National Biological Assessment and Criteria Workshop

Advancing State and Tribal Programs

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RFC 201

Reference Site Selection & Classification in Arizona

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Overview

- AZ Reference site selection process
- Criteria for determining reference
- Lessons learned in the field
- Classification analyses

Reference condition important for

- Testing ecoregion concept for AZ
- Developing a classification system
- Creating indexes for assessment
- Refining A&W designated uses
- Developing biocriteria

Initial Reference Site Selection Process

- Target riffle/run habitats of perennial, wadeable, non-effluent streams
- Coverage of physiographic provinces (basin & range, central highlands, upland plateau)
- Coverage of 10 major surface water basins and 5 ecoregions

Data sources for potential reference sites

- Seek suggestions and confirmation of potential reference sites from USFS, BLM, and other land managers
- Literature sources such as “Wild and Scenic Rivers” listing, county listings of perennial waters, USFS or BLM exclosure sites

Criteria for determining reference

- No known discharges upstream
- No major impoundments upstream
- No channel alterations within reach
- No road crossing within 0.5km upstream
- Least impacted by land uses within drainage
- Accessible within 2-hour hike or 4 miles from nearest road

Field Criteria to determine reference

- Must be perennial (presence of fish, long-lived invertebrates, well developed riparian vegetation, avoid sites that dry to pools)
- Free from local land use impacts
- No pH or Dissolved Oxygen violations
- ADEQ Habitat score >14

Lessons from the Field

- Don’t sample within 4 weeks of a bankfull or extreme flood event
- Substrate Type - Don’t sample if >50% bedrock or travertine, or if sand dominated substrate
- Stream type - No cienegas or wetlands
- Flow regime - Don’t sample temporally intermittent or ephemeral streams, some spatially intermittent streams OK

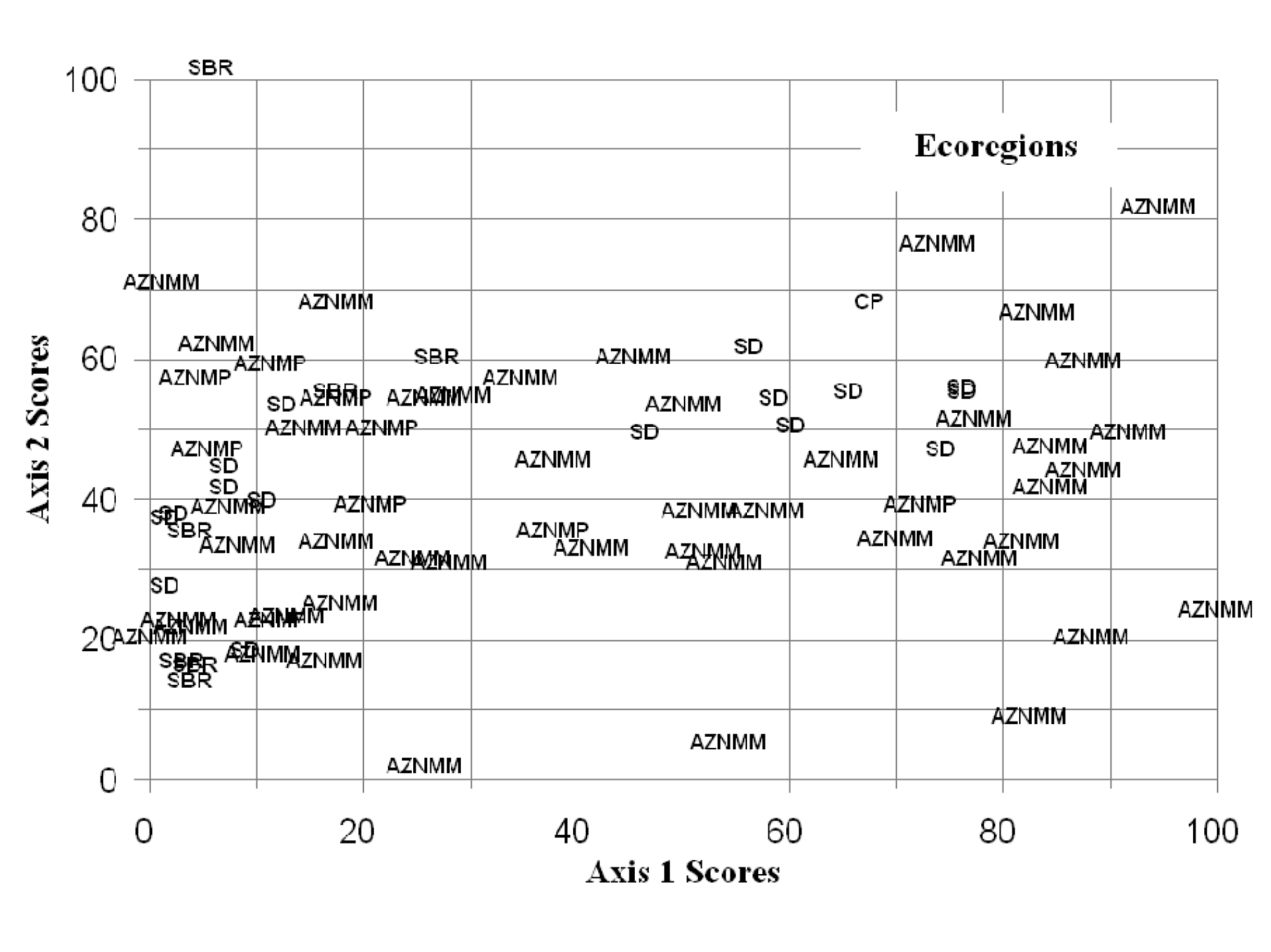
Hypothesis for reference dataset

- Test hypothesis that ecoregions adequately partition variance in statewide macroinvertebrate samples

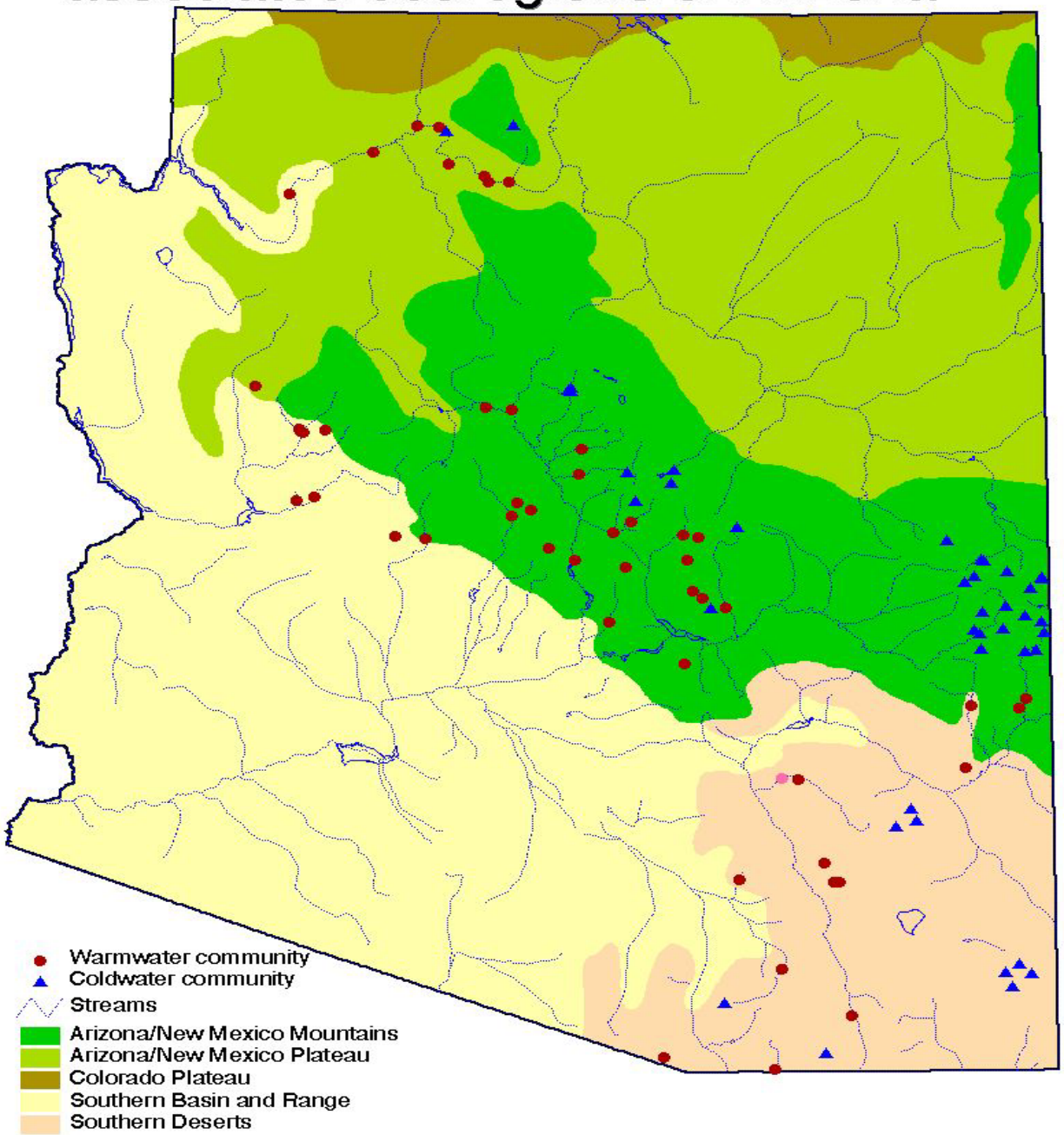
Testing ecoregions

- Multivariate Detrended Correspondence Analysis to examine groupings of community types by ecoregion

- Used 3 year dataset for replication of sites within regions and to encompass more inter-year and variable flow regimes


Ecoregions
Axis 2 Scores
Axis 1 Scores
0
20
40
60
80
100
AZNMM
SD
SBR
AZNMP
CP

Macroinvertebrate communities and associated ecoregions of Arizona



A-posteriori classification of reference sites

- Cluster analysis and discriminant function analysis to test for natural groupings and responsible environmental parameters
- Determined that elevation is primarily responsible for classification of macroinvertebrate communities into two groups: warmwater and coldwater

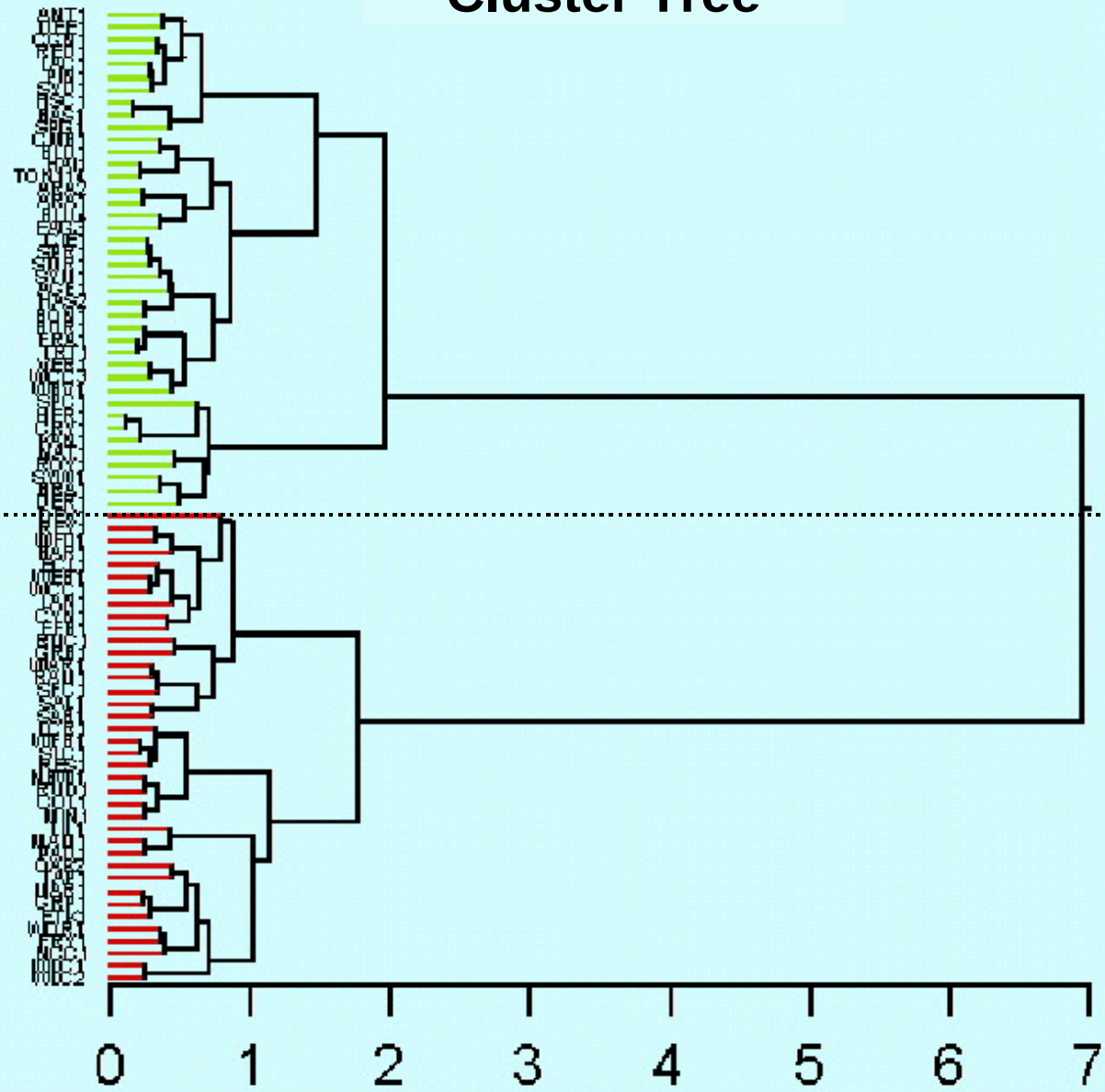
Cluster Tree

Warm Water Macroinvertebrate Community

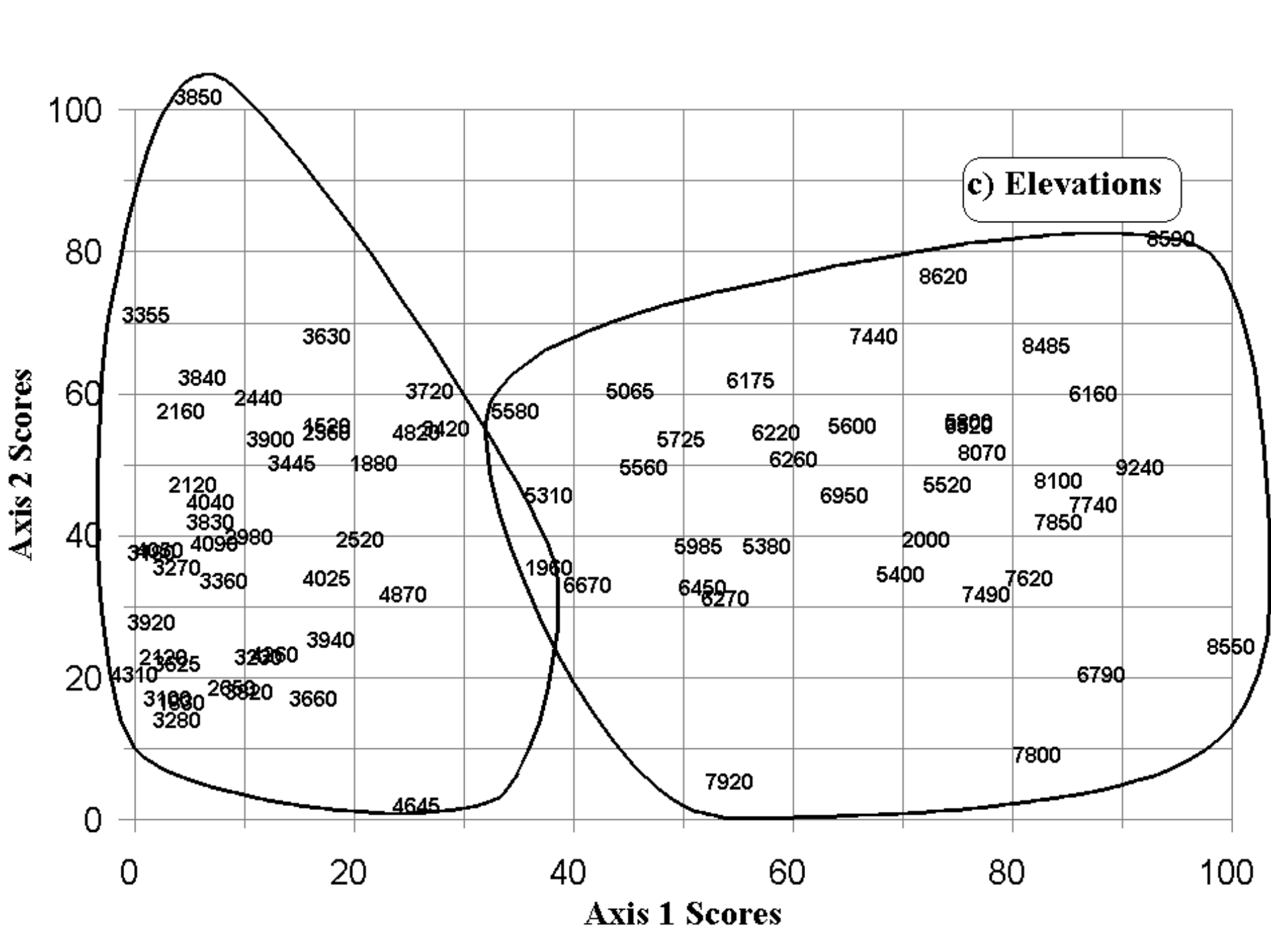
(n=40)

Cold Water Macroinvertabrate Community

(n=38)

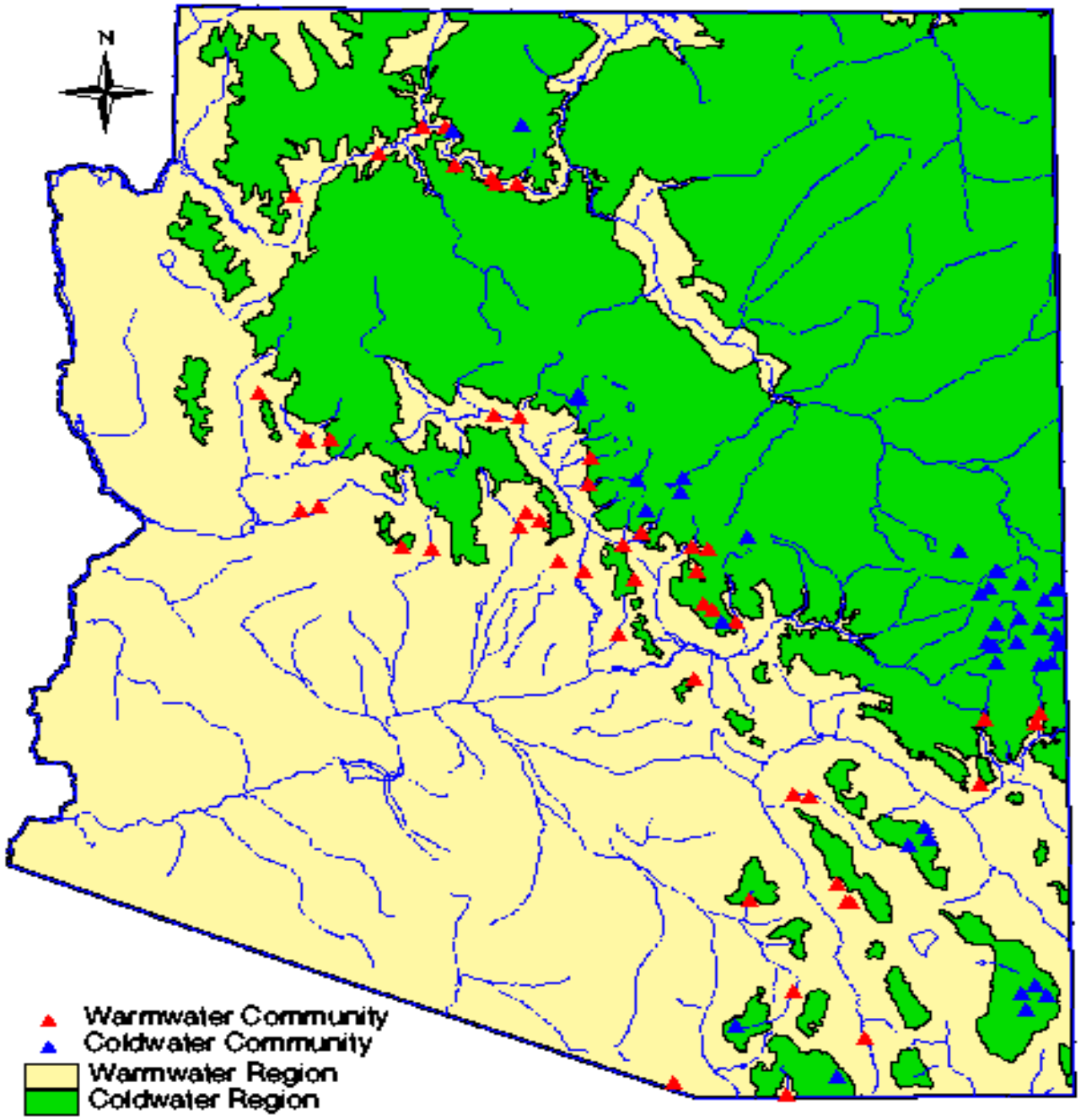


Distances


c) Elevations
Axis 2 Scores
Axis 1 Scores
0
20
40
60
80
100
3850
3355
3630
7440
8485
8590
8620
3840
2440
3720
5065
6175
6160
2160
5580
3900
3445
1880
5725
6220
5600
8070
6260
5560
9240
2120
4040
3830
5310
6950
5520
8100
7740
7850
3980
2520
5985
5380
2000
4098
3270
3360
4025
1960
6670
6450
6270
5400
7620
7490
4870
3920
3940
8550
4310
3625
6790
3660
3280
7800
7920
4645

Reference regions

- Warm water community found in wadeable, perennial streams at elevations <5000’
- Cold water community found in wadeable, perennial streams at elevations >5000’


N
Warmwater Community
Coldwater Community
Warmwater Region
Coldwater Region

Median community characteristics

- % Mayflies (ww 37%, cw 26%)
- % Stoneflies (ww 0%, cw 4%)
- Scraper taxa richness (ww 3, cw 6)
- % Scrapers (ww 5%, cw 24%)
- % Shredders (ww 0%, cw 4%)

Limiting factors in AZ

- Perennial & accessible are most limiting factors in identifying study sites in AZ
- “Minimally impacted” reference reaches are not widely available for warm water streams
- Fires & debris flows, floods, and recent drought damage reference sites

More limiting factors

- Crayfish spreading like the plague in AZ
- Perennial accounts for only 4% of lotic waters, need to address intermittent, effluent dominated, large rivers & lakes

Suggestions

- GIS land use information
- Use a variety of habitat information
- Multiple reference classes