPI	SNWR
333	95RB051	1995	POINT	357734	4384931	LAP	L2	TAMRAM	SWMA
334	95JL205	1995	POINT	356230	4384896	LAP	R1	JUNBAL	SWMA
335	95JL206	1995	POINT	356230	4384896	LAP	R1	POTLAT	SWMA
336	BD93102	1993	PLOT	330809	4384830	PNP	M1	DISSPI	OUT
337	JP93005	1993	PLOT	356865	4384799	PAP	L2	JUNBAL–DISSPI	SWMA
338	BD93109	1993	PLOT	330188	4384788	PNP	M1	SCIPUN	OUT
339	BD93110	1993	PLOT	330245	4384788	PNe	T1	SARVER/SUAMOQ	OUT
340	BD93101	1993	PLOT	330553	4384722	PNP	T1	TYPDOM	OUT
341	BD93111	1993	PLOT	329241	4384660	LNe	P3	NO VEGETATION	OUT
342	BD93104	1993	PLOT	330184	4384643	PNP	M1	TYPDOM	OUT
343	95RB054	1995	POINT	356087	4384624	PNe	T1	BASHYS	SWMA
344	95JL101	1995	PLOT	378073	4384570	LAe	P3	ALLOCC	SNWR
345	BD93103	1993	PLOT	330302	4384554	PNP	T1	TYPDOM	OUT
346	95RB055	1995	POINT	355861	4384542	PNe	T1	DISSPI	SWMA
347	95EJ414	1995	PLOT	380486	4384435	RA	P3	DISSPI	SNWR
348	95JL102	1995	POINT	378246	4384413	LAe	P3	NO VEGETATION	SNWR
349	95JL089	1995	POINT	375624	4384402	LAP	M1	SCIMAR	SNWR
350	95JL090	1995	POINT	375624	4384402	LAP	M1	SCIACU	SNWR
351	95JL098	1995	POINT	379959	4384392	RA	P3	ALLOCC	SNWR
352	95JL097	1995	POINT	379959	4384392	RA	P3	BASHYS	SNWR
353	95JL213	1995	PLOT	380417	4384379	RA	P3	ALLOCC	SNWR
354	95JL134	1995	POINT	372963	4384311	PAe	M1	DISSPI	SNWR
355	95JL100	1995	PLOT	378090	4384286	LAe	P3	NO VEGETATION	SNWR
356	95JL212	1995	POINT	379002	4384229	LAe	P1	DISSPI	SNWR
357	95RB056	1995	POINT	355601	4384175	PNe	T1	DISSPI	SWMA
358	95JL103	1995	POINT	376827	4384150	LAP	M1	TYPLAT	SNWR
359	95EJ295	1995	POINT	376234	4384074	LAP	M1	JUNBAL	SNWR
360	95EJ294	1995	POINT	376234	4384074	LAP	M1	TYPDOM	SNWR
361	95EJ293	1995	PLOT	376234	4384074	LAP	M1	PHRAUS	SNWR
362	95JL104	1995	POINT	376173	4384040	PAe	M1	DISSPI	SNWR
363	95JL106	1995	POINT	375941	4384016	LAP	M1	SCIACU	SNWR
364	95JL105	1995	POINT	375941	4384016	LAP	M1	SCIMAR	SNWR
365	95JL087	1995	POINT	375402	4383994	LAP	M1	SCIMAR	SNWR

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
366	95JL088	1995	POINT	375402	4383994	LAP	M1	TYPDOM	SNWR
367	95JL216	1995	POINT	378388	4383923	LAe	T1	SUAMOQ	SNWR
368	95JL204	1995	POINT	356295	4383905	PAe	A2	BASHYS	SWMA
369	BD93099	1993	PLOT	328788	4383773	PNP	A2	SCIPUN	OUT
370	95EJ306	1995	POINT	374938	4383652	PAe	M1	SARVER	SNWR
371	95JL099	1995	PLOT	378763	4383645	PAe	P3	BASHYS	SNWR
372	BD93100	1993	PLOT	328432	4383571	PNe	A2	SCIPUN	OUT
373	95EJ300	1995	POINT	375823	4383557	LAP	M1	DISSPI	SNWR
374	95EJ301	1995	POINT	375823	4383557	LAP	M1	SCIMAR	SNWR
375	BD93112	1993	PLOT	328285	4383535	PNe	A2	SARVER/SUAMOQ	OUT
376	BD93146	1993	PLOT	356814	4383496	LAP	A2	NO VEGETATION	SWMA
377	CG93002	1993	PLOT	356560	4383487	PNe	A2	JUNBAL–DISSPI	SWMA
378	BD93147	1993	PLOT	356898	4383476	PNe	A2	CHRCON–TETTET	SWMA
379	95JL084	1995	POINT	373715	4383429	RA	C3	SCIACU	SNWR
380	95JL085	1995	POINT	373715	4383429	RA	C3	DISSPI	SNWR
381	95JL086	1995	POINT	373715	4383429	RA	C3	JUNBAL	SNWR
382	95JL215	1995	PLOT	378612	4383415	PAe	P3	BASHYS	SNWR
383	95RB037	1995	PLOT	352491	4383406	RN	T1	POPFRE	SWMA
384	BD93097	1993	PLOT	328263	4383390	PNP	P1	SCIPUN	OUT
385	95RB046	1995	POINT	356480	4383311	PNe	L2	TRIFRA	SWMA
386	CG93003	1993	PLOT	356746	4383303	PNe	A2	JUNBAL–DISSPI	SWMA
387	95RB042	1995	POINT	356321	4383226	PNe	L2	JUNBAL	SWMA
388	95EJ305	1995	POINT	375366	4383196	LAe	M1	DISSPI	SNWR
389	95EJ309	1995	POINT	376211	4383196	PAe	M1	DISSPI	SNWR
390	BD93098	1993	PLOT	328260	4383187	PNP	P1	SCIPUN	OUT
391	95JL214	1995	PLOT	378424	4383179	RA	P3	DISSPI	SNWR
392	95RB016	1995	POINT	358439	4383107	PNe	A2	TAMRAM	SWMA
393	95EJ299	1995	POINT	377028	4383097	LAP	M1	UNCLASSIFIED	SNWR
394	95EJ310	1995	PLOT	376465	4383009	LAP	M1	PHRAUS	SNWR
395	95EJ311	1995	POINT	376465	4383009	LAP	M1	SCIACU	SNWR
396	95EJ312	1995	POINT	376465	4383009	LAP	M1	DISSPI	SNWR
397	95RB044	1995	POINT	355703	4383007	PNe	T1	TAMRAM	SWMA
398	95RB050	1995	PLOT	358841	4382998	PNe	A2	TAMRAM	SWMA
399	95RB045	1995	POINT	355481	4382978	PNe	T1	TAMRAM	SWMA
400	95EJ303	1995	PLOT	375581	4382978	PAe	M1	LACSER	SNWR
401	95EJ304	1995	POINT	375581	4382978	PAe	M1	TYPLAT	SNWR
402	95EJ308	1995	POINT	374181	4382971	LAP	L2	POTLAT	SNWR

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
403	95EJ307	1995	POINT	374181	4382971	LAP	L2	TYPLAT	SNWR
404	95EJ302	1995	POINT	375745	4382954	PAe	M1	TYPLAT	SNWR
405	95JL211	1995	POINT	375409	4382820	RA	L2	DISSPI	SNWR
406	95JL210	1995	POINT	375409	4382820	RA	L2	TYPLAT	SNWR
407	CG93001	1993	PLOT	356223	4382779	PAP	L2	JUNBAL-DISSPI	SWMA
408	95RB074	1995	POINT	348051	4382761	PNe	T1	NO VEGETATION	SWMA
409	95RB073	1995	POINT	347691	4382731	PNe	T1	NO VEGETATION	SWMA
410	95RB072	1995	POINT	345482	4382503	PNe	H1	SARVER	OUT
411	95JL142	1995	POINT	376087	4382380	LAP	L2	POTLAT	SNWR
412	95EJ322	1995	POINT	374955	4382356	PAe	M1	DISSPI	SNWR
413	95EJ323	1995	POINT	374955	4382356	PAe	M1	SCIMAR	SNWR
414	95EJ324	1995	POINT	374955	4382356	PAe	M1	TYPDOM	SNWR
415	95RB075	1995	POINT	348721	4382292	PNe	T1	NO VEGETATION	SWMA
416	95EJ317	1995	PLOT	375426	4382292	PAe	M1	ALLOCC	SNWR
417	95EJ318	1995	POINT	375426	4382292	PAe	M1	TYPDOM	SNWR
418	95EJ319	1995	POINT	375426	4382292	PAe	M1	SCIMAR	SNWR
419	95EJ320	1995	POINT	375426	4382292	PAe	M1	DISSPI	SNWR
420	95EJ321	1995	PLOT	374955	4382256	PAe	M1	ALLOCC	SNWR
421	95RB043	1995	PLOT	356108	4382205	LAP	L2	ZANPAL	SWMA
422	95EJ315	1995	POINT	376066	4382103	PAP	M1	TYPDOM	SNWR
423	95EJ316	1995	POINT	376066	4382103	PAP	M1	DISSPI	SNWR
424	95EJ314	1995	POINT	376066	4382103	PAP	M1	SCIMAR	SNWR
425	95EJ313	1995	POINT	376066	4382103	PAP	M1	POTLAT	SNWR
426	95JL140	1995	POINT	374306	4382008	LAP	L2	RUPMAR	SNWR
427	95JL141	1995	POINT	374306	4382008	LAP	L2	TYPDOM	SNWR
428	BD93011	1993	PLOT	355235	4381986	PNe	L2	ELEMAC	SWMA
429	BD93010	1993	PLOT	355398	4381973	PAP	L2	JUNBAL-DISSPI	SWMA
430	BD93012	1993	PLOT	355166	4381972	PNe	L2	ELEMAC	SWMA
431	BD93062	1993	PLOT	355723	4381907	PNP	T1	TRIFRA	SWMA
432	95RB009	1995	PLOT	355761	4381897	PNP	T1	JUNBAL	SWMA
433	BD93061	1993	PLOT	355506	4381773	LNP	L2	NO VEGETATION	SWMA
434	BD93063	1993	PLOT	355765	4381773	LNP	T1	SCIPUN	SWMA
435	95RB010	1995	PLOT	355512	4381741	PNP	L2	NO VEGETATION	SWMA
436	BD93064	1993	PLOT	356025	4381737	LNP	L2	NO VEGETATION	SWMA
437	BD93060	1993	PLOT	354764	4381736	RA	L2	JUNBAL-DISSPI	SWMA
438	95EJ430	1995	POINT	357073	4381687	RN	A2	TAMRAM	SWMA
439	BD93009	1993	PLOT	355544	4381643	PNP	L2	JUNBAL-DISSPI	SWMA

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
440	BD93059	1993	PLOT	354559	4381508	RA	T1	POTPEC	SWMA
441	95JL218	1995	POINT	375131	4381408	LAP	P1	TYPDOM	SNWR
442	95RB039	1995	POINT	354954	4381312	PNP	T1	SCIPUN	SWMA
443	95RB040	1995	POINT	354954	4381312	PNP	T1	DISSPI	SWMA
444	BD93055	1993	PLOT	369774	4381290	PAe	C3	JUNBAL	CCLUB
445	95RB105	1995	POINT	354261	4381280	PNe	F1	DISSPI	SWMA
446	95RB104	1995	POINT	354261	4381280	PNe	F1	JUNBAL	SWMA
447	BD93008	1993	PLOT	354490	4381114	PNP	T1	JUNBAL–ELEMAC	SWMA
448	BD93056	1993	PLOT	369771	4381031	PAe	C3	DISSPI	CCLUB
449	BD93052	1993	PLOT	370552	4381023	PAP	C3	JUNBAL–DISSPI	CCLUB
450	BD93083	1993	PLOT	369027	4381006	PAe	M1	DISSPI	CCLUB
451	BD93084	1993	PLOT	368760	4381005	PAe	M1	JUNBAL–DISSPI	CCLUB
452	BD93085	1993	PLOT	366782	4380999	PAe	M1	JUNBAL–DISSPI	CCLUB
453	95RB036	1995	POINT	353502	4380979	PNe	T1	DISSPI	SWMA
454	BD93130	1993	PLOT	348312	4380924	PNe	P3	SARVER–PSOPOL	OUT
455	95JL225	1995	POINT	372307	4380873	RA	P1	TAMRAM	SNWR
456	95JL138	1995	PLOT	374196	4380848	LAP	L2	NO VEGETATION	SNWR
457	95JL139	1995	POINT	374196	4380848	LAP	L2	PHRAUS	SNWR
458	95RB092	1995	POINT	354802	4380822	PAP	T1	SCIPUN	SWMA
459	95RB093	1995	POINT	354802	4380822	PAP	T1	JUNBAL–DISSPI	SWMA
460	95RB002	1995	PLOT	354521	4380821	PNe	L2	JUNBAL–DISSPI	SWMA
461	BD93007	1993	PLOT	354772	4380820	PNe	T1	TRIFRA	SWMA
462	95RB035	1995	POINT	350210	4380803	RA	T1	ELAANG	OUT
463	BD93006	1993	PLOT	354490	4380802	PNe	L2	ELEMAC	SWMA
464	BD93082	1993	PLOT	369782	4380769	PNP	M1	SCIACU–TYPDOM	CCLUB
465	95JL137	1995	POINT	373982	4380756	LAP	L2	NO VEGETATION	SNWR
466	BD93129	1993	PLOT	348334	4380751	LNe	P3	NO VEGETATION	OUT
467	95EJ410	1995	POINT	341930	4380597	LNP	A2	DISSPI	OUT
468	95EJ411	1995	POINT	341930	4380597	LNP	A2	TAMRAM	OUT
469	BD93054	1993	PLOT	370539	4380526	PAP	C3	ELEMAC	CCLUB
470	BD93053	1993	PLOT	370264	4380521	PAe	M1	TYPDOM	CCLUB
471	95RB034	1995	PLOT	354036	4380475	RA	T1	TAMRAM	SWMA
472	95RB033	1995	POINT	353746	4380462	PNe	T1	DISSPI	SWMA
473	95JL135	1995	POINT	373541	4380289	LAP	L2	POTLAT	SNWR
474	95JL136	1995	POINT	373541	4380289	LAP	L2	TYPDOM	SNWR
475	95EJ334	1995	POINT	375504	4380278	LAP	L2	DISSPI	SNWR
476	95EJ333	1995	POINT	375504	4380278	LAP	L2	POTLAT	SNWR

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
477	95EJ335	1995	POINT	375504	4380278	LAP	L2	DISSPI	SNWR
478	95RB041	1995	POINT	355281	4380267	PNP	T1	DISSPI	SWMA
479	95EJ412	1995	PLOT	342212	4380217	LNe	A2	DISSPI	OUT
480	95EJ413	1995	POINT	342212	4380217	LNe	A2	TAMRAM	OUT
481	BD93134	1993	PLOT	343737	4380146	PNe	B1	SARVER	OUT
482	BD93136	1993	PLOT	343439	4380066	LNe	P3	TAMRAM	OUT
483	BD93135	1993	PLOT	343700	4380063	LNe	B1	TAMRAM	OUT
484	95EJ431	1995	POINT	356920	4379920	RN	D1	ELEMAC	OUT
485	95RB032	1995	POINT	351022	4379856	PNe	T1	BASHYS	OUT
486	95EJ326	1995	POINT	372635	4379572	LAP	B4	JUNBAL	SNWR
487	95EJ327	1995	POINT	372635	4379572	LAP	B4	SCIMAR	SNWR
488	95EJ325	1995	PLOT	372635	4379572	LAP	B4	MUHASP	SNWR
489	BD93132	1993	PLOT	345478	4379343	LNe	A2	NO VEGETATION	OUT
490	BD93131	1993	PLOT	345528	4379297	PNe	A2	SUAMOQ	OUT
491	BD93178	1993	PLOT	365677	4379287	PNP	B4	TRIFRA	SWMA
492	BD93179	1993	PLOT	365690	4379249	PNe	B4	DISSPI	SWMA
493	BD93180	1993	PLOT	365628	4379210	PNe	B4	DISSPI	SWMA
494	95RB100	1995	POINT	345541	4379094	PNe	T1	NO VEGETATION	OUT
495	95RB099	1995	POINT	345541	4379094	PNe	T1	JUNBAL–DISSPI	OUT
496	95RB098	1995	POINT	345541	4379094	PNe	T1	SCIMAR	OUT
497	95RB101	1995	POINT	345541	4379094	PNe	T1	DISSPI	OUT
498	95EJ187	1995	PLOT	370992	4378985	RA	C3	DISSPI	SNWR
499	95EJ330	1995	POINT	372300	4378964	LAP	M1	SCIMAR	SNWR
500	95EJ328	1995	POINT	372300	4378964	LAP	M1	BASHYS	SNWR
501	95EJ329	1995	PLOT	372300	4378964	LAP	M1	DISSPI	SNWR
502	95EJ289	1995	POINT	372814	4378926	LAP	L2	POTPEC	SNWR
503	95EJ288	1995	POINT	372814	4378926	LAP	L2	SCIMAR	SNWR
504	BD93133	1993	PLOT	339692	4378917	LNe	S2	NO VEGETATION	OUT
505	95EJ190	1995	POINT	369796	4378859	PAe	S3	MEDSAT	SNWR
506	95EJ291	1995	POINT	372806	4378781	LAP	L2	POTPEC	SNWR
507	95EJ290	1995	POINT	372806	4378781	LAP	L2	SCIMAR	SNWR
508	95EJ188	1995	POINT	370498	4378707	PAP	C3	SARVER	SNWR
509	95RB029	1995	POINT	348382	4378672	PNe	T1	DISSPI	OUT
510	95RB031	1995	POINT	347562	4378653	PNe	T1	BASHYS	OUT
511	95RB030	1995	PLOT	348563	4378615	PNe	T1	DISSPI	OUT
512	95EJ332	1995	POINT	372081	4378505	LAP	M1	TYPDOM	SNWR
513	95EJ331	1995	POINT	372081	4378505	LAP	M1	DISSPI	SNWR

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
514	BD93015	1993	PLOT	362746	4378460	PNP	C2	JUNBAL–DISSPI	FIR
515	BD93058	1993	PLOT	351545	4378325	RN	D1	SALLAE	OUT
516	95RB060	1995	POINT	347402	4378310	LNe	T1	NO VEGETATION	OUT
517	95RB061	1995	POINT	347477	4378283	PNe	T1	NO VEGETATION	OUT
518	95RB027	1995	POINT	348340	4378101	PNe	T1	SCIMAR	OUT
519	95RB048	1995	POINT	351892	4378093	RA	T1	NO VEGETATION	OUT
520	BD93057	1993	PLOT	351044	4378061	RN	D1	SALLAE	OUT
521	95RB028	1995	POINT	348478	4378017	PNe	T1	DISSPI	OUT
522	95RB047	1995	POINT	352541	4377921	PNe	T1	DISSPI	OUT
523	BD93122	1993	PLOT	348217	4377847	PNe	T1	SARVER	OUT
524	BD93123	1993	PLOT	348110	4377824	LNe	T1	NO VEGETATION	OUT
525	95EJ292	1995	POINT	371204	4377821	LAP	L2	DISSPI	SNWR
526	95EJ177	1995	PLOT	366782	4377817	RA	C2	SCIACU	SNWR
527	BD93019	1993	PLOT	361236	4377727	PNP	S1	JUNBAL–DISSPI	FIR
528	BD93121	1993	PLOT	348128	4377699	PNP	T1	SCIPUN	OUT
529	BD93017	1993	PLOT	362246	4377492	RA	S1	ELEMAC	FIR
530	BD93016	1993	PLOT	361998	4377490	PAP	M1	JUNBAL–DISSPI	FIR
531	BD93120	1993	PLOT	330095	4377406	PNP	M1	JUNBAL	OUT
532	95JL181	1995	POINT	359700	4377285	LNe	D3	NO VEGETATION	OUT
533	95EJ176	1995	POINT	363489	4377262	RA	B4	ELYTRI	OUT
534	BD93020	1993	PLOT	360738	4377260	PNe	S1	JUNBAL–ELEMAC	FIR
535	BD93018	1993	PLOT	361985	4377247	PNP	M1	ELEMAC–BACEIS	FIR
536	95EJ178	1995	PLOT	366685	4377217	RA	C2	CHEGLA	SNWR
537	BD93028	1993	PLOT	338960	4377211	LNP	S2	NO VEGETATION	OUT
538	95EJ189	1995	PLOT	370104	4377189	RA	C3	POPFRE	SNWR
539	95RB007	1995	PLOT	338980	4377114	LNP	S2	RUPMAR	OUT
540	95RB064	1995	PLOT	338407	4377113	LNP	L2	RUPMAR	OUT
541	BD93174	1993	PLOT	361542	4377104	PNe	M1	JUNBAL–DISSPI	FIR
542	95RB063	1995	PLOT	349156	4377098	LNP	L2	RUPMAR	OUT
543	JP93004	1993	PLOT	360082	4377064	PNP	D1	JUNBAL–DISSPI	FIR
544	95RB059	1995	POINT	347072	4377001	LNe	A2	DISSPI	OUT
545	95EJ185	1995	POINT	368269	4376989	RA	C2	ELEMAC	SNWR
546	95EJ184	1995	POINT	368743	4376988	RA	C2	ELEMAC	SNWR
547	BD93004	1993	PLOT	351794	4376976	PNP	P2	DISSPI	OUT
548	95RB070	1995	PLOT	347962	4376951	PNe	T1	LACSER	OUT
549	BD93005	1993	PLOT	351559	4376920	PNe	P2	JUNBAL–DISSPI	OUT
[illegible]	JP93003	1993	PLOT	360063	4376827	PNP	S3	TRIFRA	FIR

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
551	95RB065	1995	PLOT	338208	4376821	LNP	L2	RUPMAR	OUT
552	BD93119	1993	PLOT	330833	4376765	LNe	M1	SCIACU	OUT
553	BD93118	1993	PLOT	330988	4376734	LNe	A2	DISSPI	OUT
554	95RB096	1995	POINT	348268	4376701	PNe	L2	SCIACU	OUT
555	95RB097	1995	POINT	348268	4376701	PNe	L2	JUNBAL	OUT
556	JP93002	1993	PLOT	360060	4376625	PNP	P2	TRIFRA	FIR
557	BD93029	1993	PLOT	340026	4376581	RA	S2	SARVER	OUT
558	95RB026	1995	POINT	347071	4376526	LAe	L1	TAMRAM	OUT
559	BD93116	1993	PLOT	331332	4376468	LNe	L2	DISSPI	OUT
560	95RB025	1995	PLOT	347612	4376417	LAe	L1	TAMRAM	OUT
561	BD93117	1993	PLOT	331173	4376298	LNe	L2	NO VEGETATION	OUT
562	JP93001	1993	PLOT	360067	4376293	PNP	D1	JUNBAL-DISSPI	FIR
563	95RB062	1995	PLOT	348921	4376194	LNP	L2	RUPMAR	OUT
564	BD93173	1993	PLOT	361548	4376125	PAP	P1	SCIACU-TYPDOM	FIR
565	95RB058	1995	PLOT	346214	4376087	LNe	L2	SCIACU-TYPDOM	OUT
566	BD93172	1993	PLOT	361515	4376067	PAe	P1	JUNBAL-DISSPI	FIR
567	95RB068	1995	POINT	347298	4376042	LNe	L2	TAMRAM	OUT
568	95RB067	1995	POINT	347649	4376031	LNe	L2	TAMRAM	OUT
569	BD93125	1993	PLOT	336500	4375985	PNe	T1	MUHASP	OUT
570	BD93175	1993	PLOT	361384	4375960	PNe	D2	ELYTRI	FIR
571	BD93115	1993	PLOT	331848	4375949	LNe	T1	SARVER	OUT
572	BD93126	1993	PLOT	336378	4375908	PNe	S2	JUNBAL	OUT
573	BD93114	1993	PLOT	332065	4375907	LNe	T1	SARVER	OUT
574	BD93127	1993	PLOT	336448	4375876	PNP	S2	SCIPUN	OUT
575	BD93176	1993	PLOT	361375	4375861	PNe	P2	JUNBAL-DISSPI	FIR
576	BD93128	1993	PLOT	336380	4375808	PNe	S2	DISSPI	OUT
577	95RB066	1995	PLOT	338712	4375808	LNP	L2	RUPMAR	OUT
578	BD93003	1993	PLOT	338653	4375788	PNe	S2	SCIPUN	OUT
579	95RB069	1995	POINT	347180	4375782	RA	T1	TYPLAT	OUT
580	95EJ179	1995	PLOT	366681	4375776	RA	C2	SCIACU	SNWR
581	95RB024	1995	PLOT	346483	4375741	RA	T1	POTPEC	OUT
582	BD93113	1993	PLOT	332532	4375667	LNe	P1	DISSPI	OUT
583	BD93177	1993	PLOT	361224	4375602	PNe	D2	TRIFRA	FIR
584	BD93001	1993	PLOT	338200	4375579	PAP	S2	SCIPUN	OUT
585	BD93021	1993	PLOT	361250	4375499	PNP	D2	TYPDOM	FIR
586	95RB049	1995	POINT	352943	4375487	LAP	C4	TAMRAM	OUT
587	BD93002	1993	PLOT	338045	4375475	PNe	S2	SARVER	OUT

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
588	BD93051	1993	PLOT	368482	4375474	RA	C3	DISSPI	SNWR
589	95JL201	1995	POINT	353154	4375380	PAe	C4	SARVER	OUT
590	95RB095	1995	POINT	345301	4375298	RA	T1	TYPLAT	OUT
591	95RB094	1995	POINT	345301	4375298	RA	T1	ELAANG	OUT
592	BD93022	1993	PLOT	361014	4375257	PNe	P2	JUNBAL	FIR
593	BD93086	1993	PLOT	364780	4375235	RA	S3	ELYTRI	OUT
594	95EJ183	1995	POINT	369236	4375187	RA	C3	ALLOCC	SNWR
595	95EJ415	1995	POINT	370635	4375072	LAP	L2	TYPLAT	SNWR
596	BD93081	1993	PLOT	370776	4375035	LAP	L2	POTPEC	SNWR
597	BD93047	1993	PLOT	370276	4375019	LAP	L2	SCIMAR	SNWR
598	95EJ416	1995	POINT	370176	4374817	LAP	M1	TYPLAT	SNWR
599	95EJ417	1995	POINT	370176	4374817	LAP	M1	SCIACU	SNWR
600	95EJ418	1995	POINT	370176	4374817	LAP	M1	POTLAT	SNWR
601	BD93048	1993	PLOT	370021	4374772	LAP	L2	SCIMAR	SNWR
602	95JL202	1995	POINT	353800	4374613	LNe	C4	TAMRAM	OUT
603	95EJ182	1995	POINT	367186	4374578	RA	C2	ELEMAC	SNWR
604	BD93027	1993	PLOT	346012	4374519	RA	S1	TYPLAT	OUT
605	BD93026	1993	PLOT	346260	4374514	RA	E1	NO VEGETATION	OUT
606	95EJ419	1995	POINT	369727	4374482	LAP	L2	TYPLAT	SNWR
607	BD93087	1993	PLOT	364723	4374470	RA	W1	TYPDOM	OUT
608	95EJ424	1995	POINT	368929	4374377	LAP	C2	TYPLAT	SNWR
609	BD93049	1993	PLOT	370033	4374257	LAP	L2	TAMRAM	SNWR
610	95EJ420	1995	POINT	369709	4374218	LAP	L2	POTLAT	SNWR
611	95JL203	1995	POINT	351935	4374027	PNP	C4	NO VEGETATION	OUT
612	BD93025	1993	PLOT	349537	4374021	RN	D2	SALLAE	OUT
613	BD93023	1993	PLOT	349002	4374019	RN	A1	SALLAE	OUT
614	95EJ422	1995	POINT	369492	4373993	LAP	L2	TYPLAT	SNWR
615	95EJ421	1995	POINT	369492	4373993	LAP	L2	SCIACU	SNWR
616	BD93024	1993	PLOT	349211	4373951	RN	D1	SALLAE	OUT
617	95EJ181	1995	POINT	367201	4373787	RA	C2	BASHYS	SNWR
618	BD93088	1993	PLOT	363013	4373758	RA	B4	ELEMAC	FIR
619	BD93050	1993	PLOT	370273	4373756	LAP	L2	SCIMAR	SNWR
620	95EJ180	1995	POINT	367717	4373693	RA	C2	BASHYS	SNWR
621	95EJ423	1995	POINT	369271	4373618	LAP	L2	TYPLAT	SNWR
622	95EJ144	1995	POINT	329350	4373313	PNe	A1	MEDSAT	OUT
623	95EJ143	1995	POINT	328172	4373250	PNe	R2	SCIACU	OUT
624	BD93190	1993	PLOT	328165	4372924	PNP	F2	TYPLAT	OUT

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
625	BD93193	1993	PLOT	327591	4372918	RN	E1	TYPLAT	OUT
626	BD93189	1993	PLOT	328234	4372909	PNe	F2	POPFRE/ELYTRI	OUT
627	BD93192	1993	PLOT	327543	4372903	PNP	E1	LEMMIN	OUT
628	BD93194	1993	PLOT	327636	4372896	RN	E1	TYPLAT	OUT
629	BD93191	1993	PLOT	327572	4372873	PNe	E1	JUNBAL	OUT
630	BD93195	1993	PLOT	327920	4372833	PNe	D1	POPFRE/ELYTRI	OUT
631	95EJ391	1995	POINT	326220	4372570	RA	B2	EQULAE	OUT
632	95EJ399	1995	POINT	323284	4372466	RA	B3	LACSER	OUT
633	95EJ398	1995	POINT	323284	4372466	RA	B3	LACSER	OUT
634	95EJ186	1995	POINT	347242	4372437	PNP	D1	UNCLASSIFIED	OUT
635	95EJ164	1995	POINT	346986	4372192	RA	A2	BIDFRO	CITY
636	95EJ388	1995	POINT	348129	4372067	RA	C4	SCIACU	CITY
637	95EJ132	1995	POINT	337125	4372009	RA	T1	SALEXI	OUT
638	BD93077	1993	PLOT	357009	4371904	RA	F2	JUNBAL-DISSPI	OUT
639	95EJ385	1995	POINT	353206	4371893	PAe	D1	MEDSAT	OUT
640	95EJ387	1995	POINT	350435	4371871	PNe	C4	SARVER	OUT
641	BD93186	1993	PLOT	344494	4371788	RN	D2	ELYTRI	OUT
642	95EJ133	1995	PLOT	336607	4371786	RA	T1	POTLAT	OUT
643	BD93066	1993	PLOT	350984	4371728	LAP	L2	ZANPAL	OUT
644	BD93068	1993	PLOT	351246	4371719	LAP	L2	SCIACU	OUT
645	95EJ427	1995	POINT	338111	4371690	RA	A1	DISSPI	OUT
646	BD93184	1993	PLOT	344348	4371665	RN	F2	SALEXI	OUT
647	BD93185	1993	PLOT	344394	4371664	RN	F2	SCIACU	OUT
648	BD93067	1993	PLOT	351011	4371624	PAP	C4	ELYTRI	OUT
649	BD93065	1993	PLOT	350803	4371599	PAP	C4	JUNBAL-ELEMAC	OUT
650	BD93187	1993	PLOT	344234	4371582	RN	A1	TYPLAT	OUT
651	95EJ386	1995	POINT	352993	4371577	PAe	R1	MEDSAT	OUT
652	BD93188	1993	PLOT	344168	4371561	RN	A1	TYPLAT	OUT
653	95EJ142	1995	POINT	338442	4371466	RA	P2	BASHYS	OUT
654	BD93080	1993	PLOT	354000	4371463	RA	D1	KOCSCO	OUT
655	BD93078	1993	PLOT	355742	4371433	RA	D1	KOCSCO	OUT
656	BD93079	1993	PLOT	355514	4371423	RA	F2	KOCSCO	OUT
657	95EJ428	1995	POINT	340957	4371376	RN	A1	POPFRE	OUT
658	95EJ392	1995	POINT	330829	4371245	RA	B1	UNCLASSIFIED	OUT
659	95EJ426	1995	POINT	338273	4370904	RA	D1	DISSPI	OUT
660	BD93074	1993	PLOT	359984	4370709	RA	A2	JUNBAL-DISSPI	OUT
661	95EJ155	1995	POINT	343204	4370682	RA	F2	ZANPAL	OUT

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
662	BD93075	1993	PLOT	358655	4370508	PAP	L2	TRIFRA	OUT
663	BD93076	1993	PLOT	358487	4370462	PAP	L2	JUNBAL	OUT
664	BD93073	1993	PLOT	359992	4370248	RA	A2	JUNBAL	OUT
665	BD93144	1993	PLOT	322846	4370134	RN	B2	SALEXI	OUT
666	BD93143	1993	PLOT	323071	4370091	RN	B2	ARTTRI	OUT
667	95RB006	1995	PLOT	323091	4370087	RN	B4	POPFRE	OUT
668	BD93145	1993	PLOT	323980	4370023	RN	S1	POPFRE/ELYTRI	OUT
669	95EJ167	1995	POINT	340586	4369981	LAP	S1	ZEAMAY	OUT
670	BD93141	1993	PLOT	321928	4369977	PNe	B3	SARVER	OUT
671	95EJ397	1995	POINT	343756	4369827	PAe	F1	MEDSAT	OUT
672	95EJ429	1995	POINT	361542	4369772	RA	S4	TAMRAM	OUT
673	BD93142	1993	PLOT	322278	4369686	LAP	L2	NO VEGETATION	OUT
674	BD93183	1993	PLOT	357407	4369525	PNe	M1	JUNBAL–DISSPI	OUT
675	BD93069	1993	PLOT	358488	4369447	PAP	M1	TYPDOM	OUT
676	BD93070	1993	PLOT	358237	4369241	PAe	M1	JUNBAL–DISSPI	OUT
677	BD93072	1993	PLOT	358729	4369237	PAP	M1	TYPDOM	OUT
678	BD93071	1993	PLOT	358474	4369231	PAP	M1	TYPDOM	OUT
679	95EJ396	1995	POINT	344146	4369213	RA	D2	BIDFRO	OUT
680	95EJ130	1995	PLOT	335819	4369113	PAe	L2	ELEMAC	OUT
681	95EJ131	1995	POINT	335479	4368927	PAe	L2	BASHYS	OUT
682	95EJ165	1995	POINT	340993	4368627	PAe	A2	MEDSAT	OUT
683	95EJ141	1995	POINT	337056	4368582	LNe	L2	TAMRAM	OUT
684	95EJ156	1995	POINT	340469	4368282	RA	S1	ELYTRI	OUT
685	BD93137	1993	PLOT	358746	4368020	PNP	A2	JUNBAL–ELEMAC	OUT
686	BD93138	1993	PLOT	358785	4367932	PNe	A2	SARVER/SUAMOQ	OUT
687	BD93095	1993	PLOT	343182	4367871	PNP	D1	ELEMAC	OUT
688	BD93139	1993	PLOT	358691	4367746	PNP	C1	JUNBAL–ELEMAC	OUT
689	95EJ126	1995	POINT	338083	4367726	PNe	A2	DISSPI	OUT
690	BD93094	1993	PLOT	341270	4367723	RA	A2	TYPLAT	OUT
691	BD93096	1993	PLOT	343008	4367723	PNP	D1	ELEMAC	OUT
692	95EJ157	1995	POINT	339815	4367722	PAe	S1	MEDSAT	OUT
693	BD93140	1993	PLOT	358757	4367689	PNe	B4	SARVER/SUAMOQ	OUT
694	95EJ140	1995	POINT	337320	4367523	PNe	T1	TAMRAM	OUT
695	95EJ125	1995	POINT	337720	4367241	PNP	T1	DISSPI	OUT
696	95EJ129	1995	POINT	332817	4367020	PAe	T1	TAMRAM	OUT
697	95EJ121	1995	POINT	336986	4366904	LAP	L2	NO VEGETATION	OUT
698	95EJ128	1995	POINT	332623	4366783	PAe	T1	TAMRAM	OUT

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
699	95EJ154	1995	POINT	346762	4366704	RA	D1	SCIACU	OUT
700	95EJ139	1995	POINT	337985	4366699	PNe	T1	JUNBAL–DISSPI	OUT
701	95EJ124	1995	POINT	337603	4366655	LAP	L2	TAMRAM	OUT
702	95EJ123	1995	POINT	337395	4366565	LAP	L2	NO VEGETATION	OUT
703	95EJ138	1995	POINT	337319	4366549	PNe	A2	BASHYS	OUT
704	95EJ166	1995	POINT	343631	4366523	PNP	D2	MEDSAT	OUT
705	95EJ122	1995	POINT	337179	4366456	LAP	L2	UNCLASSIFIED	OUT
706	95EJ152	1995	POINT	346771	4366421	RA	D1	TYPLAT	OUT
707	95EJ136	1995	POINT	337080	4366368	PNP	A2	JUNBAL–DISSPI	OUT
708	95EJ127	1995	POINT	332847	4366315	PAe	T1	TAMRAM	OUT
709	95EJ153	1995	POINT	346766	4366287	RA	D1	SCIACU	OUT
710	95EJ137	1995	POINT	337577	4366259	PNe	A2	BASHYS	OUT
711	95EJ120	1995	POINT	336186	4366004	LAP	L2	NO VEGETATION	OUT
712	BD93093	1993	PLOT	342275	4365982	RA	S1	KOCSCO	OUT
713	95EJ149	1995	POINT	347249	4365922	RA	D1	SCIACU	OUT
714	95EJ150	1995	POINT	347486	4365919	RA	D1	SALEXI	OUT
715	95EJ151	1995	POINT	347721	4365907	RA	D1	POPFRE/ELYTRI	OUT
716	95EJ148	1995	POINT	346876	4365782	RA	S1	ELYTRI	OUT
717	95EJ134	1995	PLOT	335803	4365627	PNP	A2	DISSPI	OUT
718	95EJ115	1995	POINT	335481	4365618	PAP	L2	NO VEGETATION	OUT
719	95EJ110	1995	POINT	336486	4365616	PNP	A2	UNCLASSIFIED	OUT
720	95EJ135	1995	POINT	335824	4365377	PNP	A2	DISSPI	OUT
721	95EJ114	1995	POINT	335304	4365298	LAP	L2	UNCLASSIFIED	OUT
722	95EJ160	1995	POINT	341182	4365123	PNe	A2	DISSPI	OUT
723	95EJ158	1995	POINT	342810	4365022	PNe	A2	DISSPI	OUT
724	95EJ113	1995	POINT	335103	4365016	LAP	L2	UNCLASSIFIED	OUT
725	95EJ162	1995	POINT	340979	4365012	PNe	A2	SARVER	OUT
726	95EJ159	1995	POINT	342582	4365007	PNe	A2	NO VEGETATION	OUT
727	95EJ104	1995	PLOT	337027	4365004	RA	A2	BASHYS	OUT
728	95EJ106	1995	POINT	339175	4364946	RA	A2	UNCLASSIFIED	OUT
729	95EJ105	1995	POINT	357476	4364938	RA	A2	TAMRAM	OUT
730	95EJ161	1995	POINT	340203	4364791	PNe	A2	SARVER	OUT
731	95EJ111	1995	POINT	334861	4364744	PNP	A2	JUNBAL	OUT
732	95EJ109	1995	POINT	337321	4364736	LNe	A2	SARVER	OUT
733	95EJ112	1995	POINT	334874	4364677	LAP	L2	UNCLASSIFIED	OUT
734	95EJ408	1995	POINT	336716	4364294	LNe	A2	SARVER	OUT
735	BD93092	1993	PLOT	344003	4364262	RA	F1	KOCSCO	OUT

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
736	95EJ170	1995	POINT	348367	4364232	PAP	S1	MEDSAT	OUT
737	95EJ173	1995	POINT	349470	4364230	PNP	F2	MEDSAT	OUT
738	95EJ171	1995	POINT	348773	4364229	PAP	D1	MEDSAT	OUT
739	95EJ172	1995	POINT	348995	4364228	PAP	F1	MEDSAT	OUT
740	95EJ119	1995	POINT	336140	4364196	PNe	A2	TAMRAM	OUT
741	95EJ117	1995	POINT	337183	4364025	PNe	A2	TAMRAM	OUT
742	95EJ118	1995	POINT	336923	4364001	PNe	A2	SARVER	OUT
743	95EJ407	1995	PLOT	337227	4363687	LNe	A2	SARVER	OUT
744	95EJ108	1995	POINT	338343	4363455	LNe	A2	SARVER	OUT
745	95EJ116	1995	POINT	337505	4363090	LNe	A2	UNCLASSIFIED	OUT
746	95EJ147	1995	POINT	346992	4363016	RA	F2	TYPLAT	OUT
747	95EJ107	1995	POINT	338718	4362899	LNe	A2	TAMRAM	OUT
748	95EJ146	1995	POINT	346871	4362841	RA	A2	SALEXI	OUT
749	95EJ394	1995	POINT	344826	4362741	RA	R1	JUNBAL	OUT
750	95EJ393	1995	POINT	344826	4362741	RA	R1	CHARA	OUT
751	BD93090	1993	PLOT	344988	4362739	RA	F2	KOCSCO	OUT
752	BD93091	1993	PLOT	344462	4362695	RA	R2	POPFRE/ELYTRI	OUT
753	BD93089	1993	PLOT	346507	4362460	RA	A2	KOCSCO	OUT
754	95EJ395	1995	POINT	347482	4362025	RA	S5	SALEXI	OUT
755	95EJ168	1995	POINT	345469	4361459	PNe	E1	MEDSAT	OUT
756	95EJ169	1995	POINT	345720	4361193	PNP	D1	MEDSAT	OUT
757	95EJ163	1995	POINT	342109	4361112	PNP	A2	SCIPUN	OUT
758	BD93182	1993	PLOT	358698	4360542	LNe	P3	NO VEGETATION	OUT
759	BD93181	1993	PLOT	359586	4360314	LNe	P3	NO VEGETATION	OUT
760	95EJ383	1995	POINT	356915	4360085	PNe	S3	JUNBAL	CLAKE
761	95EJ384	1995	POINT	356915	4360085	PNe	S3	DISSPI	CLAKE
762	95EJ018	1995	POINT	353262	4359152	PNe	M1	JUNBAL	CLAKE
763	95EJ019	1995	POINT	353491	4359122	PNe	M1	JUNBAL	CLAKE
764	95EJ406	1995	POINT	357642	4359108	PNe	S3	ALLOCC	CLAKE
765	95EJ405	1995	POINT	357642	4359108	PNe	S3	DISSPI	CLAKE
766	95EJ404	1995	POINT	357642	4359108	PNe	S3	ELEMAC	CLAKE
767	BD93156	1993	PLOT	357019	4358871	PAe	P2	ALLOCC	CLAKE
768	BD93157	1993	PLOT	357611	4358793	PAe	P2	ALLOCC	CLAKE
769	95EJ016	1995	POINT	354646	4358712	PNe	M1	JUNBAL	CLAKE
770	95EJ145	1995	POINT	344029	4358687	PAe	F2	DISSPI	OUT
771	95RB023	1995	POINT	353025	4358631	RA	E2	POTPEC	CLAKE
772	95EJ017	1995	POINT	354169	4358558	PNe	M1	DISSPI	CLAKE

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
773	BD93040	1993	PLOT	357767	4358543	PAe	E2	TRIFRA	CLAKE
774	BD93039	1993	PLOT	358029	4358519	PAe	T1	JUNBAL	CLAKE
775	95EJ002	1995	POINT	353414	4358416	PAe	M1	DISSPI	CLAKE
776	95RB012	1995	PLOT	356511	4358407	RN	M1	ELEMAC	CLAKE
777	95EJ011	1995	POINT	356590	4358330	LAP	E2	BASHYS	CLAKE
778	BD93042	1993	PLOT	357527	4358290	PAe	P2	JUNBAL–DISSPI	CLAKE
779	BD93041	1993	PLOT	358017	4358287	PAe	E2	JUNBAL	CLAKE
780	95EJ014	1995	POINT	355069	4358283	PNe	P2	ELEMAC	CLAKE
781	95EJ015	1995	POINT	354644	4358243	PNe	P2	BASHYS	CLAKE
782	95EJ001	1995	POINT	353460	4358200	PAe	M1	DISSPI	CLAKE
783	95EJ006	1995	POINT	354117	4358088	PAe	B4	DISSPI	CLAKE
784	BD93151	1993	PLOT	354557	4358044	PAe	B4	DISSPI	CLAKE
785	BD93150	1993	PLOT	354636	4358036	RA	B4	JUNBAL	CLAKE
786	95EJ004	1995	PLOT	353278	4358028	PAe	M1	ELEMAC–BACEIS	CLAKE
787	BD93043	1993	PLOT	357049	4358019	PAe	C2	JUNBAL–DISSPI	CLAKE
788	95RB005	1995	PLOT	354498	4358010	PAe	B4	ELEMAC	CLAKE
789	95EJ012	1995	PLOT	356546	4357988	RA	M1	ZANPAL	CLAKE
790	95EJ010	1995	PLOT	357290	4357959	PNe	C2	JUNBAL	CLAKE
791	95EJ005	1995	POINT	354575	4357861	PAe	C3	BASHYS	CLAKE
792	BD93152	1993	PLOT	355486	4357769	PAe	E2	TRIFRA	CLAKE
793	95EJ003	1995	POINT	353500	4357750	PAe	P2	DISSPI	CLAKE
794	95EJ007	1995	PLOT	353323	4357744	PAe	M1	ELEMAC	CLAKE
795	95RB090	1995	POINT	352300	4357700	PNe	M1	TYPDOM	CLAKE
796	95RB091	1995	POINT	352300	4357700	PNe	M1	DISSPI	CLAKE
797	95EJ013	1995	POINT	355126	4357666	PNe	C3	DISSPI	CLAKE
798	95RB011	1995	POINT	355500	4357500	PAe	E2	DISSPI	CLAKE
799	95RB102	1995	POINT	352213	4357497	PAe	E2	DISSPI	CLAKE
800	95RB103	1995	POINT	352213	4357497	PAe	E2	ELEMAC	CLAKE
801	95EJ009	1995	POINT	353607	4357423	PAe	P2	DISSPI	CLAKE
802	95RB001	1995	PLOT	352151	4357402	RA	E2	POTPEC	CLAKE
803	95EJ403	1995	POINT	356057	4357392	PAe	S5	DISSPI	CLAKE
804	BD93153	1993	PLOT	356676	4357364	PNe	S5	JUNBAL–DISSPI	CLAKE
805	95EJ008	1995	POINT	353279	4357360	PAe	P2	DISSPI	CLAKE
806	BD93149	1993	PLOT	352097	4357313	RA	E2	POTPEC	CLAKE
807	BD93154	1993	PLOT	357267	4357280	PAe	E2	TRIFRA	CLAKE
808	95RB018	1995	POINT	351247	4357268	PNP	B4	DISSPI	CLAKE
809	95RB019	1995	PLOT	351750	4357250	PNP	E2	DISSPI	CLAKE

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
810	95RB022	1995	POINT	352300	4357250	PAe	E2	DISSPI	CLAKE
811	95RB017	1995	PLOT	351002	4357009	PNe	E2	DISSPI	CLAKE
812	95RB014	1995	POINT	351250	4357000	PNP	E2	ELEMAC	CLAKE
813	95RB088	1995	POINT	351681	4357000	PNP	E2	DISSPI	CLAKE
814	95RB087	1995	POINT	351681	4357000	PNP	E2	ELEMAC	CLAKE
815	95RB089	1995	POINT	351681	4357000	PNP	E2	JUNBAL	CLAKE
816	95EJ382	1995	POINT	348799	4356981	PAP	S3	NO VEGETATION	CLAKE
817	BD93148	1993	PLOT	350140	4356981	PAe	E1	DISSPI	CLAKE
818	95EJ174	1995	POINT	348607	4356979	PAP	F2	MEDSAT	CLAKE
819	95EJ175	1995	POINT	348926	4356842	PAP	B4	MEDSAT	CLAKE
820	BD93155	1993	PLOT	357523	4356761	PAe	E2	JUNBAL-DISSPI	CLAKE
821	95EJ020	1995	PLOT	349946	4356568	PNe	E2	TRIFRA	CLAKE
822	95EJ024	1995	POINT	355533	4356500	PAP	E2	ELEMAC-BACEIS	CLAKE
823	95EJ381	1995	POINT	344721	4356495	PNe	C1	SARVER	OUT
824	95EJ260	1995	POINT	352823	4356481	PAP	M1	TYPDOM	CLAKE
825	95EJ096	1995	POINT	354601	4356251	PAP	M1	DISSPI	CLAKE
826	95EJ021	1995	PLOT	350021	4356155	PNe	E2	DISSPI	CLAKE
827	95EJ025	1995	POINT	357838	4356134	PNe	T1	JUNBAL-ELEMAC	CLAKE
828	95EJ022	1995	PLOT	349661	4356050	PNe	E2	ALLOCC	CLAKE
829	95EJ091	1995	POINT	352034	4356032	PAP	C3	SCIACU	CLAKE
830	95EJ262	1995	POINT	352794	4355802	PAP	M1	TYPDOM	CLAKE
831	95EJ095	1995	POINT	354656	4355784	PAP	M1	SCIMAR	CLAKE
832	95EJ097	1995	POINT	354380	4355708	PAP	M1	LEMMIN	CLAKE
833	95EJ090	1995	POINT	352010	4355692	PAP	M1	SCIACU	CLAKE
834	95EJ088	1995	POINT	351924	4355639	PAe	M1	SCIACU	CLAKE
835	95EJ061	1995	POINT	350696	4355572	PNP	C3	JUNBAL-ELEMAC	CLAKE
836	95EJ443	1995	POINT	351464	4355532	PAe	M1	JUNBAL	CLAKE
837	95EJ442	1995	POINT	351464	4355532	PAe	M1	DISSPI	CLAKE
838	95EJ087	1995	POINT	351768	4355428	PAP	M1	TYPLAT	CLAKE
839	95EJ094	1995	POINT	355152	4355378	PAP	M1	ZANPAL	CLAKE
840	95EJ023	1995	PLOT	350485	4355300	PAP	C3	BACEIS	CLAKE
841	95EJ441	1995	POINT	351689	4355299	PAP	M1	DISSPI	CLAKE
842	95EJ440	1995	POINT	351689	4355299	PAP	M1	SCIACU	CLAKE
843	95EJ261	1995	POINT	353563	4355221	PAP	M1	TYPDOM	CLAKE
844	95EJ092	1995	POINT	355841	4355151	PAP	M1	NO VEGETATION	CLAKE
845	95EJ401	1995	POINT	357143	4355133	RA	M1	ZANPAL	CLAKE
846	95EJ402	1995	POINT	357143	4355133	RA	M1	ELEMAC	CLAKE

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
847	95EJ103	1995	POINT	351867	4355096	PAP	M1	TYPDOM	CLAKE
848	95EJ060	1995	POINT	350506	4355075	PAP	P2	ELEMAC	CLAKE
849	95EJ093	1995	POINT	355686	4355032	PAP	M1	DISSPI	CLAKE
850	95EJ259	1995	POINT	352782	4354960	PAP	M1	TYPDOM	CLAKE
851	95EJ400	1995	PLOT	349387	4354925	PAe	C3	DISSPI	CLAKE
852	95EJ026	1995	POINT	357968	4354906	PNe	L1	JUNBAL-DISSPI	CLAKE
853	95EJ059	1995	POINT	350577	4354858	PAe	M1	DISSPI	CLAKE
854	95EJ031	1995	POINT	355591	4354846	PAP	M1	DISSPI	CLAKE
855	95EJ032	1995	PLOT	356946	4354732	PAP	L1	DISSPI	CLAKE
856	95EJ058	1995	POINT	350643	4354714	PAe	M1	BASHYS	CLAKE
857	95EJ100	1995	POINT	352682	4354708	LAP	M1	TYPDOM	CLAKE
858	95EJ098	1995	POINT	353499	4354693	LAP	M1	UNCLASSIFIED	CLAKE
859	95EJ101	1995	POINT	352106	4354688	LAP	M1	TYPDOM	CLAKE
860	95EJ102	1995	POINT	351427	4354652	PAP	M1	TYPDOM	CLAKE
861	BD93045	1993	PLOT	349994	4354647	PAP	M1	DISSPI	CLAKE
862	BD93031	1993	PLOT	357981	4354633	PAe	L1	TRIFRA	CLAKE
863	95RB003	1995	PLOT	350000	4354600	PAP	M1	DISSPI	CLAKE
864	95EJ099	1995	POINT	353227	4354587	LAP	M1	UNCLASSIFIED	CLAKE
865	95EJ029	1995	POINT	355356	4354506	PAP	M1	DISSPI	CLAKE
866	95EJ056	1995	POINT	350530	4354462	PAe	M1	DISSPI	CLAKE
867	95EJ030	1995	PLOT	355498	4354423	PAP	M1	SCIMAR	CLAKE
868	BD93032	1993	PLOT	357951	4354325	PAe	L1	TRIFRA	CLAKE
869	95EJ057	1995	POINT	350476	4354324	PAe	M1	DISSPI	CLAKE
870	95EJ034	1995	POINT	356754	4354274	PAP	L1	DISSPI	CLAKE
871	95EJ033	1995	POINT	356920	4354244	PAP	L1	DISSPI	CLAKE
872	BD93033	1993	PLOT	357819	4354173	PAe	L1	TRIFRA	CLAKE
873	BD93038	1993	PLOT	350698	4354043	PAP	M1	JUNBAL-DISSPI	CLAKE
874	BD93037	1993	PLOT	350698	4353968	LAP	M1	POTPEC	CLAKE
875	95RB015	1995	PLOT	351247	4353803	PNP	P2	DISSPI	CLAKE
876	BD93044	1993	PLOT	350809	4353797	PNe	M1	SCIMAR	CLAKE
877	BD93046	1993	PLOT	350761	4353521	LAe	M1	BASHYS	CLAKE
878	95EJ048	1995	PLOT	356963	4353411	PAe	L1	BACEIS	CLAKE
879	95EJ049	1995	PLOT	357009	4353395	PAe	L1	BACEIS	CLAKE
880	95EJ027	1995	POINT	358200	4353309	PNe	L1	JUNBAL-DISSPI	CLAKE
881	95EJ263	1995	POINT	355071	4353282	LAP	M1	RUPMAR	CLAKE
882	BD93036	1993	PLOT	356910	4353196	PAP	L1	DISSPI	CLAKE
883	95EJ268	1995	POINT	352307	4353162	LAP	M1	RUPMAR	CLAKE

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
884	BD93034	1993	PLOT	358090	4353079	PAe	L1	DISSPI	CLAKE
885	95EJ264	1995	POINT	353962	4353061	LAP	M1	RUPMAR	CLAKE
886	95EJ265	1995	POINT	353472	4353024	LAP	M1	RUPMAR	CLAKE
887	95EJ266	1995	POINT	352044	4352981	LAP	M1	RUPMAR	CLAKE
888	95EJ037	1995	POINT	356584	4352941	PAP	L1	DISSPI	CLAKE
889	95EJ055	1995	POINT	357529	4352878	PAe	L1	DISSPI	CLAKE
890	95EJ267	1995	POINT	352894	4352771	LAP	M1	RUPMAR	CLAKE
891	95EJ050	1995	POINT	356898	4352755	PAe	L1	DISSPI	CLAKE
892	95EJ035	1995	POINT	356730	4352641	PAe	L1	DISSPI	CLAKE
893	95EJ269	1995	POINT	354403	4352562	LAe	M1	UNCLASSIFIED	CLAKE
894	95EJ274	1995	POINT	355407	4352539	LAe	L1	NO VEGETATION	CLAKE
895	95EJ053	1995	POINT	357278	4352509	PAe	L1	DISSPI	CLAKE
896	95EJ272	1995	POINT	352478	4352506	LAe	M1	NO VEGETATION	CLAKE
897	BD93159	1993	PLOT	351282	4352466	LAe	M1	SCIMAR	CLAKE
898	BD93158	1993	PLOT	351446	4352466	LAe	M1	SCIMAR	CLAKE
899	95EJ275	1995	POINT	354971	4352462	LAe	L1	NO VEGETATION	CLAKE
900	95RB004	1995	PLOT	351401	4352431	LAe	M1	SCIPUN	CLAKE
901	95EJ271	1995	POINT	352986	4352431	LAe	M1	UNCLASSIFIED	CLAKE
902	95EJ270	1995	POINT	353634	4352421	LAe	M1	UNCLASSIFIED	CLAKE
903	95EJ085	1995	POINT	351728	4352377	LAe	M1	TYPDOM	CLAKE
904	BD93035	1993	PLOT	356635	4352326	PAP	PA	DISSPI	CLAKE
905	95EJ052	1995	POINT	357113	4352181	PAe	L1	BASHYS	CLAKE
906	95EJ051	1995	POINT	356752	4352087	PAe	L1	DISSPI	CLAKE
907	95EJ054	1995	POINT	357315	4352078	PAe	L1	DISSPI	CLAKE
908	95EJ273	1995	POINT	352413	4352041	LAe	M1	NO VEGETATION	CLAKE
909	BD93160	1993	PLOT	351411	4351622	LAe	M1	SCIMAR	CLAKE
910	BD93161	1993	PLOT	351757	4351594	LAe	L1	BASHYS	CLAKE
911	95EJ028	1995	POINT	358076	4351496	RA	L1	ELEMAC	CLAKE
912	95EJ041	1995	POINT	356720	4351251	PAe	L1	DISSPI	CLAKE
913	95EJ084	1995	POINT	351602	4351224	LAe	M1	BASHYS	CLAKE
914	95EJ039	1995	POINT	356364	4351199	PAe	L1	DISSPI	CLAKE
915	95EJ042	1995	POINT	356705	4351149	PAe	L1	DISSPI	CLAKE
916	95EJ038	1995	POINT	356528	4351143	PAe	L1	DISSPI	CLAKE
917	BD93163	1993	PLOT	351390	4350981	LAe	M1	SCIMAR	CLAKE
918	95EJ081	1995	POINT	352081	4350937	LAe	M1	UNCLASSIFIED	CLAKE
919	95EJ083	1995	POINT	351466	4350762	PAe	M1	TYPDOM	CLAKE
920	95EJ043	1995	POINT	356580	4350680	PAe	L1	SARVER	CLAKE

SAMPLE NUMBER	SAMPLE ID CODE	SAMPLE YEAR	SAMPLE TYPE	UTM COORDINATES X (Easting)	Y (Northing)	WETLAND TYPE	SOIL SERIES	PLANT ASSOCIATION OR GROUPING	MANAGED AREA
921	95EJ080	1995	POINT	351788	4350627	LAe	M1	UNCLASSIFIED	CLAKE
922	95EJ040	1995	POINT	356267	4350515	PAe	L1	DISSPI	CLAKE
923	BD93162	1993	PLOT	351344	4350498	LAe	L1	NO VEGETATION	CLAKE
924	95EJ079	1995	POINT	351720	4350330	LAe	M1	UNCLASSIFIED	CLAKE
925	95EJ078	1995	POINT	357655	4350242	LAe	M1	BASHYS	CLAKE
926	95EJ082	1995	POINT	351429	4350203	PAe	M1	UNCLASSIFIED	CLAKE
927	95EJ036	1995	POINT	356749	4350199	PAe	L1	SARVER	CLAKE
928	95EJ077	1995	POINT	351541	4350174	PAe	M1	UNCLASSIFIED	CLAKE
929	95EJ076	1995	PLOT	351480	4350049	PAe	L1	DISSPI	CLAKE
930	95EJ044	1995	PLOT	356089	4349809	PAe	L1	SARVER	CLAKE
931	95EJ067	1995	POINT	349468	4349688	PAe	L1	BASHYS	CLAKE
932	95EJ066	1995	POINT	349946	4349672	PAe	L1	UNCLASSIFIED	CLAKE
933	95EJ065	1995	POINT	349870	4349614	PAe	L1	ELEMAC	CLAKE
934	95EJ062	1995	POINT	350399	4349590	PAe	L1	SARVER	CLAKE
935	95EJ063	1995	POINT	350292	4349466	PAe	L1	ALLOCC	CLAKE
936	95EJ074	1995	POINT	352636	4349458	PAe	L1	UNCLASSIFIED	CLAKE
937	95EJ071	1995	POINT	353368	4349428	PAe	L1	DISSPI	CLAKE
938	95EJ045	1995	POINT	355837	4349424	PAe	L1	DISSPI	CLAKE
939	95EJ075	1995	POINT	352313	4349405	PAe	L1	DISSPI	CLAKE
940	95EJ072	1995	PLOT	353271	4349382	PAe	L1	ALLOCC	CLAKE
941	95EJ070	1995	POINT	353690	4349347	PAe	L1	DISSPI	CLAKE
942	95EJ073	1995	POINT	352642	4349296	PAe	L1	SARVER	CLAKE
943	95EJ064	1995	POINT	350322	4349234	PAe	L1	ALLOCC	CLAKE
944	95EJ046	1995	POINT	355572	4349227	PAe	L1	DISSPI	CLAKE
945	95EJ069	1995	PLOT	353628	4349063	PAe	L1	DISSPI	CLAKE
946	95EJ068	1995	POINT	354529	4348894	PAe	L1	ELEMAC	CLAKE
947	95EJ439	1995	POINT	354528	4348893	PAe	L1	TYPLAT	CLAKE
948	95EJ047	1995	POINT	355572	4348753	PAe	L1	BASHYS	CLAKE