

LFC - 7 893

VEGETATION INVENTORY OF
CHACO CULTURE NATIONAL HISTORIC PARK

Final Report

Lisa Floyd-Hanna, Ph.D (1)
David D. Hanna, MS (2)
Frank Hays, BS (3)
Ken Heil, MS (4)

November 24, 1993

- (1) Environmental Studies Program, Prescott College, Prescott, Arizona 86301
- (2) San Juan Ecological Research, 604 Hocker, Durango, Colorado 81301
- (3) National Park Service, Chaco Culture National Historic Park, New Mexico
- (4) San Juan College, Farmington, New Mexico 87401

INTRODUCTION

A long-term goal of Resource Management at Chaco Culture National Historic Park includes updating and expanding the inventory of vegetation resources. A vegetation inventory of the newly-acquired southeast section, Chacra Mesa, was undertaken in May and completed in October 1993, funded by the Southwest Parks and Monument Association (SPMA). The final report of the 1993 field season includes a vegetation map of the project area, Chacra Mesa, and a summary of plant species encountered in the field. The project also involved acquisition, digitization, and field screening of a 1974 vegetation map (Kelly and Potter, 1974). As part of the 1993 work, the digitized version of the map was checked for consistency with the current National Park Service standards (Colorado Plateau Vegetation Advisory Group, 1993) and for the possibility of incorporation into the present study in future years.

Background Information

Chacra Mesa lies to the south of Chaco Wash on the southeastern portion of Chaco Canyon National Historic Park. While most of the mesa-bound study area is found in San Juan County, New Mexico, the southeastern section of Chacra Mesa is in McKinley County. Before the acquisition of this land in 1992 it was managed by the Navajo Nation. Land uses primarily included grazing and woodgathering.

Chacra Mesa slopes gently to the southwest, with elevations ranging from 1909 -2060 meters on the Mesa top. Numerous rincons cut the Mesa on its northern line. These are created by ephemeral seeps. Initial reconnaissance indicated that woodland communities, dominated by *Pinus edulis* and *Juniperus monosperma* with shrub species *Artemisia nova* and *Cercocarpus montanus*, were scattered across the mesa. Pockets along sandstone outcrops support *Aletes macdougalii*, and conspicuous sand "blow-outs" support unique grassy communities. The upper elevation of the Mesa is a flat, sagebrush dominated low shrubland. The seeps support a relatively lush vegetation, with *Populus angustifolia*, *Foresteria neomexicana* and *Rhus trilobata*.

Physical description and climate

Chaco Culture National Historical Park is located near the center of the broad bowl-shaped San Juan Basin on the southeastern corner of the Colorado Plateau. Cliff House sandstone and Menefee shale are the primary geologic formations exposed at lower elevations in the Park and on Chacra Mesa.

The Cliff House sandstone, the upper member of the Mesa Verde group, forms the high cliffs found on Chacra Mesa. The Formation is derived from beach sand deposited at or near the shoreline of a Cretaceous sea, approximately

70 million years ago. The Cliff House is approximately 122 meters thick in the area, but is interfingering with the softer Menefee Formation. Consequently, weathering has produced the two cliffs separated by a bench as observed on Chacra Mesa.

The Cliff House sandstone is underlain by the coal-bearing Menefee Formation between the base of the cliff walls and the edge of the valley floor. The Menefee Formation is approximately 80 million years old and was laid down as sand, mud, and plant debris in coastal swamps and on alluvial plains.

The soils of the canyon bottoms, cut into Chacra Mesa, consist of textured clay loams and silty clay loams (USDA, SCS 1980). The soils are deep, slowly permeable, formed in alluvium derived from sandstone and shale. These soils are highly susceptible to erosion and piping. The soil cover on the mesa itself is generally thin and also easily eroded when vegetation is disturbed. However deeper, well-drained sandy soils do occur on the gentler slopes.

Chacra Mesa is located in a semi-arid region with an average annual precipitation of approximately 22 cm. Monthly precipitation is greatest in late summer. Winter precipitation, often in the form of snow, is heavier than fall or spring precipitation.

The annual temperature averages from 10 to 13 °C with an average frost free period of approximately 150 days. Maximum temperatures rarely exceed 34°C. Minimum temperatures often fall well below -18 °C in the winter.

METHODS

The Chaco Vegetation Project has been divided into sections focusing on specific objectives. In order to accommodate the annual funding schedule of the SPMA we applied to work on one objective in 1993---a vegetation inventory of the communities on Chacra Mesa. We also organized and evaluated the existing remotely acquired information of the Park in order to facilitate future vegetation projects within Chaco. Aerial coverage and MSS images were available in many different scales, primarily for their past use in determination of prehistoric roads and other features. We chose the 1:3000 B/W overlapping series of the Park to augment USGS orthophotoquads at a 1:24,000 scale. Through our inventory, we determined that the Park also had access to a non-digitized vegetation map of parts of Chaco Culture National Historic Park (Kelly and Porter, 1974). The GIS laboratory of the CPSU unit in Albuquerque digitized that map and provided us with a copy. We have begun a field check of the digitized version to determine its usefulness for continuation of the study.

A. Chacra Mesa Study: The newly acquired Chacra Mesa portion of the park was the focus of the 1993 funding and field effort.

The Park is in the process of acquiring its PC-based Geographic Information System (GIS). All data base information from this project will reside in the Park as data layers in their GIS using EPPL-7 software (although the map was built with IDRISI software). To facilitate this, we permanently recorded sites with a Trimble Global Positioning Unit (loaned by the Region's GIS Coordinator Dr. Milford Fletcher). Dr. Fletcher also corrected all positions against permanent base station GPS data. All vegetation sampling points are overlaid on base maps created by scanning aerial coverage, USGS orthophotoquads, or on a DEM (digital elevation model) of the Park.

Plant species were identified by Ken Heil, San Juan College, and any collections made will reside in the San Juan College Herbarium. The documented plant species are found in Appendix A. A complete flora was not attempted at this time. Plant identifications and collections are primarily to facilitate definition of vegetation communities.

Several transects were established on Chacra Mesa running in a northeast to southwest direction. These transects traverse the elevational gradient of the Mesa. The vegetation was sampled in approximately 7 sites along these transects using the releve method of Braun-Blanquet (Mueller-Dombois and Ellenberg, 1973). The number of releves was dependent upon the transect length. The relative cover and abundance of each species was recorded for each 15 by 15 meter releve plot as follows:

- 5 greater than 75 % cover, any number
- 4 between 50-75 % cover, any number
- 3 between 25-50 % cover, any number
- 2 between 5-25 % cover, any number
- 1 numerous but less than 5% cover
- + few, with small cover
- r solitary with small cover

Releve locations are shown in Figure 1. Additionally, seeps, which occur at the head of many of the canyons draining off of Chacra Mesa, were also sampled as were the canyon slopes immediately below the seeps (Figure 2).

The vegetation data were analyzed using the Cornell Ecological Program TWINSpan. This is a divisive, hierarchical multivariate clustering program. The various relevés were thus grouped according to similarities in floristic composition. Clusters are plotted over a digitized orthophoto quad image (1:24,000) to evaluate and delineate the spatial extent of the vegetation types. Systematic visual inspection of aerial coverage augmented the spatial definition of each vegetation type from the clustering classification.

B. Preliminary ground-truthing of Kelly and Potter Map:

In 1974 a vegetation inventory of the existing Chaco National Monument was completed (Kelly and Potter, 1974). Nine vegetation types were defined and spatially delineated; in addition substrates and several land use areas were defined (i.e. dunes, bare rock, water treatment area). This map was digitized by the CPSU unit under the direction of Dr. Milford Fletcher and made available to us in EPPL-7 format (Figure 3). An attempt was made to survey each vegetation type as defined on this map, excluding the piñon-juniper class which was not extensive within the older boundary. It was well surveyed on Chacra Mesa during this study. GPS locations were made, and 15 by 15 meter releve plots were surveyed as defined above). Nomenclature, according to Brown, Lowe, Pase (as recently adopted by the National Park Service Colorado Plateau Advisory Group) was given to each vegetation unit in this preliminary survey. These were compared with those defined by Kelly and Potter. The comparison will assist our evaluation of this map for use in future studies of Chaco Culture National Historic Park (Floyd-Hanna and Hanna, 1993 proposal to SPMA).

RESULTS

Appendix B shows the results of the initial TWINSpan classification. From this classification, 8 different vegetation types were defined on Chacra Mesa and are discussed in Section A. Nine other classes are restricted to either seeps in the north rincons of this Mesa, on the lower elevation shrublands to the northeast of Fajada Butte, or throughout the lower elevations of Chaco Canyon (the older Park boundary). The latter nine classes are presented in Section B below.

Each vegetation classification is described below. In some cases, the spatial extent of each classification, which has been defined floristically, cannot be visualized from the available aerial coverage. In these cases, an aggregation of vegetation is made for the map, and more complete descriptions are given below of the heterogeneity within that spatially defined class.

A. Chacra Mesa Vegetation Study:

At the head of rincons along the north edge of Chacra Mesa are found seeps which support moist soils and riparian, woody species.

141.04 *Populus angustifolia* Series

141.04X *Populus angustifolia*-*Foresteria neomexicana* Association.

(Note: The "X" or "Y" in the Association implies that the Brown-Lowe-Pase Association name is not yet available. Planning is in process at the Colorado Plateau Vegetation Advisory Group to organize and assign new Association names, and when that work is complete, permanent numerals will be assigned to these Associations).

This vegetation community, named as an association in the Brown-Lowe-Pase nomenclatural scheme, includes *Populus* and *Foresteria* as the dominant woody elements and a variety of low shrubs, such as *Artemisia tridentata*, *Ribes cereum*, *Cercocarpus montanus*, *Amelanchier utahensis* and *Chrysothamnus nauseosus*. Herbaceous elements include *Parthenocissus inserta*, *Castilleja chromosa*, *Eriogonum umbellatum*, *Artemisia frigida*, *Sporobolus aeroides*, and *Gutierrezia sarothrae*.

Seven seeps were surveyed by Ken Heil, defining not only the vegetation community, but also investigating the area for threatened, endangered or rare plant taxa. No such taxa were noted during the survey, however, we caution that more complete surveys, taken at more frequent intervals under a more expansive budget, are needed to eliminate the presence of any rare plants with confidence.

141.05 *Populus fremontii* Series

141.05X *Populus fremontii*- *Artemisia tridentata*-*Chrysothamnus nauseosus* Association

Along the bank of Chaco Wash is a well developed riparian vegetation consisting of mature cottonwood trees and dense sagebrush and rabbitbrush understory. Grasses include *Hilaria jamesii*, *Oryzopsis hymenoides* (= *Stipa hymenoides*), *Bromus ciliata* and species of *Agropyron*. Herbs include *Gilia aggregata* and *Eriogonum leptophyllum*. Although mature cottonwoods are common, a brief age structure survey indicated that stands tends to be even-aged, lacking seedlings.

Across the mesa-top, which varies several hundred feet in elevation 1909 - 2060 meters, we have defined 8 vegetation classes. The first three Associations (*Juniperus osteosperma*-*Cercocarpus montanus* Association, *Juniperus osteosperma*-*Atriplex canescens* Association, and *Pinus edulis*-*Cowania neomexicana*-*Rhus trilobata* Association) are not distinguishable from the orthophotoquadrangles and aerial coverage available, although they are distinguished on the ground from field data. The map combines these as a "Piñon -juniper" community , which is adequately defined for the purposes of Resource Management goals. We will, however, describe each Association, as defined in the cluster analysis below.

141.02 *Juniperus osteosperma* Series

141.02X *Juniperus osteosperma*-*Cercocarpus montanus* Association

This association is restricted to pockets in sandstone outcrops on Chacra Mesa. Unlike other vegetation Associations within this Series, juniper trees are small and scattered, and share dominance with large shrubby species. An important element in the understory is *Artemisia nova* and a rich herbaceous flora include *Penstemon purpurea*, *Brickellia scabrida* and *Ephedra viridis*. *Rhus trilobata* is found in many samples of this association, where it is supported by relatively moist substrates.

141.02Y *Juniperus osteosperma*-*Atriplex canescens* Association

The Juniper woodland is accompanied by saltbush in this community. Understory includes dense clusters of *Oryzopsis hymenoides*, *Mentzelia pumila*, *Penstemon* species, *Townsendia incana*, *Sphaeralcea coccinea*, and *Artemisia frigida*. In contrast to the previous association, this community supports *Juniperus* at low density and an understory of higher density.

141.01 *Pinus edulis* Series

141.01X *Pinus edulis*--*Cowania neomexicana*-*Rhus trilobata* Association

The most widespread vegetation community on Chacra Mesa, the Piñon and shrub association varies considerably as to understory composition. In some samples the associated species were limited to *Rhus trilobata* and *Brickellia gracilentia*, while in others the piñon was accompanied by juniper, *Cowania mexicana*, *Artemisia nova*, *Tetradymia canescens* and *Chrysothamnus nauseosus*. Understory includes *Gutierrezia sarothrae*, *Yucca angustifolia*, *Happlopappus ameroides*, *Petradoria pumila*, *Astragalus purpurea* and other *Astragalus* species. *Aletes macdougallii* is typically restricted to the sides of sandstone outcrops, where a protected, sandy microsite is created. It is dense in these sites, but because this species is not widespread in the Park or surrounding area, this habitat should receive special consideration.

Two usual, restricted vegetation communities are scattered among the more common piñon association on the Mesa with the dominants *Chrysothamnus Greenei*, *Bouteloua gracilis*, and *Gutierrezia sarothrae*. The two descriptions are given below, but as spatial delineation was not possible, they are lumped on the map in Figure 4.

143.21 *Chrysothamnus Greenei* Series

143.21X *Chrysothamnus Greenei* -*Bouteloua gracilis* Association

The community forms an opening in the low woodland canopy, and it is likely more highly distributed than the aerial coverage allows us to depict. Further ground sampling will likely uncover additional stands on Chacra Mesa. Shrubs include *Tetradymia canescens*, *Gutierrezia sarothrae*, *Yucca angustifolia*, *Artemisia frigida* and *Ephedra* species. Occasionally scattered *Juniperus osteosperma* occur. Other species associated with this community are the grasses *Oryzopsis hymenoides* or *Stipa commata* and *Sitanion hystrix*. Herbs include *Lygodesmia* and *Lupinus* species, *Erysimum capitata*, *Astragalus mollissimus*, *Penstemon pinata*, *P. purpurea*, *Townsendia incana* and *Eriogonum leptophyllum*.

143.13 *Gutierrezia sarothrae* Series

143.13X *Gutierrezia sarothrae*-*Tetradymia* Association

This low shrubland is co-dominated by broom snakeweed and horsebush, and includes *Yucca angustifolia*, *Eriogonum microthecum*, *E. leptophyllum* and

Ephedra torrya. Grasses include *Muhlenbergia pungens*, *Sitanion hystrix*, and herbs include *Townsendia incana*, *Lapula redowski* and *Cryptantha flava*.

143.20 *Artemisia nova* Series

143.20X *Artemisia nova*-*Ephedra torreyi*-*Oryzopsis hymenoides* Association

Black sagebrush dominates in a widespread vegetation community along the southern, high elevation expanse of Chacra Mesa. It is associated with rice grass clusters, as well as Mormon Tea. Scattered shrubs or trees at low densities include *Gutierrezia sarothrae*, *Atriplex canescens*, *Artemisia frigida* and *Juniperus osteosperma*. The herbaceous flora of the community includes *Eriogonum corymbosa*, *Muhlenbergia thurbergi*, and *Comandra umbellatum*, *Chrysantha flava*, *Cymopterus bulbosa* and *Allium* species.

Within this community are pockets of *Bouteloua gracilis*, *Gutierrezia sarothrae* and *Atriplex* species. Herbs include *Mentzelia pumila* and *Rumex hymenosepalus*. At the spatial resolution available in aerial coverage, the patchiness within this community cannot be accurately mapped.

143.07 *Atriplex canescens* Series

143.07X *Atriplex canescens*- *Lycium pallida*-*Sporobolus aeroides*-*Hilaria jamesii* Association

This Association is widespread throughout the Chaco Culture National Historic Park. It is abundant in the lower elevations throughout the area, and in the study site it is found south of Chaco Wash and north of the base of Chacra Mesa. Besides the species for which it is named, other species include *Sarcobatus vermiculatus*, *Mentzelia pumila*, and *Tetradymia canescens*. Grasses include *Sitanion hystrix*, *Bouteloua gracilis* and occasionally *Oryzopsis hymenoides*.

143.07Y *Atriplex species*-*Ceratoides lanata*-*Artemisia tridentata* Association.

To the north and downslope of the seeps, on north slopes, occurs a widespread low shrubland consisting of saltbush, shadscale, winterfat and sagebrush and occasionally greasewood. This widespread vegetation type also includes grasses *Oryzopsis hymenoides*, *Hilaria jamesii*, *Sitanion hystrix*, *Sporobolus aeroides* and *Bromus tectorum*. Forbs include *Artemisia ludoviciana*, *Stanleya pinnata*, *Eriogonum corymbosa* and *Leuceline ericoides*. *Lycium pallida* indicates the presence of archeological sites within this community. This plant community is also described in Section B below, as it is widespread in the Park beyond the Chacra Mesa study area.

The digitized vegetation map, based spatially on 1:24,000 orthophotoquads can be seen in Figure 4.

Human disturbances- both recent and prehistoric-- have supported a weedy, generally non-native flora in patches surrounding archeological sites north of Chacra Mesa or in the heads of rincons. Although we did not extensively document these sites, a listing follows of species from three selected weedy area. Species are followed by the Braun-Blanquet cover/abundance values for 3 plots.

<i>Amaranthus hybridus</i>	r,+,1
<i>Opuntia pycnantha</i>	r
<i>Atriplex canescens</i>	r,+,1
<i>Atriplex conferifolia</i>	r,+,1
<i>Chenopodium sp.</i>	r,+
<i>Kochia scoparia</i>	r,+,1
<i>Salsola iberica</i>	3,4
<i>Helianthus periolous</i>	1,+
<i>Bromus tectorum</i>	3,4
<i>Festuca octoflora</i>	1,2
<i>Machaeranthera tanacetifolia</i>	1,+
<i>Sphaeralcea fendleri</i>	1,+

The relative contribution of particular species, such as *Salsola iberica* and *Bromus tectorum* to the dominance of these weedy sites will vary with the season.

B: Preliminary ground truth of Kelly and Potter map:

The Chaco Vegetation Project will adhere to guidelines for vegetation classification established by the National Park Service for the Colorado Plateau Parks (CPSU, DRAFT, 1993). The classification system in use is a modification of the Brown-Low-Pase system, adapted for the communities of the Colorado Plateau. The older Chaco Canyon National Historic Park boundary (Kelly and Porter, 1974) has been digitized by Dr. Milford Fletcher and a copy was made available to this project. In order to determine how this existing map will coincide with the new nomenclatural system, and to determine at what scale the Kelly and Porter map was created, we surveyed a few sample plots within each defined vegetation class. We could not, in the time allowed, fully ground truth this map; our goal was simply to evaluate the extent to which the current classification can be used should further funding become available.

Multivariate TWINSpan analysis of the species cover/abundance values fell into the following clusters:

1. *Chrysothamnus nauseosus*-*Artemisia campestris*
2. *Ribes cereum*-*Rhus trilobata*-*Artemisia tridentata*
3. *Sarcobatus vermiculatus*-*Lycium pallidum*-*Sporobolus aeroides*-*Hilaria jansii*
4. *Atriplex species*-*Ceratoides lanata*-*Artemisia tridentata*
5. *Atriplex canescens*-*Tetradymia canescens*-*Artemisia frigida*-*Bouteloua gracilis*
6. *Populus fremontii*-*Chrysothamnus nauseosus*
7. *Juniperus monosperma*-*Artemisia tridentata*
8. *Atriplex canescens*-*Lycium pallidum*
9. *Sarcobatus vermiculatus*-*Atriplex canescens*

Kelly and Porter (1974) defined 8 vegetation types. They also identify one type representing the heavily disturbed sites (old field succession) and two dune areas (active and vegetated). A comparison of Kelly and Porter with our preliminary cluster analysis follows:

Kelly and Porter	Cluster Number
<i>Atriplex-Oryzopsis-Sporobolus</i>	n/a
<i>Atriplex-Sarcobatus</i>	9
<i>Hilaria-Bouteloua (Atriplex)</i>	5
<i>Hilaria-Bouteloua (Juniperus)</i>	7
<i>Piñon-juniper</i>	several classes- see section A
<i>Riparian-woody</i>	6
<i>Sarcobatus-Sporobolus</i>	3
<i>Sporobolus-Sitanion</i>	n/a

Comparing the two mapping efforts allows us to make a preliminary comparison. The scale at which we will be mapping the vegetation is finer than that used in the older map. For example, the *Hilaria-Bouteloua (Atriplex)* class of Kelly and Porter includes vegetation classes 2, 4 as well as 5 in our preliminary clustering. The piñon-juniper class might be divided into 3 different piñon and juniper dominated associations (see section A above). Our clustering algorithm separated the *Atriplex* containing communities from the *Sarcobatus* containing ones, while they were lumped in the previous classification. Although we presently define one riparian class, we feel that a complete sampling of the riparian areas will allow delineation of several different classes. For example,

the recent invasion of Tamarisk to areas within this zone will be delineated from the riparian communities dominated by cottonwoods or willows.

DISCUSSION

A vegetation inventory of Chaco Culture National Historic Park, undertaken in May 1993, included the initial vegetation mapping of new land acquisitions, as well as revisiting areas mapped within the older Park boundary, created in 1974. Chacra Mesa, a newly acquired section of the Park was surveyed using methods recently adopted by the Colorado Plateau Vegetation Advisory Group. Scanned orthophotoquad images and Digital Elevation model data were used as base maps on a GIS, over which were placed the field sampling locations. All locations are made with a GPS unit. Seventeen vegetation classes have been statistically defined in seeps, in open flatlands and across Chacra Mesa. Of these, 8 are found in the Chacra Mesa study area. A limited screening of an older vegetation map Chaco Canyon is being evaluated for its current usefulness in the Colorado Plateau's Brown-Lowe-Pase classification of vegetation. Nine vegetation types were defined in the lower elevations of the Park in this preliminary effort. Although our screening has been very limited, we believe that the resolution of the current vegetation mapping will be finer than that done in 1974 and that the Kelly and Porter map will be a useful delineation of the most widespread vegetation types, upon which we can overlay finer delineation of vegetation communities.

We recommend that if Resource Management goals for Chaco Culture National Historic Park should change and require a finer spatial delineation of vegetation type, Multi-spectral (MSS) data might be classified. In addition, although we sampled 7 seep communities, others might be outlined with a GPS unit, as it is difficult or impossible to delineate these on remote sensed data.

References

CPSU-NAU. 1993. DRAFT. Methods for Vegetation Surveying and Classification.

Martin, W.C. and Hutchins, C.R. 1984. Spring Wildflowers of New Mexico. U. New Mexico Press. Albuquerque.

Mueller-Dombois and Ellenburg. 1974. Aims and methods in vegetation ecology. John Wiley and Sons, New York.

New Mexico Native Plants Protection Advisory Committee. 1983. A handbook of rare and endemic plants of New Mexico. UNM Press. Albuquerque.

Welsh, S.L et al. 1987. A Utah Flora. Great Basin Memoirs. Brigham Young Univ.

Figure 1:

Chacra Mesa Vegetation Study Area - 1993

Chaco Culture National Historic Park

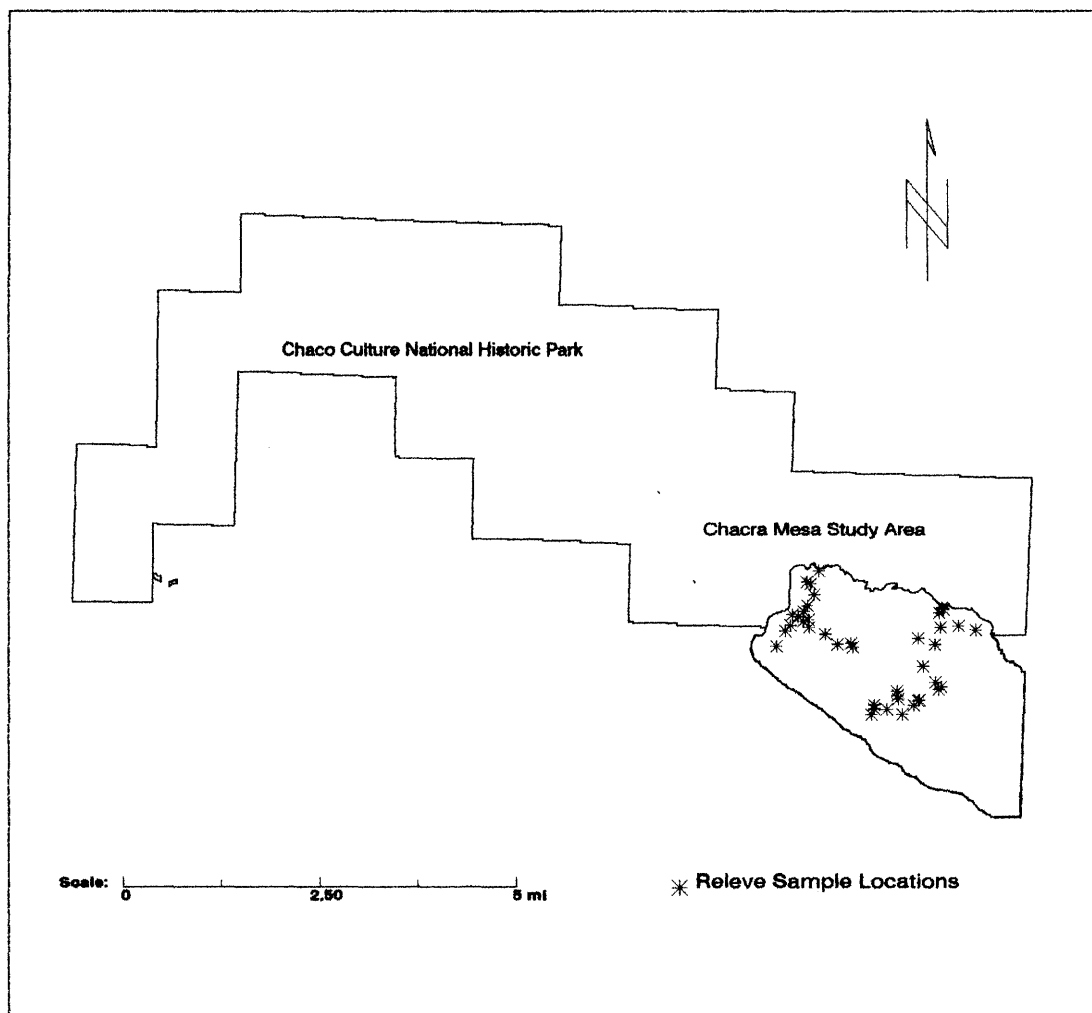
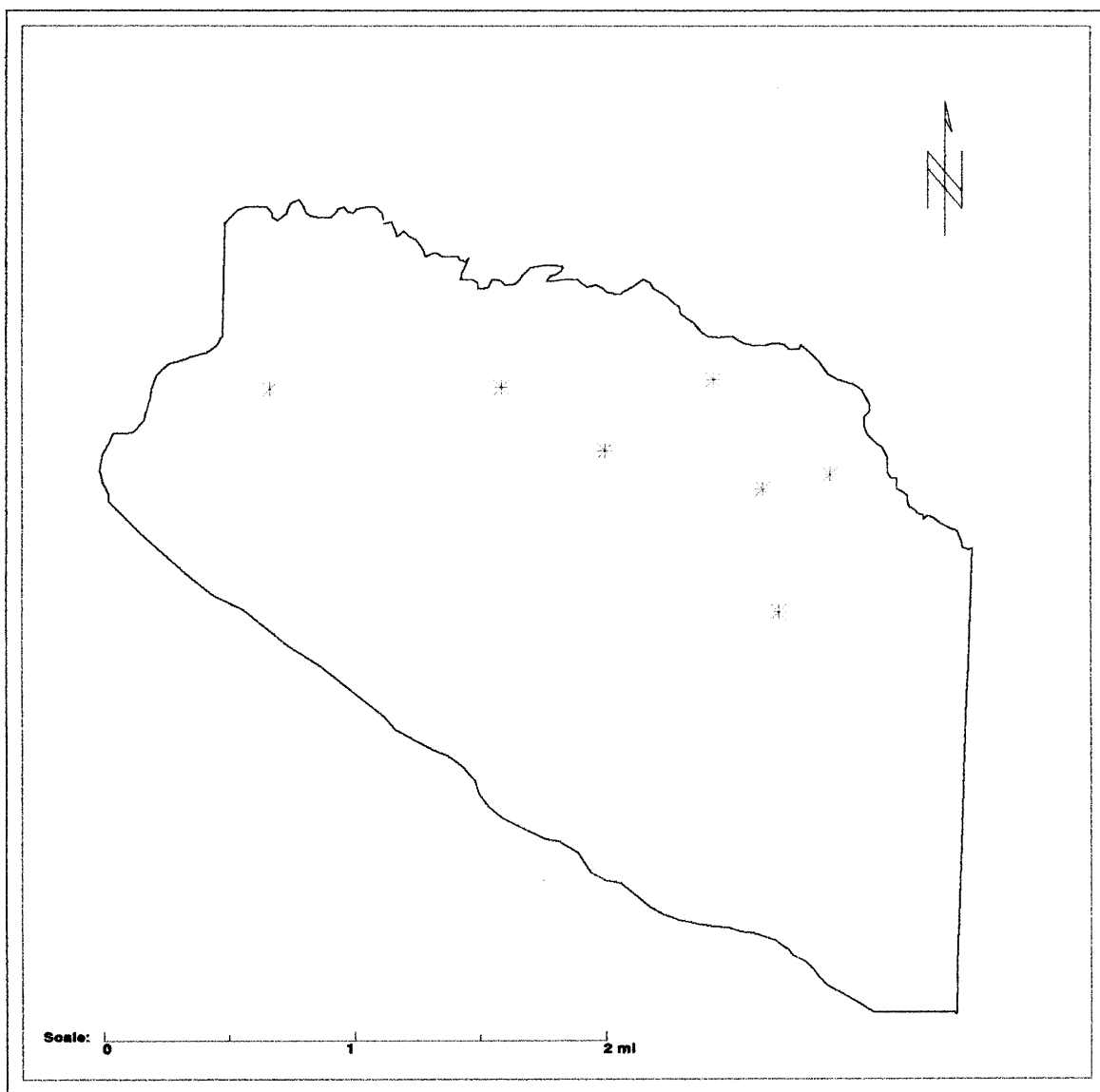


Figure 2:

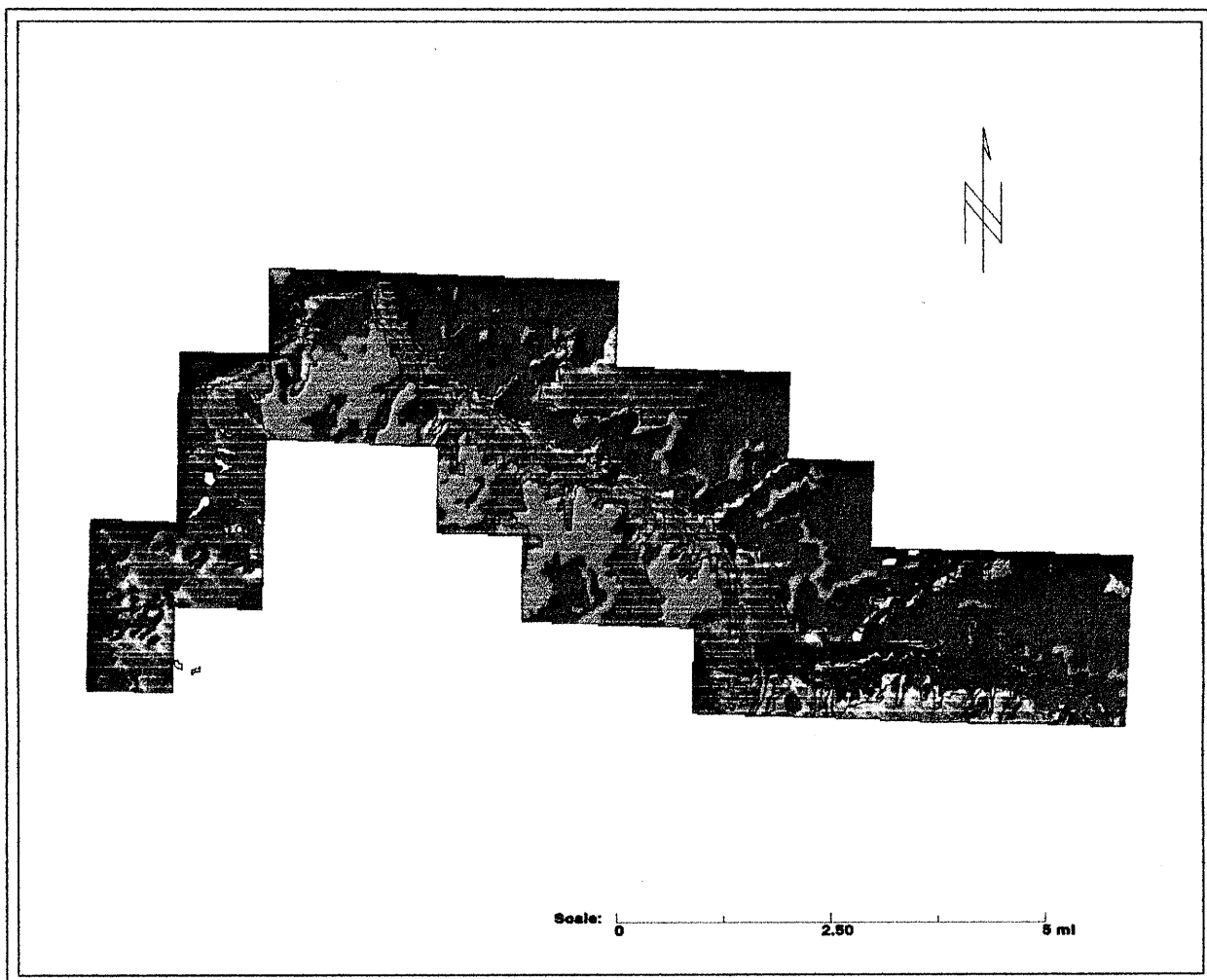
Chacra Mesa Vegetation Inventory Seep Sampling Locations



* Seep Sampling Locations

Figure 3:

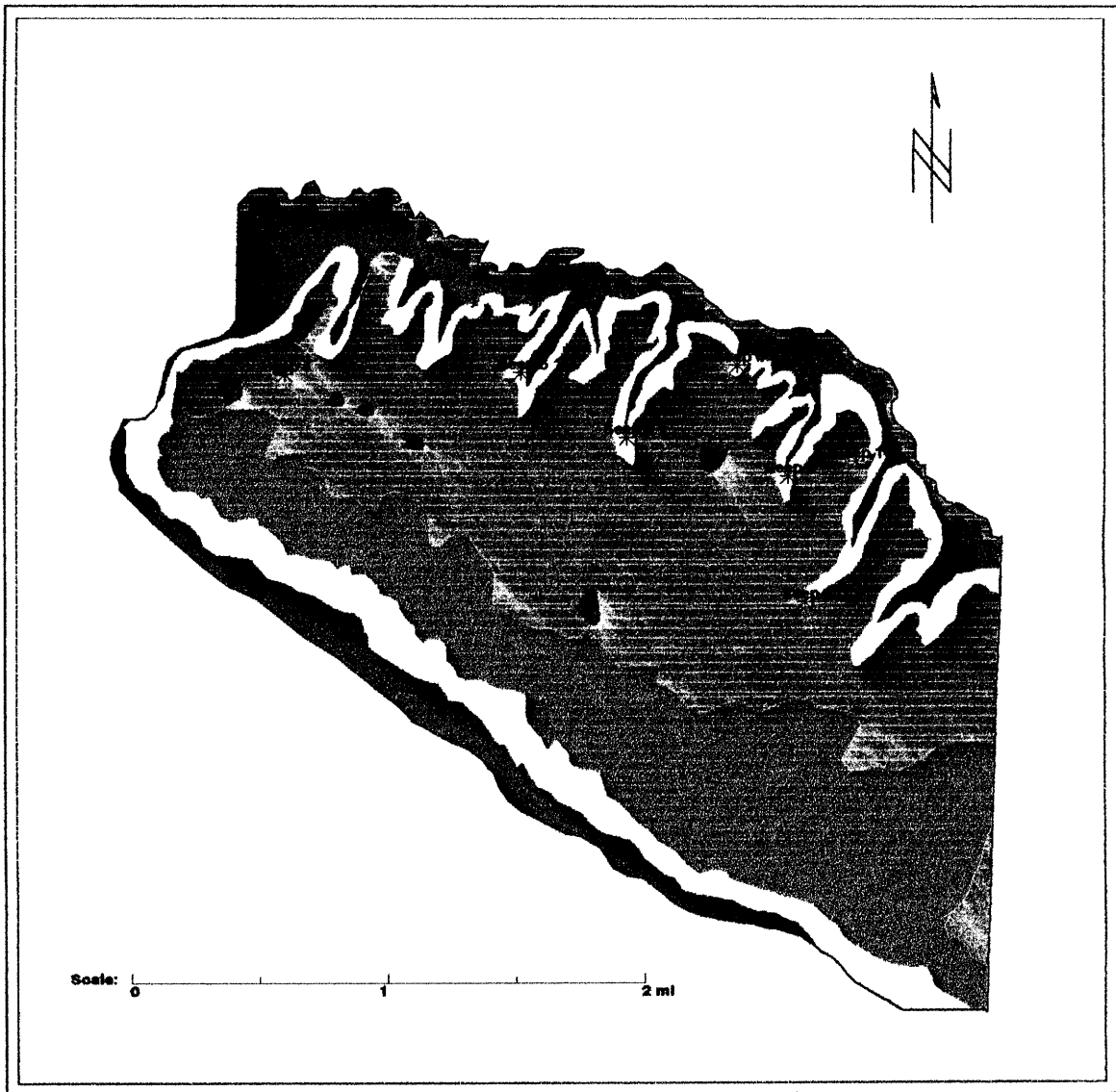
**Vegetation Communities
Chaco Culture National Historic Park
(Kelly & Potter, 1973)**



- ☐ OFFSITE
- ☐ ATRIPLEX-ORYZOPSIS-SPOROBOLUS
- ☐ ATRIPLEX-SARCOBATUS
- ☐ BARE ROCK
- ☐ DUNE ACTIVE
- ☐ DUNE VEGETATED
- ☐ HILARIA-BOUVELOUA (ATRIPLEX)
- ☐ HILARIA-BOUVELOUA (JUNIPERUS)
- ☐ OLD FIELD SUCCESSION
- ☐ PINYON JUNIPER
- ☐ RIPARIAN-WOODY
- ☐ SARCOBATUS-SPOROBOLUS
- ☐ SPOROBOLUS-SITANION
- ☐ WATER TREATMENT

Figure 4:

Chacra Mesa Vegetation Communities Chaco Culture National Historic Park



CHACRA MESA VEGETATION COMMUNITIES (141.01) = Brown, Lowe, Pase Designations

-  Pinon/Juniper Communities (141.0xx)
-  Artemisia nova Series (143.20)
-  Chrysothamnus, Gutierrezia Series (143.xxx)
-  Populus angustifolia Series (141.04)
-  Populus fremontii Series (141.05)
-  Atriplex, Lycium, Sporobolus (143.07x)
-  Atriplex, Ceratoides, Artemisia (143.07y)

✧ Seep Location
(Populus, Forstiera)

Appendix A.

Plant Species List documented from this study.

Chaco Culture National Historic Park
Plants of the 1988 (Cully) and 1993 (Floyd-Hanna et. al.)
Surveys

Family	Species
Agavaceae	<i>Yucca angustifolia</i> <i>Yucca angustissima</i>
Amaranthaceae	<i>Amaranthus graecizana</i> <i>Amaranthus hybridus</i> <i>Amaranthus powellii</i> <i>Tidestromi langinosa</i>
Anacardiaceae	<i>Rhus trilobata</i>
Asclepiadaceae	<i>Asclepias macrotis</i>
Asteraceae	<i>Antennaria marginata</i> <i>Artemisia biglovii</i> <i>Artemisia dracunculus</i> <i>Artemisia campestris</i> <i>Artemisia filifolia</i> <i>Artemisia frigida</i> <i>Artemisia ludoviciana</i> <i>Artemisia nova</i> <i>Artemisia tridentata</i> <i>Artemisia</i> <i>Bahia neomexicana</i> <i>Brickellia californica</i> <i>Brickellia scabra</i> <i>Centaurea repens</i> <i>Chrysopsis canescens</i> <i>Chrysopsis foliosa</i> <i>Chrysopsis villosa (Heterotheca villosa)</i> <i>Chrysothamnus greenei</i> <i>Chrysothamnus nauseosus</i> <i>Chrysothamnus parryi</i> <i>Chrysothamnus viscidiflorus</i> <i>Cirsium calcareum var. pulchellum</i> <i>Cirsium pulchellum</i> <i>Cirsium wheeleri</i>

Conyza canadensis
Conyza coulteri
Erigeron divergens
Erigeron flagellaris
Erigeron nudiflorus
Erigeron pumilis
Franseria acanthicarpa
Grindelia squorrosa
Gutierrezia microcephala
Gutierrezia sarothrae
Happlopappus ameroides
Helianthus annuus
Helianthus petiolaris
Hymenopappus filifolius
Hymenoxys invesiana
Hymenoxys odorata
Leucelene ericoides
Lygodesmia grandiflora
Machaeranthera boltoniae
Machaeranthera canescens
Machaeranthera tanacetifolia
Petradoria pumila
Senecio multicapitatus
Senecio multilobatus
Solidago missouriensis
Solidago petradoria
Stephanomeria pauciflora
Tetradymia canescens
Thelesperma megapotamicum
Townsendia annua
Townsendia incana
Townsendia strigosa
Tragopogon dubius
Verbesina enceloiedes
Xanthium saccharatum

Berberidaceae

Berberis fendleri

Boraginaeae

Cryptantha crassiseppala
Cryptantha flava
Crypantha fulvocanescens
Crypantha jamesii
Crypantha micrantha
Hackelia gracilentia
Lappula occidentalis
Lappula redowskii

<i>Brassicaceae</i>	<i>Arabis lignifera</i> <i>Arabis perrenans</i> <i>Descurania pinnata</i> <i>Dithyrea wislenzii</i> <i>Erysium capitatum</i> <i>Lesquerella fendleri</i> <i>Roripa microtites</i> <i>Sisymbrium altissimum</i> <i>Stanleya pinnata</i> <i>Streptanthella longirostris</i> <i>Streptanthus cordatus</i>
<i>Cactaceae</i>	<i>Coryphantha viviparis</i> <i>Echinocerus triglochidiatus</i> <i>Opuntia polycantha</i> <i>Opuntia whipplei</i>
<i>Capparidaceae</i>	<i>Cleome serrulata</i>
<i>Caryophyllaceae</i>	<i>Arenaria confusa</i> <i>Arenaria fendleri</i> <i>Silene scouleri</i>
<i>Chenopodiaceae</i>	<i>Atriplex argentea</i> <i>Atriplex canescens</i> <i>Atriplex jonesii</i> <i>Atriplex obovata</i> <i>Atriplex powellii</i> <i>Chenopodium berlandieri</i> <i>Chenopodium incanum</i> <i>Chenopodium fremontii</i> <i>Chenopodium leptophyllum</i> <i>Chenopodium watsoni</i> <i>Eurotia lanata (Ceratoides lanata)</i> <i>Kochia scoparia</i> <i>Salsosa kali (S. iberica)</i> <i>Sarcobatus vermiculatus</i> <i>Suckleya suckleyana</i> <i>Sueda torreyana</i>
<i>Convolvulaceae</i>	<i>Cuscuta campestris</i>
<i>Cupressaceae</i>	<i>Juniperus osteosperma</i>
<i>Cyperaceae</i>	<i>Carex filifolia</i>

Ephedraceae	<i>Ephedra cutleri</i> <i>Ephedra torreyana</i> <i>Ephedra viridis</i>
Euphorbiaceae	<i>Croton texensis</i> <i>Euphorbia fendleri</i> <i>Euphorbia glyptosperma</i> <i>Euphorbia micromera</i> <i>Euphorbia serpens</i>
Geraniaceae	<i>Erodium cicutarium</i>
Hydrophyllaceae	<i>Nama hispidum</i> <i>Phacelia crenulata</i> <i>Phacelia ivesiana</i> <i>Phacelia neomexicana</i>
Lamiaceae	<i>Hedeoma drummondii</i> <i>Marrubium vulgare</i> <i>Moldavica parviflora</i>
Fabaceae	<i>Astragalus amphioxys</i> <i>Astragalus calycosus</i> <i>Astragalus convallarius</i> <i>Astragalus lentiginosus</i> <i>Astragalus mollisimus</i> <i>Astragalus praelongus</i> <i>Dalea terminalis</i> <i>Lathyrus eucosmus</i> <i>Lupinus caudatus</i> <i>Lupinus lingii</i> <i>Lupinus pusillus</i> <i>Melilotus officinalis</i> <i>Petalostemum candidum</i> <i>Psoralea lanceolata</i>
Liliaceae	<i>Allium macropetalum</i>

Linaceae	<i>Linium aristatum</i> <i>Linium lewisii</i> <i>Linium puberulum</i>
Loasaceae	<i>Mentzelia albicaulis</i> <i>Mentzelia pumila</i>
Malvaceae	<i>Sphaeralcea coccinea</i> <i>Sphaeralcea emoryi</i> <i>Sphaeralcea fendleri</i> <i>Sphaeralcea incana</i> <i>Sphaeralcea parviflora</i>
Nyctaginaceae	<i>Abronia elliptica</i> <i>Abronia fragrans</i> <i>Mirabilis multiflora</i> <i>Mirabilis oxybaphoides</i> <i>Oxybaphus glaber</i> <i>Oxybaphus pumilus</i> <i>Tripterocalyx wootonii</i>
Oleaceae	<i>Forestiera neomexicana</i>
Onagraceae	<i>Oenothera albicaulis</i> <i>Oenothera caespitosa</i>
Pinaceae	<i>Pinus edulis</i>
Plantaginaceae	<i>Plantago purshii</i>
Poaceae	<i>Agropyron repens</i> <i>Agropyron smithii</i> <i>Agropyron subsecundum</i> <i>Andropogon scoparius</i> <i>Aristida fendleriana</i> <i>Aristida purpurea</i> <i>Bouteloua barbata</i> <i>Bouteloua curtipendula</i> <i>Bouteloua gracilis</i> <i>Bromus anamalous</i> <i>Bromus ciliata</i> <i>Bromus tectorum</i> <i>Elymus glaucus</i> <i>Eragrostis pectinacea</i> <i>Festuca octoflora</i> <i>Hilaria jamesii</i>

Hordeum jubatum
Hordeum pusillum
Muhlenbergia pungens
Muhlenbergia racemosa
Muhlenbergia rigens
Munroa squarrosa
Oryzopsis hymenoides (Stipa hymenoides)
Phleum pratense
Phragmites communis
Piptochaetium fimbriatum
Poa fendleriana
Setaria viridis
Sitanion hystrix
Sporobolus airoides
Sporobolus contractus
Sporobolus cryptandrus
Stipa commata
Stipa neomexicana
Stipa speciosa

Polemoniaceae

Ipomopsis aggregata
Ipomopsis longiflora
Ipomopsis multiflora
Ipomopsis pumila
Leptodactylon pungens
Gilia longiflora

Polygonaceae

Eriogonum alatum
Eriogonum cernuum
Eriogonum corymbosum
Eriogonum effusum
Eriogonum jamesii
Eriogonum leptophyllum
Eriogonum microthecum
Eriogonum ovalifolium
Eriogonum umbellatum
Rumex hymenosepalus

Polypodiaceae

Cheilanthes feei

Portulacaceae

Portulaca oleracea

Ranunculaceae

Clematis linguisticifolia

Rosaceae

Prunus virginiana
Cowania mexicana
Cercocarpus montanus

	<i>Fallugia paradoxa</i>
Santalaceae	<i>Commandra pallida</i>
Salicaceae	<i>Populus acuminata</i> <i>Populus angustifolia</i> <i>Populus fremontii</i> <i>Salix exigua</i> <i>Salix goodinii</i> <i>Salix lasiandra</i> <i>Salix lutea</i> <i>Salix taxifolia</i>
Saxifragaceae	<i>Ribes aueum</i> <i>Ribes cerum</i> <i>Ribes inebrians</i>
Scrophulariaceae	<i>Castilleja inegra</i> <i>Castilleja linarifolia</i> <i>Orobanche multiflora</i> <i>Penstemon angustifolius</i> <i>Penstemon barbatus</i> <i>Verbascus thapsus</i>
Solanaceae	<i>Chamaesaracha coronopus</i> <i>Datura meteloides</i> <i>Lycium pallidum</i> <i>Physalis hederafolia</i> <i>Solanum jamesii</i> <i>Solanum triflorum</i>
Tamaricaceae	<i>Tamarix pentandra</i>
Typhaceae	<i>Typha latifolia</i>
Umbelliferae	<i>Aletes macdougalli</i> <i>Cymopteris bulbosus</i> <i>Cymopterus fendleri</i> <i>Cympoterus montanus</i>
Vitaceae	<i>Parthenocissus innserta</i>

Appendix B.

**TWINSPAN clustering of vegetation sampling,
Chacra Mesa region of Chaco Canyon National
Historic Park.**

ONUMBER OF SAMPLES 89
 ONUMBER OF SPECIES 537
 4 PSEUDOSPECIES CUT LEVELS
 CUT LEVELS =

.00 1.00 2.00 3.00

LENGTH OF DATA ARRAY AFTER DEFINING PSEUDOSPECIES 2222

TOTAL NUMBER OF SPECIES AND PSEUDOSPECIES 400

NUMBER OF SPECIES, EXCLUDING PSEUDOSPECIES AND ONES WITH NO OCCURRENCES 177

ODIVISION 1 (N= 89) I.E. GROUP *

EIGENVALUE .553 AT ITERATION 2

INDICATORS, TOGETHER WITH THEIR SIGN

HILA JAM1(-) SPOR AER1(-) ATRI CAN2(-) SENE MUL1(+) JUNI OST1(+) SALS KAL1(-) ARTE NOV1(+)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP -1 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 0

OITEMS IN NEGATIVE GROUP 2 (N= 45) I.E. GROUP *0

A20XX015 IXXNW036 AXXXX037 XXXXX038 IXXXX039 B18NE041 A18NN042 B18EE043 IXXXX044 IXXXX045 IXXXX046 AXXXX047
 AXXNE048 s30NN050 S2OSS051 A15NW053 B35EE054 A35NW056 B30SE057 A20WW059 A35NN060 A30NW062 B20SE063 A03WW064
 A03WW065 A05WW066 A05WW067 BXXXX068 BXXXX069 I08WW070 I08WW071 I03SE072 I03SE073 IXXXX074 IXXXX075 A03SE076
 A03SE077 SXXXX078 SXXXX079 AXXXX080 AXXXX081 AXXXX082 AXXXX083 AXXXX084 AXXXX085

OBORDERLINE NEGATIVES (N= 3)

IXXNW036 AXXNE048 AXXXX084

OMISCLASSIFIED NEGATIVES (N= 1)

IXXX039

OITEMS IN POSITIVE GROUP 3 (N= 44) I.E. GROUP *1

A18EE001 A20NW002 A18XX003 B18SE004 S19EE005 A19NE006 A18XX007 A19SW008 A20NE009 AXXNE010 AXXNE011 AXXSW012
 A20SW013 X20XX014 A20NE016 A19NE017 I19NE018 X19NE019 A19XX020 X19NN021 A20XX022 A20NW023 A20NN024 A20WW025
 AXXXX026 AXXNW027 AXXNN028 A19NW029 AXXNW030 AXXNW031 AXXNN032 AXXEE033 AXXNN034 AXXNE035 A18NN040 A09XX049
 B15NE052 BXXNE055 AXXXX058 A15NE061 AXXXX086 AXXXX087 SXXXX088 SXXXX089

OMISCLASSIFIED POSITIVES (N= 1)

A20NW023

ONEGATIVE PREFERENTIALS

ARTE TRI1(16, 5) ATRI CAN1(33, 10) ATRI CON1(10, 1) BROM TEC1(9, 1) HILA JAM1(32, 1) LYCI PAL1(10, 2)
 SALS KAL1(16, 0) SARC VER1(12, 2) SPOR AER1(26, 2) CERA LAN1(13, 0) ARTE TRI2(16, 5) ATRI CAN2(32, 7)
 ATRI CON2(10, 1) HILA JAM2(30, 1) LYCI PAL2(9, 0) SALS KAL2(11, 0) SARC VER2(11, 2) SPOR AER2(25, 2)
 CERA LAN2(13, 0) ATRI CAN3(19, 1) BOUT GRA3(12, 5) HILA JAM3(14, 0) SPOR AER3(19, 1) CERA LAN3(11, 0)
 SPOR AER4(9, 1)

OPOSITIVE PREFERENTIALS

ARTE NOV1(0, 17) BRIC SCA1(2, 9) CERC MON1(0, 9) CHRY VIL1(2, 9) FORE NEO1(2, 12) JUNI OST1(0, 21)
 PINU EDU1(0, 17) SENE MUL1(0, 22) TETR CAN1(4, 10) YUCC ANG1(1, 13) ARTE NOV2(0, 12) FORE NEO2(2, 10)
 JUNI OST2(0, 18) PINU EDU2(0, 15) FORE NEO3(1, 10) JUNI OST3(0, 9) PINU EDU3(0, 12)

ONON-PREFERENTIALS

ARTE FRI1(11, 11) BOUT GRA1(19, 21) CHRY NAU1(6, 9) GUTI SAR1(23, 32) OPUN POL1(7, 12) ORYZ HYM1(30, 29)
 RHUS TRI1(6, 10) SITA HYS1(7, 10) BOUT GRA2(18, 14) GUTI SAR2(18, 19) ORYZ HYM2(26, 23) GUTI SAR3(9, 9)
 ORYZ HYM3(8, 9)

0 END OF LEVEL 1

ODIVISION 2 (N= 45) I.E. GROUP *0

EIGENVALUE .502 AT ITERATION 2

INDICATORS, TOGETHER WITH THEIR SIGN

CHRY NAU3(-)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP -1 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 0

OITEMS IN NEGATIVE GROUP 4 (N= 5) I.E. GROUP *00

IXXX039 A05WW066 A05WW067 IXXXX074 IXXXX075

OITEMS IN POSITIVE GROUP 5 (N= 40) I.E. GROUP *01

A20XX015 IXXNW036 AXXXX037 XXXXX038 B18NE041 A18NN042 B18EE043 IXXXX044 IXXXX045 IXXXX046 AXXXX047 AXXNE048
 s30NN050 S2OSS051 A15NW053 B35EE054 A35NW056 B30SE057 A20WW059 A35NN060 A30NW062 B20SE063 A03WW064 A03WW065
 BXXXX068 BXXXX069 I08WW070 I08WW071 I03SE072 I03SE073 A03SE076 A03SE077 SXXXX078 SXXXX079 AXXXX080 AXXXX081
 AXXXX082 AXXXX083 AXXXX084 AXXXX085

ONEGATIVE PREFERENTIALS

CHRY NAU1(5, 1) EUPH FEN1(1, 2) GILI AGG1(1, 0) POPU FRE1(1, 0) SEDU STE1(2, 2) ARTE CAM1(2, 2)
 ERIO LEP1(2, 4) AGRO SPX1(1, 0) UNK 0131(1, 0) UNK 0141(1, 0) BROM CIL1(3, 0) HAPP SPX1(2, 0)
 CHRY NAU2(5, 1) GILI AGG2(1, 0) POPU FRE2(1, 0) ARTE CAM2(2, 0) AGRO SPX2(1, 0) UNK 0132(1, 0)
 BROM CIL2(1, 0) HAPP SPX2(2, 0) ARTE TRI3(2, 5) CHRY NAU3(5, 0) GILI AGG3(1, 0) POPU FRE3(1, 0)
 ARTE CAM3(2, 0) AGRO SPX3(1, 0) ARTE TRI4(1, 1) CHRY NAU4(4, 0) POPU FRE4(1, 0) ARTE CAM4(2, 0)
 AGRO SPX4(1, 0)

OPOSITIVE PREFERENTIALS

ARTE FRI1(0, 11) ATRI CON1(0, 10) BOUT GRA1(0, 19) LYCI PAL1(0, 10) ORYZ HYM1(1, 29) SALS KAL1(0, 16)

SARC VER1(0, 12) SPOR AER1(0, 26) CERA LAN1(0, 13) ARTE FRI2(0, 8) ATRI CON2(0, 10) BOUT GRA2(0, 18)
 GUTI SAR2(1, 17) LYCI PAL2(0, 9) ORYZ HYM2(1, 25) SALS KAL2(0, 11) SARC VER2(0, 11) SPOR AER2(0, 25)
 CERA LAN2(0, 13) ATRI CAN3(0, 19) BOUT GRA3(0, 12) HILA JAM3(0, 14) ORYZ HYM3(0, 8) SPOR AER3(0, 19)
 CERA LAN3(0, 11) SPOR AER4(0, 9)

ONON-PREFERENTIALS

ARTE TRI1(3, 13) ATRI CAN1(2, 31) BROM TEC1(1, 8) GUTI SAR1(2, 21) HILA JAM1(2, 30) ARTE TRI2(3, 13)
 ATRI CAN2(2, 30) BROM TEC2(1, 6) HILA JAM2(2, 28) GUTI SAR3(1, 8)

ODIVISION 3 (N= 44) I.E. GROUP *1

EIGENVALUE .593 AT ITERATION 2

INDICATORS, TOGETHER WITH THEIR SIGN

FORE NEO1(+) ARTE LUD2(+) GUTI SAR1(-) ARTE NOV1(-) PINU EDU1(-)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP -1 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 0

OITEMS IN NEGATIVE GROUP 6 (N= 34) I.E. GROUP *10

A18EE001 A20NW002 A18XX003 B18SE004 S19EE005 A19NE006 A18XX007 A19SW008 A20NE009 AXXNE010 AXXNE011 AXXSW012
 A20SW013 X20XX014 A20NE016 A19NE017 I19NE018 A19XX020 X19NN021 A20XX022 A20NW023 A20NN024 A20WW025 AXXX026
 AXXNW027 A19NW029 AXXNW030 AXXNW031 AXXNN032 AXXEE033 AXXNN034 AXXNE035 AXXX086 AXXX087

OMISCLASSIFIED NEGATIVES (N= 1)

A20NE016

OITEMS IN POSITIVE GROUP 7 (N= 10) I.E. GROUP *11

X19NE019 AXXNN028 A18NN040 A09XX049 B15NE052 BXXNE055 AXXX058 A15NE061 SXXX088 SXXX089

ONEGATIVE PREFERENTIALS

ARTE NOV1(17, 0) BOUT GRA1(20, 1) COMM UMB1(7, 0) CRYP FLA1(8, 0) GUTI SAR1(29, 3) JUNI OST1(19, 2)
 OPUN POL1(11, 1) PINU EDU1(17, 0) TETR CAN1(10, 0) YUCC ANG1(12, 1) EPHE VIR1(8, 0) CHRY GRE1(8, 0)
 LUP1 SPX1(7, 0) ARTE NOV2(12, 0) BOUT GRA2(14, 0) CHRY NAU2(7, 1) GUTI SAR2(18, 1) JUNI OST2(16, 2)
 PINU EDU2(15, 0) TETR CAN2(7, 0) EPHE VIR2(8, 0) CHRY GRE2(7, 0) ARTE NOV3(7, 0) GUTI SAR3(9, 0)
 JUNI OST3(9, 0) ORYZ HYM3(9, 0) PINU EDU3(12, 0)

OPOSITIVE PREFERENTIALS

AMEL UTA1(0, 2) ARTE LUD1(2, 6) ARTE TRI1(3, 2) BRIC SCA1(4, 5) CAST CHR1(2, 2) CHRY VIL1(4, 5)
 CIRS PUL1(0, 4) CLEM LIG1(0, 4) ERIO UMB1(2, 2) FORE NEO1(2, 10) POA FEN1(3, 5) POPU ANG1(0, 2)
 PRUN VIR1(0, 2) RHUS TRI1(6, 4) SARC VER1(0, 2) STAN PIN1(0, 2) SPOR AER1(0, 2) RIBE CER1(0, 5)
 ERIG FLA1(0, 3) RIBE CER1(0, 2) POPU ACU1(0, 2) 1(0, 2) AMEL UTA2(0, 2) ARTE LUD2(1, 6)
 ARTE TRI2(3, 2) BRIC SCA2(1, 3) CAST CHR2(2, 2) CHRY VIL2(4, 4) CIRS PUL2(0, 4) CLEM LIG2(0, 2)
 ERIO UMB2(2, 2) FORE NEO2(1, 9) POA FEN2(1, 4) POPU ANG2(0, 2) PRUN VIR2(0, 2) RHUS TRI2(4, 4)
 SARC VER2(0, 2) SENE MUL2(2, 2) SITA HYS2(2, 3) STAN PIN2(0, 2) SPOR AER2(0, 2) RIBE CER2(0, 5)
 RIBE CER2(0, 2) POPU ACU2(0, 2) 2(0, 2) AMEL UTA3(0, 2) ARTE LUD3(0, 4) CAST CHR3(0, 2)
 FORE NEO3(1, 9) POA FEN3(0, 2) PRUN VIR3(0, 2) RHUS TRI3(1, 3) SARC VER3(0, 2) RIBE CER3(0, 2)
 POPU ACU3(0, 2) FORE NEO4(0, 5)

ONON-PREFERENTIALS

ARTE FRI1(9, 2) ATRI CAN1(7, 3) CERC MON1(7, 2) CHRY NAU1(7, 2) ERIO ALA1(4, 2) ORYZ HYM1(23, 6)
 SENE MUL1(17, 5) SITA HYS1(7, 3) CERC MON2(6, 2) ORYZ HYM2(17, 6)

0 END OF LEVEL 2

ODIVISION 4 (N= 5) I.E. GROUP *00

EIGENVALUE .754 AT ITERATION 1

INDICATORS, TOGETHER WITH THEIR SIGN

ARTE TRI1(+)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP 0 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 1

OITEMS IN NEGATIVE GROUP 8 (N= 2) I.E. GROUP *000

IXXX074 IXXX075

OITEMS IN POSITIVE GROUP 9 (N= 3) I.E. GROUP *001

IXXX039 A05WW066 A05WW067

ONEGATIVE PREFERENTIALS

ATRI CAN1(2, 0) SEDU STE1(2, 0) ARTE CAM1(2, 0) HAPP SPX1(2, 0) ATRI CAN2(2, 0) ARTE CAM2(2, 0)
 HAPP SPX2(2, 0) ARTE CAM3(2, 0) ARTE CAM4(2, 0)

OPOSITIVE PREFERENTIALS

ARTE TRI1(0, 3) BROM TEC1(0, 1) EUPH FEN1(0, 1) GILI AGG1(0, 1) GUTI SAR1(0, 2) HILA JAM1(0, 2)
 ORYZ HYM1(0, 1) POPU FRE1(0, 1) ERIO LEP1(0, 2) AGRO SPX1(0, 1) UNK 0131(0, 1) UNK 0141(0, 1)
 BROM CIL1(0, 3) ARTE TRI2(0, 3) BROM TEC2(0, 1) GILI AGG2(0, 1) GUTI SAR2(0, 1) HILA JAM2(0, 2)
 ORYZ HYM2(0, 1) POPU FRE2(0, 1) AGRO SPX2(0, 1) UNK 0132(0, 1) BROM CIL2(0, 1) ARTE TRI3(0, 2)
 GILI AGG3(0, 1) GUTI SAR3(0, 1) POPU FRE3(0, 1) AGRO SPX3(0, 1) ARTE TRI4(0, 1) CHRY NAU4(1, 3)
 POPU FRE4(0, 1) AGRO SPX4(0, 1)

ONON-PREFERENTIALS

CHRY NAU1(2, 3) CHRY NAU2(2, 3) CHRY NAU3(2, 3)

ODIVISION 5 (N= 40) I.E. GROUP *01

EIGENVALUE .379 AT ITERATION 3

INDICATORS, TOGETHER WITH THEIR SIGN

SALS KAL1(-) GUTI SAR1(+) BOUT GRA1(+) ARTE TRI1(+)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP 0 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 1
 OITEMS IN NEGATIVE GROUP 10 (N= 16) I.E. GROUP *010
 AXXXX037 XXXXX038 A18NN042 IXXXX044 IXXXX045 IXXXX046 AXXXX047 S20SS051 A03SE076 A03SE077 SXXXX078 SXXXX079
 AXXXX080 AXXXX081 AXXXX082 AXXXX083
 OITEMS IN POSITIVE GROUP 11 (N= 24) I.E. GROUP *011
 A20XX015 IXXNW036 B18NE041 B18EE043 AXNE048 s30NN050 A15NW053 B35EE054 A35NW056 B30SE057 A20WW059 A35NN060
 A30NW062 B20SE063 A03WW064 A03WW065 BXXXX068 BXXXX069 I08WW070 I08WW071 I03SE072 I03SE073 AXXXX084 AXXXX085
 OBORDERLINE POSITIVES (N= 3)
 B20SE063 A03WW064 BXXXX068
 ONEGATIVE PREFERENTIALS
 MENT ALB1(4, 2) SALS KAL1(14, 2) SARC VER1(7, 5) SALS KAL2(9, 2) LYCI PAL3(4, 1) SALS KAL3(4, 0)
 SARC VER3(5, 1) ATRI CAN4(4, 3) HILA JAM4(4, 2) SARC VER4(4, 0) SPOR AER4(6, 3)
 OPOSITIVE PREFERENTIALS
 ARTE FRI1(2, 9) ARTE TRI1(0, 13) ATRI CON1(1, 9) BOUT GRA1(1, 18) BROM TEC1(2, 6) GUTI SAR1(1, 20)
 OPUN POL1(0, 7) ORYZ HYM1(7, 22) RHUS TRI1(0, 6) STAN PIN1(0, 6) CHRY GRE1(0, 6) CERA LAN1(1, 12)
 ERIO MIC1(0, 6) ARTE SP11(0, 5) ARTE FRI2(0, 8) ARTE TRI2(0, 13) ATRI CON2(1, 9) BOUT GRA2(1, 17)
 GUTI SAR2(1, 16) OPUN POL2(0, 6) ORYZ HYM2(6, 19) RHUS TRI2(0, 6) STAN PIN2(0, 5) CHRY GRE2(0, 6)
 CERA LAN2(1, 12) ERIO MIC2(0, 5) ARTE SP12(0, 5) ARTE TRI3(0, 5) ATRI CON3(1, 6) BOUT GRA3(1, 11)
 GUTI SAR3(0, 8) ORYZ HYM3(0, 8) CERA LAN3(1, 10)
 ONON-PREFERENTIALS
 ATRI CAN1(11, 20) HILA JAM1(13, 17) LYCI PAL1(5, 5) SPHA PAR1(2, 5) SPOR AER1(10, 16) ATRI CAN2(10, 20)
 HILA JAM2(12, 16) LYCI PAL2(5, 4) SARC VER2(6, 5) SPOR AER2(10, 15) ATRI CAN3(7, 12) HILA JAM3(7, 7)
 SPOR AER3(10, 9)

 ODIVISION 6 (N= 34) I.E. GROUP *10
 EIGENVALUE .474 AT ITERATION 3
 INDICATORS, TOGETHER WITH THEIR SIGN
 GUTI SAR3(-) PINU EDU2(+) ORYZ HYM2(-) YUCC ANG1(+) JUNI OST1(+) CHRY GRE1(-)
 MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP -1 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 0
 OITEMS IN NEGATIVE GROUP 12 (N= 14) I.E. GROUP *100
 A19NE006 A20NE009 AXNE010 AXNE011 AXSW012 A20SW013 X20XX014 A20NE016 A20NN024 AXXXX026 AXNW027 A19NW029
 AXNN032 AXNE035
 OMISCLASSIFIED NEGATIVES (N= 1)
 AXNN032
 OITEMS IN POSITIVE GROUP 13 (N= 20) I.E. GROUP *101
 A18EE001 A20NW002 A18XX003 B18SE004 S19EE005 A18XX007 A19SW008 A19NE017 I19NE018 A19XX020 X19NN021 A20XX022
 A20NW023 A20WW025 AXNW030 AXNW031 AXEE033 AXNN034 AXXXX086 AXXXX087
 OBORDERLINE POSITIVES (N= 1)
 A20WW025
 OMISCLASSIFIED POSITIVES (N= 1)
 B18SE004
 ONEGATIVE PREFERENTIALS
 ARTE FRI1(6, 3) CRYP FLA1(6, 2) CYMO BUL1(4, 0) STIP COM1(5, 0) TETR CAN1(6, 4) ASTR SPX1(5, 0)
 CHRY GRE1(7, 1) ERIO LEP1(3, 2) LUPI SPX1(5, 2) EPHE TOR1(3, 1) PENS PUR1(3, 2) PENS PIN1(3, 2)
 ARTE FRI2(5, 0) CRYP FLA2(3, 0) GUTI SAR2(12, 6) ORYZ HYM2(11, 6) STIP COM2(4, 0) TETR CAN2(6, 1)
 CHRY GRE2(6, 1) ERIO LEP2(3, 0) BOUT GRA3(3, 2) GUTI SAR3(9, 0) ORYZ HYM3(7, 2) STIP COM3(3, 0)
 TETR CAN3(4, 0) CHRY GRE3(6, 0) GUTI SAR4(5, 0) ORYZ HYM4(3, 0) CHRY GRE4(5, 0)
 OPOSITIVE PREFERENTIALS
 ALET MAC1(0, 6) BRIC SCA1(0, 4) CERC MON1(0, 7) CHRY VIL1(0, 4) CHRY NAU1(0, 7) ERIO ALA1(0, 4)
 EUPH FEN1(0, 4) JUNI OST1(4, 15) LESQ SPX1(1, 4) MIRA MUL1(0, 4) PINU EDU1(2, 15) RHUS TRI1(0, 6)
 SENE MUL1(4, 13) YUCC ANG1(1, 11) PETR PUM1(0, 5) COWA NEO1(0, 6) ERIO MIC1(1, 4) ALET MAC2(0, 4)
 CERC MON2(0, 6) CHRY VIL2(0, 4) CHRY NAU2(0, 7) JUNI OST2(4, 12) PINU EDU2(1, 14) RHUS TRI2(0, 4)
 YUCC ANG2(1, 4) COWA NEO2(0, 6) JUNI OST3(2, 7) PINU EDU3(0, 12)
 ONON-PREFERENTIALS
 ARTE NOV1(6, 11) ATRI CAN1(3, 4) BOUT GRA1(8, 12) COMM UMB1(4, 3) GUTI SAR1(13, 16) OPUN POL1(4, 7)
 ORYZ HYM1(12, 11) SITA HYS1(3, 4) EPHE VIR1(3, 5) PENS SPX1(3, 3) ARTE NOV2(4, 8) ATRI CAN2(3, 3)
 BOUT GRA2(7, 7) EPHE VIR2(3, 5) ARTE NOV3(3, 4)

 ODIVISION 7 (N= 10) I.E. GROUP *11
 EIGENVALUE .656 AT ITERATION 2
 INDICATORS, TOGETHER WITH THEIR SIGN
 CAST CHR1(+)
 MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP 0 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 1
 OITEMS IN NEGATIVE GROUP 14 (N= 8) I.E. GROUP *110
 X19NE019 AXNN028 A18NN040 A09XX049 B15NE052 BXXNE055 AXXXX058 A15NE061
 OITEMS IN POSITIVE GROUP 15 (N= 2) I.E. GROUP *111
 SXXXX088 SXXXX089
 ONEGATIVE PREFERENTIALS
 AMEL UTA1(2, 0) ARTE FRI1(2, 0) ARTE LUD1(6, 0) ATRI CAN1(3, 0) BRIC SCA1(5, 0) CERC MON1(2, 0)
 CHRY NAU1(2, 0) CIRS PUL1(4, 0) CLEM LIG1(4, 0) JUNI OST1(2, 0) POA FEN1(5, 0) PRUN VIR1(2, 0)
 RHUS TRI1(4, 0) SARC VER1(2, 0) SENE MUL1(5, 0) STAN PIN1(2, 0) SPOR AER1(2, 0) ERIG FLA1(3, 0)

RIBE CER1(2, 0) POPU ACU1(2, 0) AMEL UTA2(2, 0) ARTE LUD2(6, 0) BRIC SCA2(3, 0) CERC MON2(2, 0)
 CIRS PUL2(4, 0) CLEM LIG2(2, 0) FORE NEO2(8, 1) JUNI OST2(2, 0) POA FEN2(4, 0) PRUN VIR2(2, 0)
 RHUS TRI2(4, 0) SARC VER2(2, 0) SENE MUL2(2, 0) STAN PIN2(2, 0) SPOR AER2(2, 0) RIBE CER2(2, 0)
 POPU ACU2(2, 0) AMEL UTA3(2, 0) ARTE LUD3(4, 0) FORE NEO3(8, 1) POA FEN3(2, 0) PRUN VIR3(2, 0)
 RHUS TRI3(3, 0) SARC VER3(2, 0) RIBE CER3(2, 0) POPU ACU3(2, 0)

OPPOSITE PREFERENTIALS

ARTE TRI1(1, 1) CAST CHR1(0, 2) ERIO ALA1(1, 1) ERIO UMB1(0, 2) GUTI SAR1(2, 1) POPU ANG1(0, 2)
 SITA HYS1(1, 2) 1(0, 2) ARTE TRI2(1, 1) CAST CHR2(0, 2) ERIO UMB2(0, 2) POPU ANG2(0, 2)
 SITA HYS2(1, 2) 2(0, 2) CAST CHR3(0, 2) CHRY VIL3(0, 1) POPU ANG3(0, 1) SITA HYS3(0, 1)
 3(0, 1) CAST CHR4(0, 1) POPU ANG4(0, 1) 4(0, 1)

ONON-PREFERENTIALS

CHRY VIL1(4, 1) FORE NEO1(8, 2) ORYZ HYM1(5, 1) RIBE CER1(4, 1) CHRY VIL2(3, 1) ORYZ HYM2(5, 1)
 RIBE CER2(4, 1) FORE NEO4(4, 1)
 0 END OF LEVEL 3

ODIVISION 8 (N= 2) I.E. GROUP *000

DIVISION FAILS - THERE ARE TOO FEW ITEMS

ODIVISION 9 (N= 3) I.E. GROUP *001

DIVISION FAILS - THERE ARE TOO FEW ITEMS

ODIVISION 10 (N= 16) I.E. GROUP *010

EIGENVALUE .522 AT ITERATION 2

INDICATORS, TOGETHER WITH THEIR SIGN

SITA HYS1(-)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP -1 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 0

0 ITEMS IN NEGATIVE GROUP 20 (N= 3) I.E. GROUP *0100

IXXXX045 IXXX046 AXXX047

0 ITEMS IN POSITIVE GROUP 21 (N= 13) I.E. GROUP *0101

AXXXX037 XXXX038 A18NN042 IXXX044 S20SS051 A03SE076 A03SE077 SXXXX078 SXXXX079 AXXX080 AXXX081 AXXX082

AXXXX083

0 BORDERLINE POSITIVES (N= 1)

XXXXX038

ONEGATIVE PREFERENTIALS

ATRI CON1(1, 0) SITA HYS1(3, 0) AMBR FRE1(1, 0) ERIO SPX1(1, 0) UNK 0161(2, 0) UNK 0171(1, 0)

ATRI CON2(1, 0) MENT ALB2(1, 2) ORYZ HYM2(2, 4) SITA HYS2(3, 0) ATRI CON3(1, 0) SITA HYS3(2, 0)

ATRI CON4(1, 0) SITA HYS4(1, 0)

OPPOSITE PREFERENTIALS

ATRI CAN1(0, 11) LYCI PAL1(0, 5) SPOR AER1(0, 10) ATRI CAN2(0, 10) LYCI PAL2(0, 5) SALS KAL2(0, 9)

SPOR AER2(0, 10) ATRI CAN3(0, 7) LYCI PAL3(0, 4) SALS KAL3(0, 4) SPOR AER3(0, 10) ATRI CAN4(0, 4)

SPOR AER4(0, 6)

ONON-PREFERENTIALS

HILA JAM1(3, 10) MENT ALB1(1, 3) ORYZ HYM1(2, 5) SALS KAL1(2, 12) SARC VER1(2, 5) HILA JAM2(2, 10)

SARC VER2(1, 5) HILA JAM3(1, 6) SARC VER3(1, 4) HILA JAM4(1, 3) SARC VER4(1, 3)

ODIVISION 11 (N= 24) I.E. GROUP *011

EIGENVALUE .404 AT ITERATION 2

INDICATORS, TOGETHER WITH THEIR SIGN

BOUT GRA1(-) RHUS TRI1(+)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP 0 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 1

0 ITEMS IN NEGATIVE GROUP 22 (N= 20) I.E. GROUP *0110

A20XX015 IXXNW036 B18NE041 B18EE043 AXNNE048 S30NN050 A15NW053 B35EE054 A35NW056 B30SE057 A20WW059 A35NN060

A30NW062 B20SE063 A03WW064 A03WW065 I03SE072 I03SE073 AXXX084 AXXX085

0 ITEMS IN POSITIVE GROUP 23 (N= 4) I.E. GROUP *0111

BXXXX068 BXXXX069 I08WW070 I08WW071

ONEGATIVE PREFERENTIALS

ARTE FRI1(9, 0) ARTE LUD1(4, 0) ATRI CON1(9, 0) BOUT GRA1(18, 0) BROM TEC1(6, 0) LYCI PAL1(5, 0)

OPUN POL1(7, 0) ORYZ HYM1(20, 2) SARC VER1(5, 0) SITA HYS1(4, 0) SPHA PAR1(5, 0) CPOR CRY1(4, 0)

STAN PIN1(6, 0) TETR CAN1(4, 0) LEUC ERI1(4, 0) CHRY GRE1(6, 0) CERA LAN1(12, 0) ERIO MIC1(6, 0)

ARTE FRI2(8, 0) ARTE LUD2(4, 0) ATRI CON2(9, 0) BOUT GRA2(17, 0) BROM TEC2(4, 0) LYCI PAL2(4, 0)

OPUN POL2(6, 0) SARC VER2(5, 0) STAN PIN2(5, 0) SPOR AER2(14, 1) LEUC ERI2(4, 0) CHRY GRE2(6, 0)

CERA LAN2(12, 0) ERIO MIC2(5, 0) ARTE FRI3(4, 0) ATRI CON3(6, 0) BOUT GRA3(11, 0) HILA JAM3(7, 0)

SPOR AER3(9, 0) CERA LAN3(10, 0) BOUT GRA4(4, 0)

OPPOSITE PREFERENTIALS

ARTE TRI1(9, 4) BOUT CUR1(0, 1) CHRY VIL1(0, 2) CHRY NAU1(0, 1) EPHR VIR1(0, 1) ERIO ALA1(1, 1)

PENS BAR1(0, 1) RHUS TRI1(2, 4) SALS KAL1(0, 2) ERIO LEP1(2, 2) ARTE SP11(3, 2) RIBE CER1(0, 2)

CORY VIV1(0, 1) ARTE TRI2(9, 4) CHRY VIL2(0, 1) CHRY NAU2(0, 1) EPHR VIR2(0, 1) RHUS TRI2(2, 4)

SALS KAL2(0, 2) ERIO LEP2(2, 2) ARTE SP12(3, 2) RIBE CER2(0, 2) EPHR VIR3(0, 1) RHUS TRI3(0, 2)

RIBE CER3(0, 2) ARTE TRI4(0, 1) RHUS TRI4(0, 2) RIBE CER4(0, 1)

ONON-PREFERENTIALS

ATRI CAN1(16, 4) GUTI SAR1(16, 4) HILA JAM1(14, 3) SPOR AER1(14, 2) ATRI CAN2(16, 4) GUTI SAR2(14, 2)
 HILA JAM2(14, 2) ORYZ HYM2(17, 2) ARTE TRI3(4, 1) ATRI CAN3(10, 2) GUTI SAR3(7, 1) ORYZ HYM3(6, 2)

ODIVISION 12 (N= 14) I.E. GROUP *100

EIGENVALUE .463 AT ITERATION 3

INDICATORS, TOGETHER WITH THEIR SIGN

STIP COM1(-) TETR CAN1(+) COMM UMB1(-) ARTE NOV2(-) ASTR SPX1(+)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP 0 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 1

OITEMS IN NEGATIVE GROUP 24 (N= 6) I.E. GROUP *1000

AXXSW012 A20SW013 A20NN024 AXXX026 AXXNN032 AXXNE035

OITEMS IN POSITIVE GROUP 25 (N= 8) I.E. GROUP *1001

A19NE006 A20NE009 AXXNE010 AXXNE011 X20XX014 A20NE016 AXXNW027 A19NW029

ONEGATIVE PREFERENTIALS

ARTE NOV1(4, 2) ATRI CAN1(2, 1) COMM UMB1(4, 0) CRYP FLA1(4, 2) CYMO BUL1(3, 1) OPUN POL1(3, 1)

SITA HYS1(2, 1) STIP COM1(5, 0) ERIO PUM1(2, 0) EPHE TOR1(2, 1) ASTR RED1(2, 0) PENS PUR1(2, 1)

PENS PIN1(3, 0) PENS SPX1(2, 1) ERIO SPX1(2, 0) ARTE NOV2(4, 0) ATRI CAN2(2, 1) COMM UMB2(2, 0)

CRYP FLA2(2, 1) STIP COM2(4, 0) EPHE TOR2(2, 0) ERIO SPX2(2, 0) ARTE NOV3(3, 0) BOUT GRA3(2, 1)

STIP COM3(3, 0) ARTE NOV4(2, 0) ORYZ HYM4(2, 1)

OPOSITIVE PREFERENTIALS

ARTE FRI1(1, 5) LAPP RED1(0, 2) SPHA COC1(0, 2) TETR CAN1(0, 6) TOWN INC1(0, 2) ASTR SPX1(0, 5)

ARTE FRI2(0, 5) TETR CAN2(0, 6) ASTR SPX2(0, 2) CHRY GRE2(1, 5) JUNI OST3(0, 2) TETR CAN3(0, 4)

CHRY GRE3(1, 5) GUTI SAR4(0, 5) TETR CAN4(0, 2) CHRY GRE4(0, 5)

ONON-PREFERENTIALS

BOUT GRA1(4, 4) GUTI SAR1(5, 8) JUNI OST1(2, 2) ORYZ HYM1(5, 7) SENE MUL1(2, 2) EPHE VIR1(1, 2)

CHRY GRE1(2, 5) ERIO LEP1(1, 2) LUPI SPX1(2, 3) BOUT GRA2(3, 4) GUTI SAR2(5, 7) JUNI OST2(2, 2)

ORYZ HYM2(4, 7) EPHE VIR2(1, 2) ERIO LEP2(1, 2) GUTI SAR3(4, 5) ORYZ HYM3(3, 4)

ODIVISION 13 (N= 20) I.E. GROUP *101

EIGENVALUE .477 AT ITERATION 2

INDICATORS, TOGETHER WITH THEIR SIGN

ARTE TRI1(+)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP 0 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 1

OITEMS IN NEGATIVE GROUP 26 (N= 18) I.E. GROUP *1010

A18EE001 A20NW002 A18XX003 B18SE004 S19EE005 A18XX007 A19SW008 A19NE017 I19NE018 A19XX020 X19NN021 A20XX022

A20NW023 A20WW025 AXXNW030 AXXNW031 AXxEE033 AXXNN034

OITEMS IN POSITIVE GROUP 27 (N= 2) I.E. GROUP *1011

AXXX086 AXXXX087

ONEGATIVE PREFERENTIALS

ALET MAC1(6, 0) ARTE NOV1(11, 0) ATRI CAN1(4, 0) BRIC SCA1(4, 0) CERC MON1(7, 0) CHRY NAU1(7, 0)

ERIO ALA1(4, 0) LESQ SPX1(4, 0) OPUN POL1(7, 0) PINU EDU1(15, 0) RHUS TRI1(6, 0) SENE MUL1(13, 0)

SITA HYS1(4, 0) TETR CAN1(4, 0) YUCC ANG1(11, 0) EPHE VIR1(5, 0) PETR PUM1(5, 0) COWA NEO1(6, 0)

ERIO MIC1(4, 0) ALET MAC2(4, 0) ARTE NOV2(8, 0) CERC MON2(6, 0) CHRY NAU2(7, 0) ORYZ HYM2(6, 0)

PINU EDU2(14, 0) RHUS TRI2(4, 0) YUCC ANG2(4, 0) EPHE VIR2(5, 0) COWA NEO2(6, 0) ARTE NOV3(4, 0)

PINU EDU3(12, 0)

OPOSITIVE PREFERENTIALS

ARTE TRI1(0, 2) ASTE GLA1(0, 2) CAST CHR1(0, 2) CHRY VIL1(2, 2) EUPH FEN1(2, 2) MIRA MUL1(2, 2)

ARTE TRI2(0, 2) ASTE GLA2(0, 2) CAST CHR2(0, 2) CHRY VIL2(2, 2) MIRA MUL2(0, 1) ARTE TRI3(0, 2)

BOUT GRA3(1, 1) ARTE TRI4(0, 2)

ONON-PREFERENTIALS

BOUT GRA1(10, 2) GUTI SAR1(14, 2) JUNI OST1(13, 2) ORYZ HYM1(10, 1) BOUT GRA2(6, 1) GUTI SAR2(5, 1)

JUNI OST2(10, 2) JUNI OST3(6, 1)

ODIVISION 14 (N= 8) I.E. GROUP *110

EIGENVALUE .555 AT ITERATION 1

INDICATORS, TOGETHER WITH THEIR SIGN

ARTE FRI1(-)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP -1 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 0

OITEMS IN NEGATIVE GROUP 28 (N= 2) I.E. GROUP *1100

X19NE019 AXXNN028

OITEMS IN POSITIVE GROUP 29 (N= 6) I.E. GROUP *1101

A18NN040 A09XX049 B15NE052 BXXNE055 AXXX058 A15NE061

ONEGATIVE PREFERENTIALS

ALET MAC1(1, 0) AMEL UTA1(1, 1) ARTE FRI1(2, 0) ARTE TRI1(1, 0) CERC MON1(2, 0) ERIO ALA1(1, 0)

GUTI SAR1(1, 1) JUNI OST1(1, 1) LAPP RED1(1, 0) LESQ SPX1(1, 0) LYCI PAL1(1, 0) SENE MUL1(2, 3)

SPHA COC1(1, 0) STEP COR1(1, 0) YUCC ANG1(1, 0) ERIO PUM1(1, 0) RIBE CER1(2, 2) DESC SPX1(1, 0)

POA SPX1(1, 0) UNK 0051(1, 0) UNK 0061(1, 0) UNK 0071(1, 0) UNK 0081(1, 0) AMEL UTA2(1, 1)

ARTE FRI2(1, 0) ARTE TRI2(1, 0) CERC MON2(2, 0) JUNI OST2(1, 1) SPHA COC2(1, 0) YUCC ANG2(1, 0)

ERIO PUM2(1, 0) RIBE CER2(2, 2) POA SPX2(1, 0) AMEL UTA3(1, 1) CERC MON3(1, 0) RIBE CER3(1, 1)

POA SPX3(1, 0) AMEL UTA4(1, 0) CERC MON4(1, 0) FORE NEO4(2, 2) RIBE CER4(1, 0) POA SPX4(1, 0)

OPOSITIVE PREFERENTIALS

BRIC SCA1(0, 5) CHRY NAU1(0, 2) CIRS PUL1(0, 4) CLEM LIG1(0, 4) PRUN VIR1(0, 2) SARC VER1(0, 2)
 STAN PIN1(0, 2) SPOR AER1(0, 2) ERIG FLA1(0, 3) RIBE CER1(0, 2) POPU ACU1(0, 2) BRIC SCA2(0, 3)
 CIRS PUL2(0, 4) CLEM LIG2(0, 2) POA FEN2(0, 4) PRUN VIR2(0, 2) SARC VER2(0, 2) SENE MUL2(0, 2)
 STAN PIN2(0, 2) SPOR AER2(0, 2) RIBE CER2(0, 2) POPU ACU2(0, 2) ARTE LUD3(0, 4) POA FEN3(0, 2)
 PRUN VIR3(0, 2) SARC VER3(0, 2) POPU ACU3(0, 2)

ONON-PREFERENTIALS

ARTE LUD1(1, 5) ATRI CAN1(1, 2) CHRY VIL1(1, 3) FORE NEO1(2, 6) ORYZ HYM1(1, 4) POA FEN1(1, 4)
 RHUS TRI1(1, 3) ARTE LUD2(1, 5) CHRY VIL2(1, 2) FORE NEO2(2, 6) ORYZ HYM2(1, 4) RHUS TRI2(1, 3)
 FORE NEO3(2, 6) RHUS TRI3(1, 2)

ODIVISION 15 (N= 2) I.E. GROUP *111

DIVISION FAILS - THERE ARE TOO FEW ITEMS

0 END OF LEVEL 4

ODIVISION 20 (N= 3) I.E. GROUP *0100

DIVISION FAILS - THERE ARE TOO FEW ITEMS

ODIVISION 21 (N= 13) I.E. GROUP *0101

EIGENVALUE .439 AT ITERATION 2

INDICATORS, TOGETHER WITH THEIR SIGN

BRIC CAL1(-)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP -1 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 0

0ITEMS IN NEGATIVE GROUP 42 (N= 2) I.E. GROUP *01010

AXXX080 AXXX081

0ITEMS IN POSITIVE GROUP 43 (N= 11) I.E. GROUP *01011

AXXX037 XXXX038 A18NN042 IXXX044 S20SS051 A03SE076 A03SE077 SXXX078 SXXX079 AXXX082 AXXX083

ONEGATIVE PREFERENTIALS

BRIC CAL1(2, 0) FORE NEO1(1, 0) GILI LON1(1, 0) BRIC CAL2(1, 0) FORE NEO2(1, 0) GILI LON2(1, 0)

ATRI CAN3(2, 5) FORE NEO3(1, 0) GILI LON3(1, 0) ATRI CAN4(2, 2)

OPOSITIVE PREFERENTIALS

HILA JAM1(0, 10) MENT ALB1(0, 3) ORYZ HYM1(0, 5) SARC VER1(0, 5) SPOR AER1(0, 10) HILA JAM2(0, 10)

ORYZ HYM2(0, 4) SARC VER2(0, 5) SPOR AER2(0, 10) HILA JAM3(0, 6) SALS KAL3(0, 4) SARC VER3(0, 4)

SPOR AER3(0, 10) HILA JAM4(0, 3) SARC VER4(0, 3) SPOR AER4(0, 6)

ONON-PREFERENTIALS

ATRI CAN1(2, 9) LYCI PAL1(1, 4) SALS KAL1(2, 10) ATRI CAN2(2, 8) LYCI PAL2(1, 4) SALS KAL2(1, 8)

LYCI PAL3(1, 3)

ODIVISION 22 (N= 20) I.E. GROUP *0110

EIGENVALUE .336 AT ITERATION 3

INDICATORS, TOGETHER WITH THEIR SIGN

CERA LAN1(-) ATRI CON1(-)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP -1 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 0

0ITEMS IN NEGATIVE GROUP 44 (N= 13) I.E. GROUP *01100

B18NE041 B18EE043 s30NN050 A15NW053 B35EE054 A35NW056 B30SE057 A20WW059 A35NN060 A30NW062 B20SE063 I03SE072
 I03SE073

OBORDERLINE NEGATIVES (N= 1)

I03SE072

0ITEMS IN POSITIVE GROUP 45 (N= 7) I.E. GROUP *01101

A20XX015 IXXNW036 AXXNE048 A03WW064 A03WW065 AXXX084 AXXX085

ONEGATIVE PREFERENTIALS

ARTE LUD1(4, 0) ATRI CON1(9, 0) BROM TEC1(6, 0) ERIO COR1(3, 0) LYCI PAL1(4, 1) POA FEN1(3, 0)

SARC VER1(5, 0) SPHA PAR1(5, 0) CPOR CRY1(4, 0) STAN PIN1(6, 0) SPOR AER1(12, 2) LEUC ERI1(4, 0)

CERA LAN1(12, 0) ERIO MIC1(6, 0) ARTE SP11(3, 0) MACH TAN1(3, 0) ARTE LUD2(4, 0) ATRI CON2(9, 0)

BROM TEC2(4, 0) ERIO COR2(3, 0) LYCI PAL2(4, 0) OPUN POL2(5, 1) POA FEN2(3, 0) SARC VER2(5, 0)

SPHA PAR2(3, 0) STAN PIN2(5, 0) SPOR AER2(12, 2) LEUC ERI2(4, 0) CERA LAN2(12, 0) ERIO MIC2(5, 0)

ARTE SP12(3, 0) MACH TAN2(3, 0) ARTE TRI3(4, 0) ATRI CON3(6, 0) BOUT GRA3(10, 1) HILA JAM3(6, 1)

CERA LAN3(10, 0) SPOR AER4(3, 0)

OPOSITIVE PREFERENTIALS

LYGO GRA1(0, 2) TEIR CAN1(0, 4) TETR CAN2(0, 3) ARTE FRI3(1, 3) TEIR CAN3(0, 2) ARTE FRI4(0, 3)

ATRI CAN4(1, 2)

ONON-PREFERENTIALS

ARTE FRI1(5, 4) ARTE TRI1(7, 2) ATRI CAN1(9, 7) BOUT GRA1(13, 5) GUTI SAR1(9, 7) HILA JAM1(9, 5)

OPUN POL1(5, 2) ORYZ HYM1(13, 7) SITA HYS1(3, 1) CHRY GRE1(4, 2) ARTE FRI2(4, 4) ARTE TRI2(7, 2)

ATRI CAN2(9, 7) BOUT GRA2(13, 4) GUTI SAR2(9, 5) HILA JAM2(9, 5) ORYZ HYM2(12, 5) CHRY GRE2(4, 2)

ATRI CAN3(5, 5) GUTI SAR3(4, 3) ORYZ HYM3(4, 2) SPOR AER3(7, 2) BOUT GRA4(3, 1)

ODIVISION 23 (N= 4) I.E. GROUP *0111

DIVISION FAILS - THERE ARE TOO FEW ITEMS

ODIVISION 24 (N= 6) I.E. GROUP *1000

EIGENVALUE .585 AT ITERATION 1

INDICATORS, TOGETHER WITH THEIR SIGN

CYMO BUL1(-) STIP COM1(+) BOUT GRA1(+) EPHE TOR1(-) PENS SPX1(-) ARTE NOV4(-)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP -2 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP -1

OITEMS IN NEGATIVE GROUP 48 (N= 2) I.E. GROUP *10000

AXXSW012 A20SW013

OITEMS IN POSITIVE GROUP 49 (N= 4) I.E. GROUP *10001

A20NN024 AXXX026 AXNN032 AXNE035

ONEGATIVE PREFERENTIALS

ARTE NOV1(2, 2) ATRI CAN1(1, 1) CRYP FLA1(2, 2) CYMO BUL1(3, 0) ERIO CER1(1, 0) ERIO COR1(1, 0)
JUNI OST1(1, 1) LESQ SPX1(1, 0) MUHL THU1(1, 0) LUPI SPX1(1, 1) EPHE TOR1(2, 0) PENS SPX1(2, 0)
UNK 0021(1, 0) ALLI SPX1(1, 0) ARTE NOV2(2, 2) ATRI CAN2(1, 1) COMM UMB2(1, 1) CYMO BUL2(1, 0)
ERIO CER2(1, 0) ERIO COR2(1, 0) JUNI OST2(1, 1) OPUN POL2(1, 0) ORYZ HYM2(2, 2) MUHL THU2(1, 0)
EPHE TOR2(2, 0) PENS SPX2(1, 0) ARTE NOV3(2, 1) ERIO CER3(1, 0) GUTI SAR3(2, 2) ORYZ HYM3(2, 1)
EPHE TOR3(1, 0) ARTE NOV4(2, 0) ERIO CER4(1, 0) ORYZ HYM4(1, 1)

OPOSITIVE PREFERENTIALS

ARTE FRI1(0, 1) BOUT GRA1(0, 4) ERIO UMB1(0, 1) LYGO GRA1(0, 1) PINU EDU1(0, 1) RUME CRI1(0, 1)
SENE MUL1(0, 2) SITA HYS1(0, 2) STIP COM1(0, 5) EPHE VIR1(0, 1) CHRY GRE1(0, 2) ERYC CAP1(0, 1)
EPHE TOR1(0, 1) ERIO PUM1(0, 2) ERIO LEP1(0, 1) ASTR MOL1(0, 1) ASTR MIC1(0, 1) ASTR RED1(0, 2)
PENS PUR1(0, 2) PENS PIN1(0, 3) ERIO SPX1(0, 2) UNK 0101(0, 1) UNK 0111(0, 1) ARTE SP11(0, 1)
CREP SP11(0, 1) BOUT GRA2(0, 3) CRYP FLA2(0, 2) ERIO UMB2(0, 1) LYGO GRA2(0, 1) PINU EDU2(0, 1)
SITA HYS2(0, 1) STIP COM2(0, 4) EPHE VIR2(0, 1) CHRY GRE2(0, 1) EPHE TOR2(0, 1) ERIO LEP2(0, 1)
PENS PUR2(0, 1) ERIO SPX2(0, 2) UNK 0102(0, 1) UNK 0112(0, 1) ARTE SP12(0, 1) BOUT GRA3(0, 2)
STIP COM3(0, 3) CHRY GRE3(0, 1) UNK 0103(0, 1) ARTE SP13(0, 1)

ONON-PREFERENTIALS

COMM UMB1(1, 3) GUTI SAR1(2, 3) OPUN POL1(1, 2) ORYZ HYM1(2, 3) GUTI SAR2(2, 3)

ODIVISION 25 (N= 8) I.E. GROUP *1001

EIGENVALUE .462 AT ITERATION 3

INDICATORS, TOGETHER WITH THEIR SIGN

ARTE NOV1(+)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP 0 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 1

OITEMS IN NEGATIVE GROUP 50 (N= 6) I.E. GROUP *10010

A19NE006 A20NE009 AXNE010 AXNE011 X20XX014 A20NE016

OITEMS IN POSITIVE GROUP 51 (N= 2) I.E. GROUP *10011

AXXNW027 A19NW029

ONEGATIVE PREFERENTIALS

JUNI OST1(2, 0) SPHA COC1(2, 0) ASTR SPX1(5, 0) EPHE VIR1(2, 0) CHRY GRE1(5, 0) LUPI SPX1(3, 0)
JUNI OST2(2, 0) ASTR SPX2(2, 0) EPHE VIR2(2, 0) CHRY GRE2(5, 0) JUNI OST3(2, 0) ORYZ HYM3(4, 0)
CHRY GRE3(5, 0) CHRY GRE4(5, 0)

OPOSITIVE PREFERENTIALS

ARTE NOV1(0, 2) BOUT GRA1(2, 2) CRYP FLA1(1, 1) LAPP RED1(1, 1) OPUN POL1(0, 1) PINU EDU1(0, 1)
SENE MUL1(1, 1) SITA HYS1(0, 1) TOWN INC1(1, 1) YUCC ANG1(0, 1) MUHL GRA1(0, 1) ERIO LEP1(1, 1)
ERIO MIC1(0, 1) EPHE TOR1(0, 1) PENS PUR1(0, 1) POA SPX1(0, 1) UNK 0121(0, 1) BOUT GRA2(2, 2)
SITA HYS2(0, 1) YUCC ANG2(0, 1) MUHL GRA2(0, 1) ERIO LEP2(1, 1) ERIO MIC2(0, 1) PENS PUR2(0, 1)
POA SPX2(0, 1) BOUT GRA3(0, 1) GUTI SAR3(3, 2) YUCC ANG3(0, 1) ERIO LEP3(0, 1) ERIO MIC3(0, 1)
GUTI SAR4(3, 2) TETR CAN4(1, 1) ERIO MIC4(0, 1)

ONON-PREFERENTIALS

ARTE FRI1(4, 1) GUTI SAR1(6, 2) ORYZ HYM1(5, 2) TETR CAN1(4, 2) ARTE FRI2(4, 1) GUTI SAR2(5, 2)

ORYZ HYM2(5, 2) TETR CAN2(4, 2) TETR CAN3(3, 1)

ODIVISION 26 (N= 18) I.E. GROUP *1010

EIGENVALUE .394 AT ITERATION 2

INDICATORS, TOGETHER WITH THEIR SIGN

CERC MON2(+) EPHE VIR1(+) PINU EDU3(-) SOLI PET1(+)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP 1 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 2

OITEMS IN NEGATIVE GROUP 52 (N= 13) I.E. GROUP *10100

A18XX007 A19SW008 A19NE017 I19NE018 A19XX020 X19NN021 A20XX022 A20NW023 A20WW025 AXXNW030 AXXNW031 AXEE033

AXXNN034

OBORDERLINE NEGATIVES (N= 1)

A20WW025

OITEMS IN POSITIVE GROUP 53 (N= 5) I.E. GROUP *10101

A18EE001 A20NW002 A18XX003 B18SE004 S19EE005

ONEGATIVE PREFERENTIALS

ALET MAC1(6, 0) CHRY NAU1(7, 0) COMM UMB1(3, 0) SITA HYS1(4, 0) TETR CAN1(4, 0) YUCC ANG1(10, 1)
PETR PUM1(5, 0) ERIO PUM1(3, 0) ASTR MOL1(3, 0) ERIO MIC1(4, 0) ASTR MIC1(3, 0) HAPP GR1(3, 0)
ASTR PUR1(3, 0) ALET MAC2(4, 0) CHRY NAU2(7, 0) PINU EDU2(12, 2) YUCC ANG2(4, 0) CHRY NAU3(3, 0)
PINU EDU3(11, 1)

OPOSITIVE PREFERENTIALS

ARTE FRI1(1, 2) ASTR CAL1(1, 1) ATRI CAN1(2, 2) ATRI CON1(0, 1) CERC MON1(2, 5) CHRY VIS1(0, 1)

CRYP BAK1(0, 1) ERIO ALA1(2, 2) ERIO UMB1(0, 1) HILA JAM1(0, 1) MIRA MUL1(1, 1) PENS ANG1(1, 1)
 SOLI PET1(0, 3) CRYP SPX1(0, 2) EPHE VIR1(1, 4) CHRY FOL1(0, 1) ERYC CAP1(1, 1) LUPI SPX1(1, 1)
 ELHI TRI1(0, 1) PENS PUR1(1, 1) ERIO SPX1(0, 1) UNK 3011(0, 1) UNK 3021(0, 2) UNK 3031(0, 1)
 UNK 3041(0, 1) UNK 0011(0, 1) ATRI CAN2(1, 2) ATRI CON2(0, 1) BRIC SCA2(0, 1) CERC MON2(1, 5)
 ERIO UMB2(0, 1) HILA JAM2(0, 1) ORYZ HYM2(3, 3) RHUS TRI2(2, 2) SOLI PET2(0, 2) EPHE VIR2(1, 4)
 ERIO SPX2(0, 1) UNK 3022(0, 1) ARTE NOV3(1, 3) BRIC SCA3(0, 1) CERC MON3(1, 2) ERIO UMB3(0, 1)
 JUNI OST3(3, 3) ORYZ HYM3(1, 1) COWA NEO3(1, 1) BRIC SCA4(0, 1)

ONON-PREFERENTIALS

ARTE NOV1(8, 3) BOUT GRA1(8, 2) BRIC SCA1(3, 1) GUTI SAR1(10, 4) JUNI OST1(9, 4) HETE VIL1(2, 1)
 LESQ SPX1(3, 1) OPUN POL1(4, 3) ORYZ HYM1(7, 3) PINU EDU1(12, 3) POA FEN1(2, 1) RHUS TRI1(4, 2)
 SENE MUL1(10, 3) COWA NEO1(5, 1) PENS SPX1(2, 1) ARTE NOV2(5, 3) BOUT GRA2(4, 2) GUTI SAR2(3, 2)
 JUNI OST2(6, 4) COWA NEO2(5, 1) PINU EDU4(2, 1)

ODIVISION 27 (N= 2) I.E. GROUP *1011

DIVISION FAILS - THERE ARE TOO FEW ITEMS

ODIVISION 28 (N= 2) I.E. GROUP *1100

DIVISION FAILS - THERE ARE TOO FEW ITEMS

ODIVISION 29 (N= 6) I.E. GROUP *1101

EIGENVALUE .501 AT ITERATION 1

INDICATORS, TOGETHER WITH THEIR SIGN

CHRY NAU1(+)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP 0 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 1

OITEMS IN NEGATIVE GROUP 58 (N= 4) I.E. GROUP *11010

A18NN040 B15NE052 AXXXX058 A15NE061

OITEMS IN POSITIVE GROUP 59 (N= 2) I.E. GROUP *11011

A09XX049 BXXNE055

ONEGATIVE PREFERENTIALS

ARTE DRA1(1, 0) BRIC CAL1(1, 0) BRIC SCA1(4, 1) CHEN FRE1(1, 0) CLEM LIG1(4, 0) GILI AGG1(1, 0)
 Hyme FIL1(1, 0) JUNI OST1(1, 0) POA FEN1(4, 0) POPU FRE1(1, 0) PRUN VIR1(2, 0) SITA HYS1(1, 0)
 STAN PIN1(2, 0) PETR PUM1(1, 0) RIBE CER1(2, 0) ERIG FLA1(3, 0) POPU ACU1(2, 0) LACT SER1(1, 0)
 BROM CIL1(1, 0) ARTE DRA2(1, 0) ATRI CAN2(1, 0) BRIC CAL2(1, 0) CLEM LIG2(2, 0) JUNI OST2(1, 0)
 POA FEN2(4, 0) POPU FRE2(1, 0) PRUN VIR2(2, 0) SITA HYS2(1, 0) STAN PIN2(2, 0) RIBE CER2(2, 0)
 ERIG FLA2(1, 0) POPU ACU2(2, 0) BROM CIL2(1, 0) CLEM LIG3(1, 0) POA FEN3(2, 0) POPU FRE3(1, 0)
 PRUN VIR3(2, 0) RIBE CER3(1, 0) POPU ACU3(2, 0) POA FEN4(1, 0) POPU FRE4(1, 0) POPU ACU4(1, 0)

OPOSITIVE PREFERENTIALS

AMEL UTA1(0, 1) ATRI CAN1(1, 1) BOUT GRA1(0, 1) CAST LIN1(0, 1) CHRY VIL1(1, 2) CHRY NAU1(0, 2)
 CIRS PUL1(2, 2) ERIO COR1(0, 1) GUTI SAR1(0, 1) OPUN POL1(0, 1) ORYZ HYM1(2, 2) SARC VER1(1, 1)
 SENE MUL1(1, 2) SPOR AER1(1, 1) ERIO MIC1(0, 1) RIBE CER1(1, 1) PART INS1(0, 1) HELI SPX1(0, 1)
 AMEL UTA2(0, 1) CAST LIN2(0, 1) CHRY VIL2(0, 2) CHRY NAU2(0, 1) CIRS PUL2(2, 2) GUTI SAR2(0, 1)
 ORYZ HYM2(2, 2) SARC VER2(1, 1) SENE MUL2(0, 2) SPOR AER2(1, 1) RIBE CER2(1, 1) PART INS2(0, 1)
 AMEL UTA3(0, 1) CHRY NAU3(0, 1) CIRS PUL3(0, 1) RHUS TRI3(1, 1) SARC VER3(1, 1) SPOR AER3(0, 1)
 RIBE CER3(0, 1) PART INS3(0, 1) FORE NEO4(1, 1) RHUS TRI4(0, 1) SPOR AER4(0, 1)

ONON-PREFERENTIALS

ARTE LUD1(3, 2) FORE NEO1(4, 2) RHUS TRI1(2, 1) ARTE LUD2(3, 2) BRIC SCA2(2, 1) FORE NEO2(4, 2)
 RHUS TRI2(2, 1) ARTE LUD3(3, 1) FORE NEO3(4, 2)

0 END OF LEVEL 5

ODIVISION 42 (N= 2) I.E. GROUP *01010

DIVISION FAILS - THERE ARE TOO FEW ITEMS

ODIVISION 43 (N= 11) I.E. GROUP *01011

EIGENVALUE .314 AT ITERATION 2

INDICATORS, TOGETHER WITH THEIR SIGN

LYCI PAL1(-)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP -1 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 0

OITEMS IN NEGATIVE GROUP 86 (N= 5) I.E. GROUP *010110

A18NN042 S20SS051 A03SE076 SXXXX078 SXXXX079

OMISCLASSIFIED NEGATIVES (N= 1)

SXXXX078

OITEMS IN POSITIVE GROUP 87 (N= 6) I.E. GROUP *010111

AXXXX037 XXXXX038 IXXXX044 A03SE077 AXXXX082 AXXXX083

OBORDERLINE POSITIVES (N= 1)

AXXXX082

ONEGATIVE PREFERENTIALS

BOUT GRA1(1, 0) BROM TEC1(2, 0) ERIO COR1(1, 0) LYCI PAL1(4, 0) MIRA MUL1(1, 0) RUME HYM1(1, 0)
 SEDU STE1(2, 0) SISO ALT1(1, 0) SPHA PAR1(2, 0) CPOR CRY1(1, 0) CERA LAN1(1, 0) MACH TAN1(1, 0)
 ATRI CAN2(5, 3) BOUT GRA2(1, 0) BROM TEC2(2, 0) ERIO COR2(1, 0) LYCI PAL2(4, 0) SEDU STE2(1, 0)

SISY AL2(1, 0) CPOR CRY2(1, 0) CERA LAN2(1, 0) BOUT GRA3(1, 0) BROM TEC3(1, 0) LYCI PAL3(3, 0)
SALS KAL3(3, 1) CERA LAN3(1, 0) ATRI CAN4(2, 0)

ODIVISION 44 (N= 13) I.E. GROUP *01100
EIGENVALUE .318 AT ITERATION 3
INDICATORS, TOGETHER WITH THEIR SIGN
ARTE CAM1(-)
MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP -1 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 0
OITEMS IN NEGATIVE GROUP 88 (N= 2) I.E. GROUP *011000
I03SE072 I03SE073
OITEMS IN POSITIVE GROUP 89 (N= 11) I.E. GROUP *011001
B18NE041 B18EE043 s30NN050 A15NW053 B35EE054 A35NW056 B30SE057 A20WW059 A35NN060 A30NW062 B20SE063

ONEGATIVE PREFERENTIALS
CHRY VIS1(1, 0) ARTE CAM1(2, 0) ERIO LEP1(2, 0) CHRY VIS2(1, 0) ERIO LEP2(2, 0) CHRY VIS3(1, 0)
SPOR AER3(2, 5) ATRI CAN4(1, 0) BOUT GRA4(2, 1) CHRY VIS4(1, 0) SPOR AER4(1, 2)

OPOSITIVE PREFERENTIALS
ARTE FRI1(0, 5) ARTE LUD1(0, 4) ARTE TRI1(0, 7) ATRI CON1(0, 9) BROM TEC1(0, 6) ERIO COR1(0, 3)
GUTI SAR1(0, 9) HILA JAM1(0, 9) LYCI PAL1(0, 4) OPUN POL1(0, 5) POA FEN1(0, 3) SARC VER1(0, 5)
SITA HYS1(0, 3) CPOR CRY1(0, 4) STAN PIN1(0, 6) LEUC ERI1(0, 4) CHRY GRE1(0, 4) ERIO MIC1(0, 6)
ARTE SP11(0, 3) MACH TAN1(0, 3) ARTE FRI2(0, 4) ARTE LUD2(0, 4) ARTE TRI2(0, 7) ATRI CON2(0, 9)
BROM TEC2(0, 4) ERIO COR2(0, 3) GUTI SAR2(0, 9) HILA JAM2(0, 9) LYCI PAL2(0, 4) OPUN POL2(0, 5)
POA FEN2(0, 3) SARC VER2(0, 5) SPHA PAR2(0, 3) STAN PIN2(0, 5) LEUC ERI2(0, 4) CHRY GRE2(0, 4)
ERIO MIC2(0, 5) ARTE SP12(0, 3) MACH TAN2(0, 3) ARTE TRI3(0, 4) ATRI CON3(0, 6) GUTI SAR3(0, 4)
HILA JAM3(0, 6) ORYZ HYM3(0, 4)

ONON-PREFERENTIALS
ATRI CAN1(2, 7) BOUT GRA1(2, 11) ORYZ HYM1(2, 11) SPHA PAR1(1, 4) SPOR AER1(2, 10) CERA LAN1(2, 10)
ATRI CAN2(2, 7) BOUT GRA2(2, 11) ORYZ HYM2(2, 10) SPOR AER2(2, 10) CERA LAN2(2, 10) ATRI CAN3(1, 4)
BOUT GRA3(2, 8) CERA LAN3(1, 9)

ODIVISION 45 (N= 7) I.E. GROUP *01101
EIGENVALUE .449 AT ITERATION 2
INDICATORS, TOGETHER WITH THEIR SIGN
LYCI PAL1(+)
MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP 0 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 1
OITEMS IN NEGATIVE GROUP 90 (N= 6) I.E. GROUP *011010
IXXNW036 AXNNE048 A03WW064 A03WW065 AXXXX084 AXXXX085
OITEMS IN POSITIVE GROUP 91 (N= 1) I.E. GROUP *011011
A20XX015

ONEGATIVE PREFERENTIALS
ARTE TRI1(2, 0) HILA JAM1(5, 0) LYGO GRA1(2, 0) OPUN POL1(2, 0) TETR CAN1(4, 0) SPOR AER1(2, 0)
CHRY GRE1(2, 0) ARTE TRI2(2, 0) HILA JAM2(5, 0) TETR CAN2(3, 0) SPOR AER2(2, 0) CHRY GRE2(2, 0)
ARTE FRI3(3, 0) ORYZ HYM3(2, 0) TETR CAN3(2, 0) SPOR AER3(2, 0) ARTE FRI4(3, 0) ATRI CAN4(2, 0)

OPOSITIVE PREFERENTIALS
ARTE FRI1(3, 1) LYCI PAL1(0, 1) RUME CRI1(0, 1) LUP1 SPX1(0, 1) MENT PUM1(0, 1) PENS SPX1(0, 1)
UNK 0031(0, 1) UNK 0041(0, 1) ARTE FRI2(3, 1) BOUT GRA2(3, 1) LUP1 SPX2(0, 1) UNK 0032(0, 1)
UNK 0042(0, 1) BOUT GRA3(0, 1) GUTI SAR3(2, 1) BOUT GRA4(0, 1)

ONON-PREFERENTIALS
ATRI CAN1(6, 1) BOUT GRA1(4, 1) GUTI SAR1(6, 1) ORYZ HYM1(6, 1) ATRI CAN2(6, 1) GUTI SAR2(4, 1)
ORYZ HYM2(4, 1) ATRI CAN3(4, 1)

ODIVISION 48 (N= 2) I.E. GROUP *10000
DIVISION FAILS - THERE ARE TOO FEW ITEMS

ODIVISION 49 (N= 4) I.E. GROUP *10001
DIVISION FAILS - THERE ARE TOO FEW ITEMS

ODIVISION 50 (N= 6) I.E. GROUP *10010
EIGENVALUE .519 AT ITERATION 1
INDICATORS, TOGETHER WITH THEIR SIGN
ARTE FRI1(-) SPHA COC1(-)
MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP -2 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP -1
OITEMS IN NEGATIVE GROUP 100 (N= 2) I.E. GROUP *100100
X20XX014 A20NE016

OMISCLASSIFIED NEGATIVES (N= 1)
X20XX014

OITEMS IN POSITIVE GROUP 101 (N= 4) I.E. GROUP *100101

A19NE006 A2ONE009 AXNE010 AXNE011

ONEGATIVE PREFERENTIALS

ARTE FRI1(3, 1) ATRI CAN1(1, 0) BOUT GRA1(1, 1) FORE NEO1(1, 0) JUNI OST1(1, 1) LAPP RED1(1, 0)
SPHA COC1(2, 0) STEP COR1(1, 0) TOWN INC1(1, 0) LUPI SPX1(2, 1) MENT PUM1(1, 0) PENS SPX1(1, 0)
DESC SPX1(1, 0) ARTE FRI2(3, 1) ATRI CAN2(1, 0) BOUT GRA2(1, 1) JUNI OST2(1, 1) LAPP RED2(1, 0)
ASTR SPX2(1, 1) MENT PUM2(1, 0) PENS SPX2(1, 0) ATRI CAN3(1, 0) JUNI OST3(1, 1) ORYZ HYM3(2, 2)
JUNI OST4(1, 0) ORYZ HYM4(1, 0)

OPOSITIVE PREFERENTIALS

ARTE TRI1(0, 1) CRYP FLA1(0, 1) CYMO BUL1(0, 1) LUPI CAU1(0, 1) PENS ANG1(0, 1) LAPP OCC1(0, 1)
SENE MUL1(0, 1) TETR CAN1(0, 4) EPHE VIR1(0, 2) CHRY GRE1(1, 4) ERIO LEP1(0, 1) ASTR MOL1(0, 1)
ASTR PUR1(0, 1) MUHL PUN1(0, 1) ARTE TRI2(0, 1) CRYP FLA2(0, 1) GUTI SAR2(1, 4) PENS ANG2(0, 1)
TETR CAN2(0, 4) EPHE VIR2(0, 2) CHRY GRE2(1, 4) ERIO LEP2(0, 1) ASTR PUR2(0, 1) MUHL PUN2(0, 1)
ARTE FRI3(0, 1) TETR CAN3(0, 3) EPHE VIR3(0, 1) CHRY GRE3(1, 4) ARTE FRI4(0, 1) TETR CAN4(0, 1)
CHRY GRE4(1, 4)

ONON-PREFERENTIALS

GUTI SAR1(2, 4) ORYZ HYM1(2, 3) ASTR SPX1(2, 3) ORYZ HYM2(2, 3) GUTI SAR3(1, 2) GUTI SAR4(1, 2)

ODIVISION 51 (N= 2) I.E. GROUP *10011

DIVISION FAILS - THERE ARE TOO FEW ITEMS

ODIVISION 52 (N= 13) I.E. GROUP *10100

EIGENVALUE .378 AT ITERATION 3

INDICATORS, TOGETHER WITH THEIR SIGN

BRIC GRA1(-)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP -1 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 0

OITEMS IN NEGATIVE GROUP 104 (N= 1) I.E. GROUP *101000

AXXNW031

OITEMS IN POSITIVE GROUP 105 (N= 12) I.E. GROUP *101001

A18XX007 A19SW008 A19NE017 I19NE018 A19XX020 X19NN021 A20XX022 A20NW023 A20WW025 AXXNW030 AXEE033 AXNN034

ONEGATIVE PREFERENTIALS

ARTE LUD1(1, 1) BRIC GRA1(1, 0) RHUS TRI1(1, 3) ERIO MIC1(1, 3) POA SPX1(1, 0) BOUT GRA2(1, 3)
BRIC GRA2(1, 0) RHUS TRI2(1, 1) POA SPX2(1, 0) RHUS TRI3(1, 0) POA SPX3(1, 0) PINU EDU4(1, 1)

OPOSITIVE PREFERENTIALS

ALET MAC1(0, 6) ARTE NOV1(0, 8) BRIC SCA1(0, 3) CHRY NAU1(0, 7) COMM UMB1(0, 3) GUTI SAR1(0, 10)
JUNI OST1(0, 9) LESQ SPX1(0, 3) OPUN POL1(0, 4) ORYZ HYM1(0, 7) SITA HYS1(0, 4) TETR CAN1(0, 4)
YUCC ANG1(0, 10) PETR PUM1(0, 5) ERIO PUM1(0, 3) ASTR MOL1(0, 3) COWA NEO1(0, 5) ASTR MIC1(0, 3)
HAPP GR1(0, 3) ASTR PUR1(0, 3) ALET MAC2(0, 4) ARTE NOV2(0, 5) CHRY NAU2(0, 7) GUTI SAR2(0, 3)
JUNI OST2(0, 6) ORYZ HYM2(0, 3) YUCC ANG2(0, 4) COWA NEO2(0, 5) CHRY NAU3(0, 3) JUNI OST3(0, 3)

ONON-PREFERENTIALS

BOUT GRA1(1, 7) PINU EDU1(1, 11) SENE MUL1(1, 9) PINU EDU2(1, 11) PINU EDU3(1, 10)

ODIVISION 53 (N= 5) I.E. GROUP *10101

EIGENVALUE .519 AT ITERATION 1

INDICATORS, TOGETHER WITH THEIR SIGN

BOUT GRA1(+)

MAXIMUM INDICATOR SCORE FOR NEGATIVE GROUP 0 MINIMUM INDICATOR SCORE FOR POSITIVE GROUP 1

OITEMS IN NEGATIVE GROUP 106 (N= 3) I.E. GROUP *101010

A18EE001 A20NW002 B18SE004

OITEMS IN POSITIVE GROUP 107 (N= 2) I.E. GROUP *101011

A18XX003 S19EE005

ONEGATIVE PREFERENTIALS

ARTE FRI1(2, 0) CRYP BAK1(1, 0) ERIO UMB1(1, 0) GUTI SAR1(3, 1) PINU EDU1(3, 0) POA FEN1(1, 0)
SOLI PET1(3, 0) YUCC ANG1(1, 0) ERYC CAP1(1, 0) COWA NEO1(1, 0) UNK 3011(1, 0) UNK 3021(2, 0)
UNK 3031(1, 0) UNK 3041(1, 0) ERIO UMB2(1, 0) PINU EDU2(2, 0) SOLI PET2(2, 0) COWA NEO2(1, 0)
UNK 3022(1, 0) ERIO UMB3(1, 0) ORYZ HYM3(1, 0) PINU EDU3(1, 0) COWA NEO3(1, 0) PINU EDU4(1, 0)

OPOSITIVE PREFERENTIALS

ASTR CAL1(0, 1) ATRI CON1(0, 1) BOUT GRA1(0, 2) BRIC SCA1(0, 1) CHRY VIS1(0, 1) ERIO ALA1(0, 2)
HILA JAM1(0, 1) HETE VIL1(0, 1) LESQ SPX1(0, 1) MIRA MUL1(0, 1) OPUN POL1(1, 2) ORYZ HYM1(1, 2)
PENS ANG1(0, 1) SENE MUL1(1, 2) CHRY FOL1(0, 1) LUPI SPX1(0, 1) ELHI TRI1(0, 1) PENS PUR1(0, 1)
PENS SPX1(0, 1) ERIO SPX1(0, 1) UNK 0011(0, 1) ATRI CON2(0, 1) BOUT GRA2(0, 2) BRIC SCA2(0, 1)
HILA JAM2(0, 1) ORYZ HYM2(1, 2) ERIO SPX2(0, 1) BRIC SCA3(0, 1) CERC MON3(0, 2) JUNI OST3(1, 2)
BRIC SCA4(0, 1)

ONON-PREFERENTIALS

ARTE NOV1(2, 1) ATRI CAN1(1, 1) CERC MON1(3, 2) JUNI OST1(2, 2) RHUS TRI1(1, 1) CRYP SPX1(1, 1)
EPHE VIR1(2, 2) ARTE NOV2(2, 1) ATRI CAN2(1, 1) CERC MON2(3, 2) GUTI SAR2(1, 1) JUNI OST2(2, 2)
RHUS TRI2(1, 1) EPHE VIR2(2, 2) ARTE NOV3(2, 1)

ODIVISION 58 (N= 4) I.E. GROUP *11010

DIVISION FAILS - THERE ARE TOO FEW ITEMS

0DIVISION 59 (N= 2) I.E. GROUP *11011

DIVISION FAILS - THERE ARE TOO FEW ITEMS

0 END OF LEVEL 6

0THIS IS THE END OF THE DIVISIONS REQUESTED
