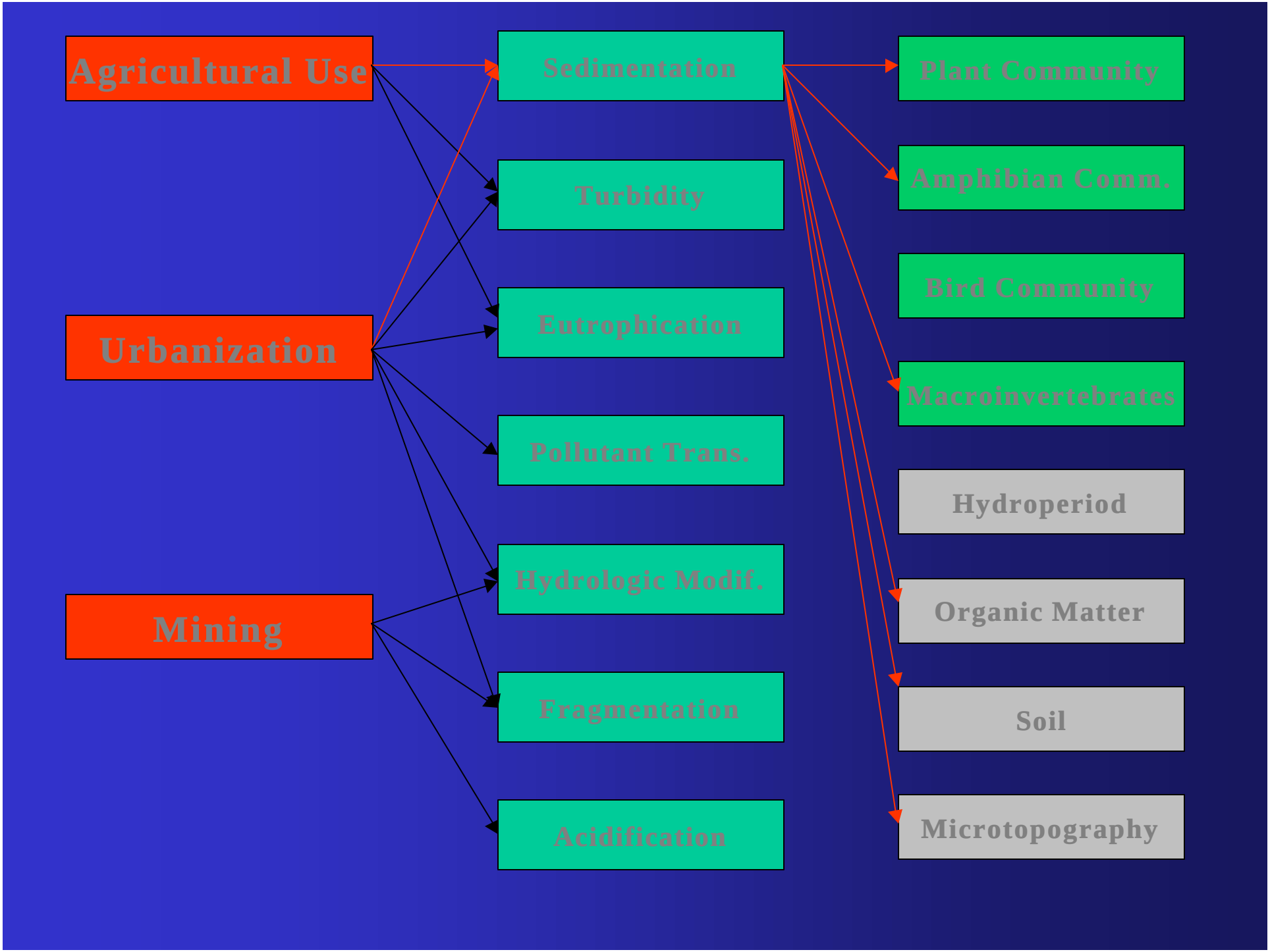
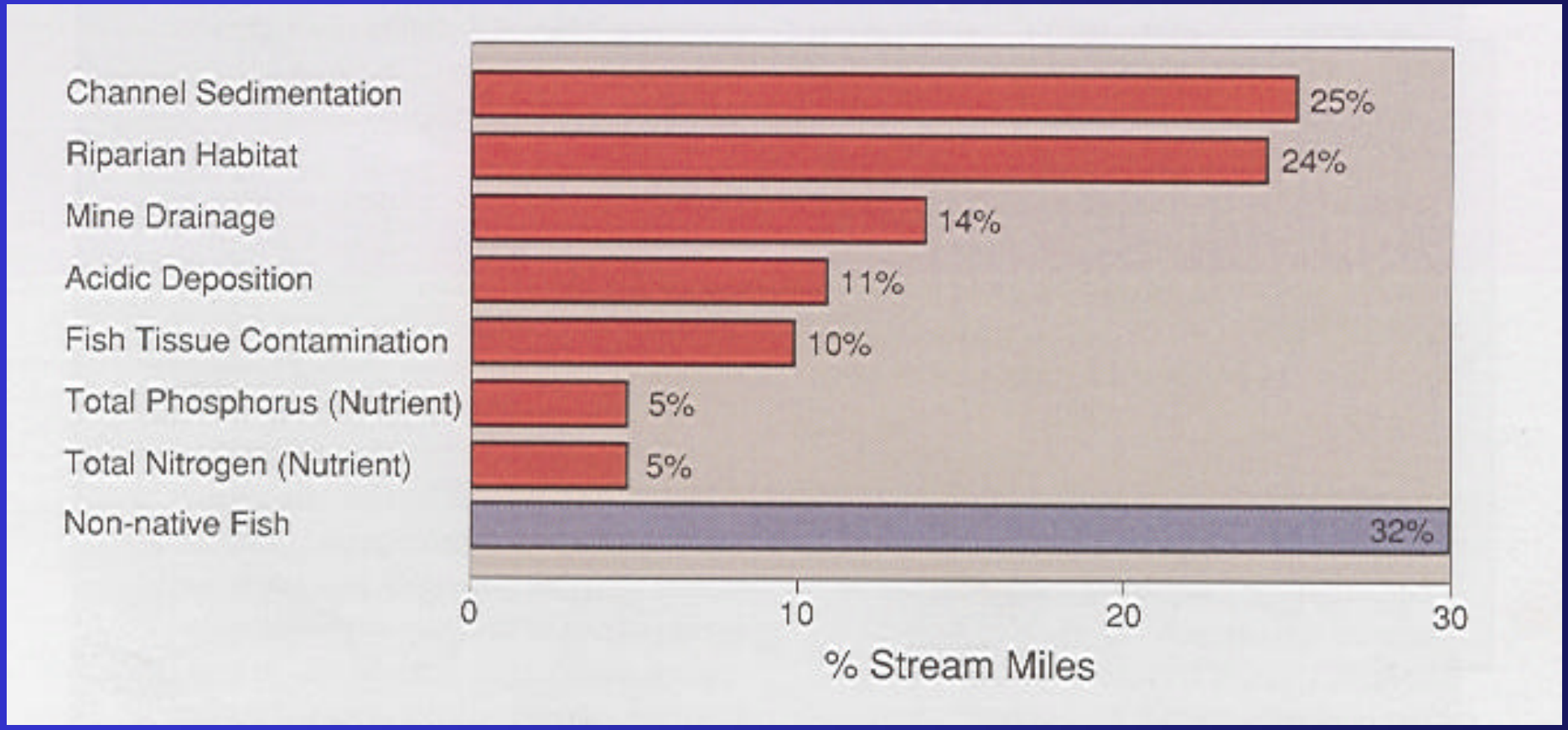
Linkage between Activities, Stressors, and Impacts

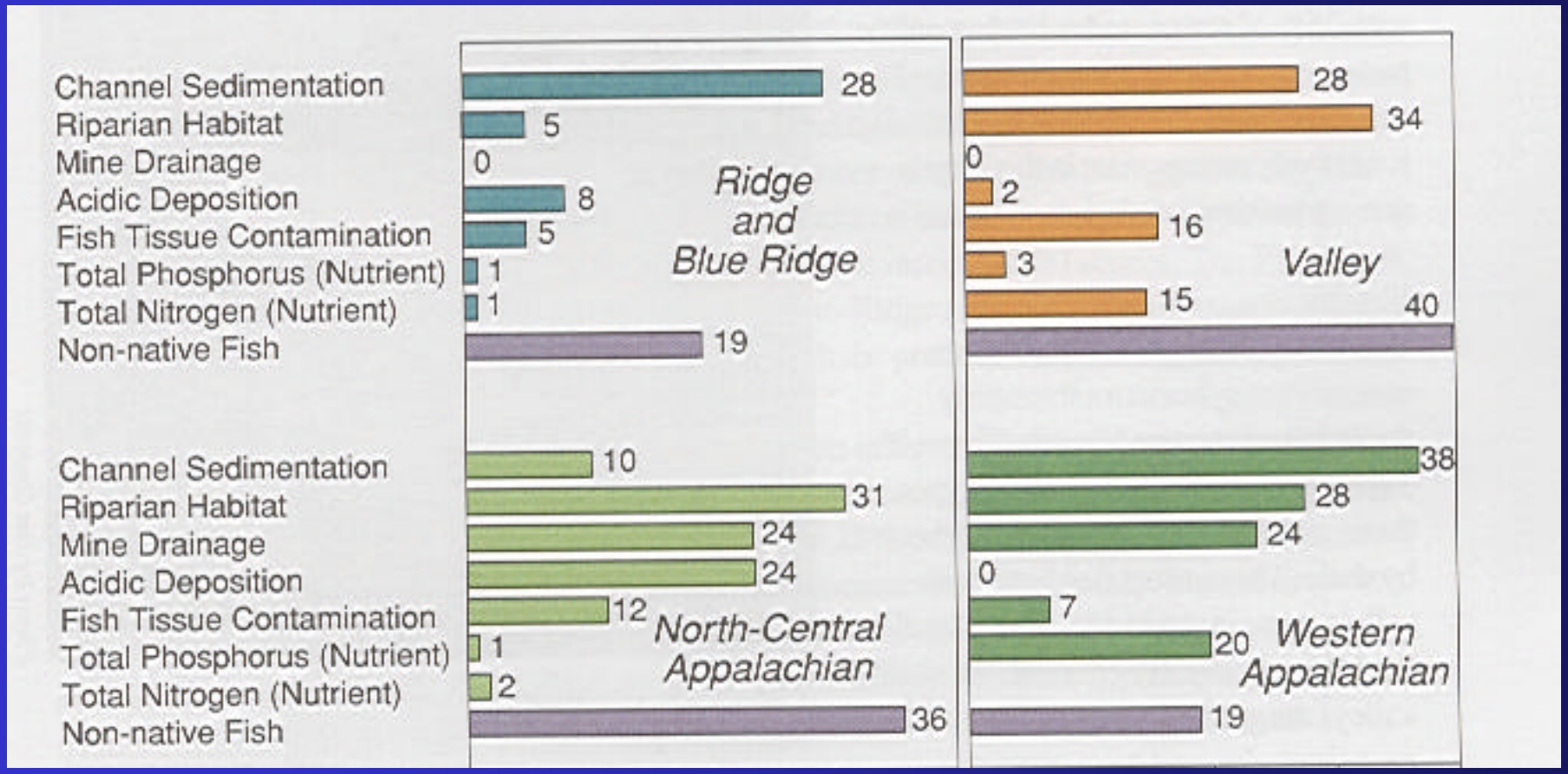
- What are the major human activities?
- What are the associated stressors?
- How are those stressors “felt”?
- IF IT’S BROKEN, HOW DO WE FIX IT?


Agricultural Use
Urbanization
Mining
Sedimentation
Turbidity
Eutrophication
Pollutant Trans.
Hydrologic Modif.
Fragmentation
Acidification
Plant Community
Amphibian Comm.
Bird Community
Macroinvertebrates
Hydroperiod
Organic Matter
Soil
Microtopography

Predominant Stressors in Streams



Stressors in Streams by Ecoregion



Stressor Checklist

- Hydrologic Modification
- Sedimentation
- Dissolved oxygen
- Contaminant toxicity
- Vegetation alteration
- Eutrophication
- Acidification
- Turbidity
- Thermal Alteration
- Salinity

STRESSOR CHECKLIST

Stressor Score: _____

Site Name: _____ Site Number: _____ Date: _____

Buffer Type*:	Buffer Width: >100	30-100	10-30	3-10	0-3
Natural Forest	14	12	10	8	6
Shrub/Sapling	12	10	8	6	4
Perennial Herb	10	8	6	4	2
Other	0	0	0	0	0

*If exactly one-half of two buffer types, take half the sum

Buffer Width _____ (m) Buffer Score _____

Buffer Type

- ☐ Natural Forest
- ☐ Perennial Herb
- ☐ Shrub/Sapling
- ☐ Other (list) _____

Hydrologic Modification

Score: _____ *(Score = the number of checked boxes)*

- ☐ Ditch
- ☐ Tile Drain
- ☐ Dike
- ☐ Weir/dam *Type:* _____
- ☐ Stormwater inputs/culvert
- ☐ Point source (non-stormwater)
- ☐ Filling, grading, dredging (of wetland/waterbody or immediate buffers)
- ☐ Road bed/railroad
- ☐ Dead/dying trees
- ☐ Other _____

Sedimentation

Score: _____

- ☐ Sediment deposits/plumes
- ☐ Eroding banks/slopes
- ☐ Active/recently active adjacent construction, plowing, heavy grazing, or forest harvesting
- ☐ Silllines on ground or vegetation
- ☐ Urban/road stormwater input/culvert
- ☐ Dominant presence (>50% of vegetation) of sediment tolerant plants (see list)
- ☐ Other _____

Dissolved Oxygen

Score: _____

- ☐ Excessive density of aquatic plants or algal mats in water column
- ☐ Excessive deposition or dumping of organic waste (e.g., leaves, grass clippings, woody debris, etc.)
- ☐ Direct discharges of organic wastewater or material (e.g., milkhouse waste, food-processing waste, other wastewater sources)

Contaminant Toxicity

Score: _____

- ☐ Severe vegetation stress
- ☐ Obvious spills, discharges, plumes, odors
- ☐ Wildlife impacts (e.g., tumors, abnormalities, etc.)
- ☐ Adjacent industrial sites, proximity of railroad
- ☐ Other _____

Vegetation Alteration

Score: _____

- ☐ Mowing
- ☐ Grazing
- ☐ Tree cutting (> 50 % canopy removal)
- ☐ Brush cutting (mechanized removal of shrubs/saplings)
- ☐ Removal of woody debris
- ☐ Aquatic weed control (mechanical or herbicide)
- ☐ Excessive herbivory (deer, muskrat, geese, carp, etc.)
- ☐ Dominant presence (>50% of the vegetation) of exotic or aggressive plant species (see list)
- ☐ Evidence of chemical defoliation
- ☐ Other _____

Eutrophication

Score: _____

- ☐ Direct discharges from agricultural feedlots, manure pits, etc.
- ☐ Direct discharges from septic or sewage treatment systems
- ☐ Heavy or moderately heavy formation of algal mats
- ☐ Dominant presence (>50% of vegetation) of nutrient tolerant species (e.g., uniform stands of exotic/aggressive species - see list)
- ☐ Other (e.g., signs of excess nutrients - methane odor, dead fish, etc.) _____

Acidification

Score: _____

- ☐ AMD discharges
- ☐ Adjacent mined lands/spoil piles
- ☐ Excessively clear water
- ☐ Absence of expected biota
- ☐ Other (e.g., abnormally low pH measure) _____

Turbidity (if high conc, check both boxes)

Score: _____

- ☐ High concentration of suspended solids in water column
- ☐ Moderate concentration of suspended solids in water column

Thermal Alteration (if high temp, check both boxes)

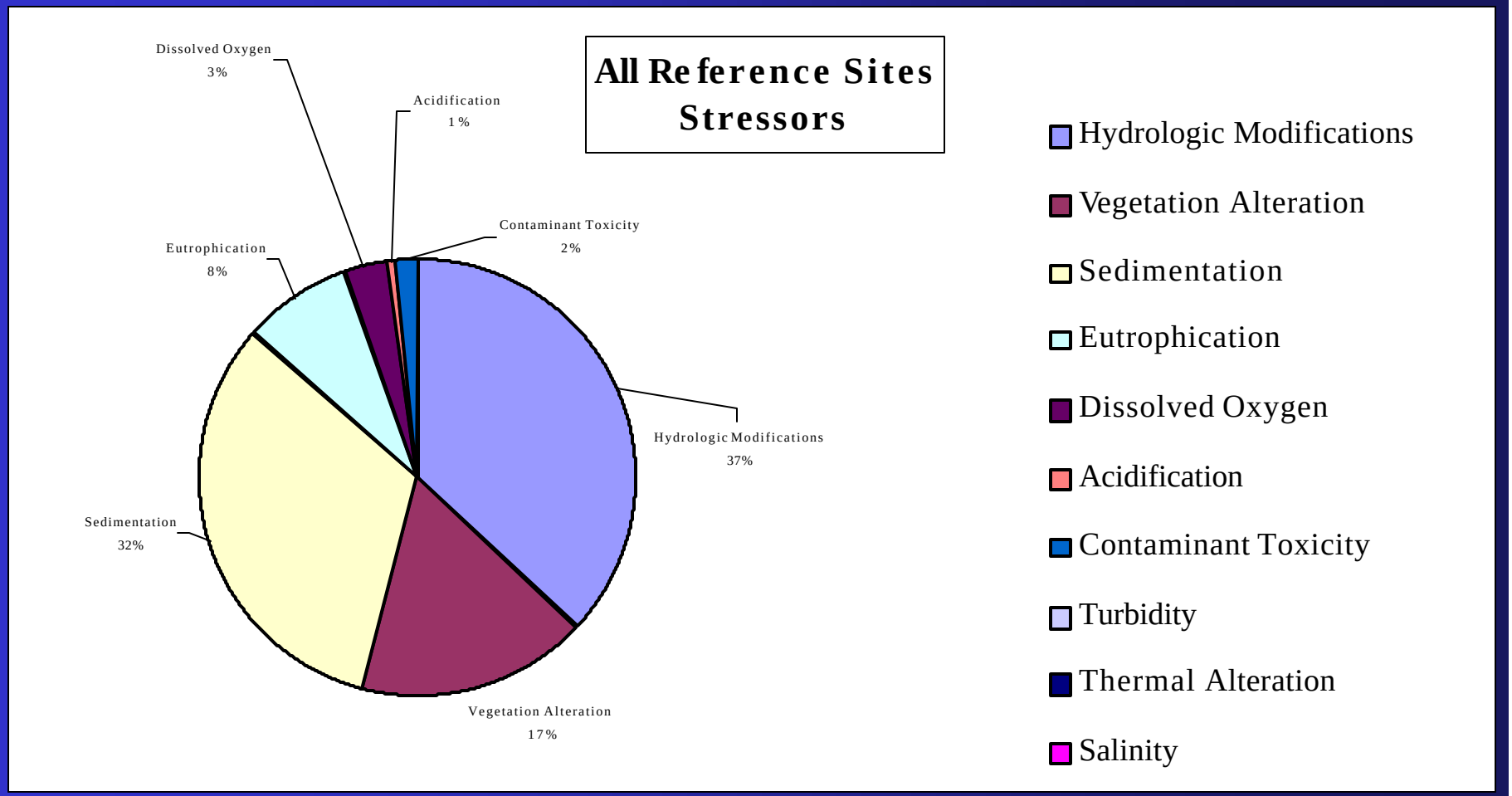
Score: _____

- ☐ Significant increase water temperture
- ☐ Moderate increase in water temperature

Salinity

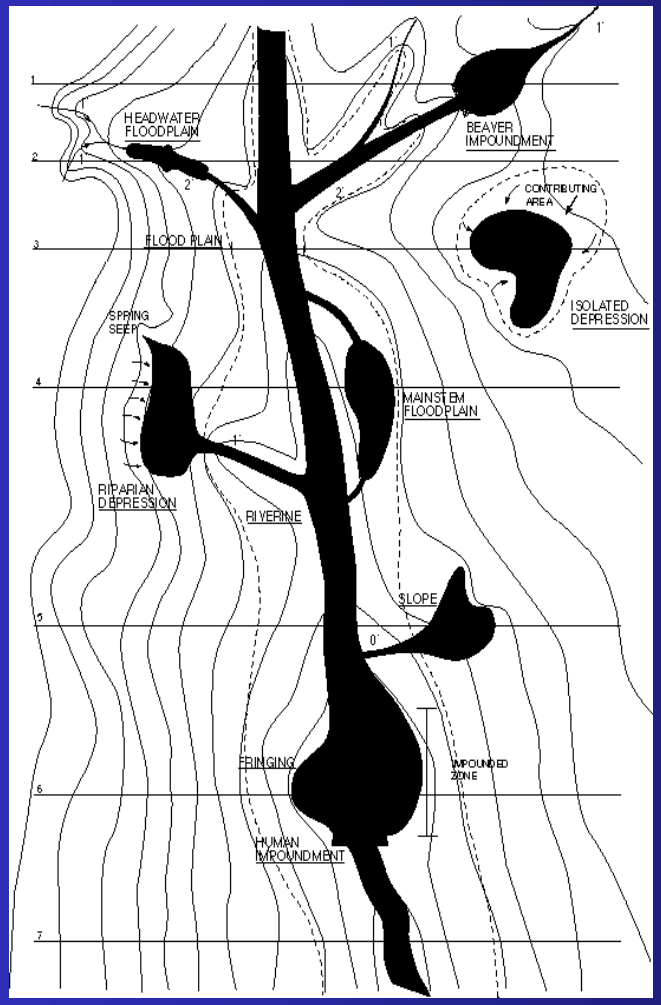
Score: _____

- ☐ Obvious increase in concentration of dissolved salts


All Reference Sites Stressors
Dissolved Oxygen 3%
Acidification 1%
Contaminant Toxicity 2%
Eutrophication 8%
Hydrologic Modifications 37%
Sedimentation 32%
Vegetation Alteration 17%
Hydrologic Modifications
Vegetation Alteration
Sedimentation
Eutrophication
Dissolved Oxygen
Acidification
Contaminant Toxicity
Turbidity
Thermal Alteration
Salinity

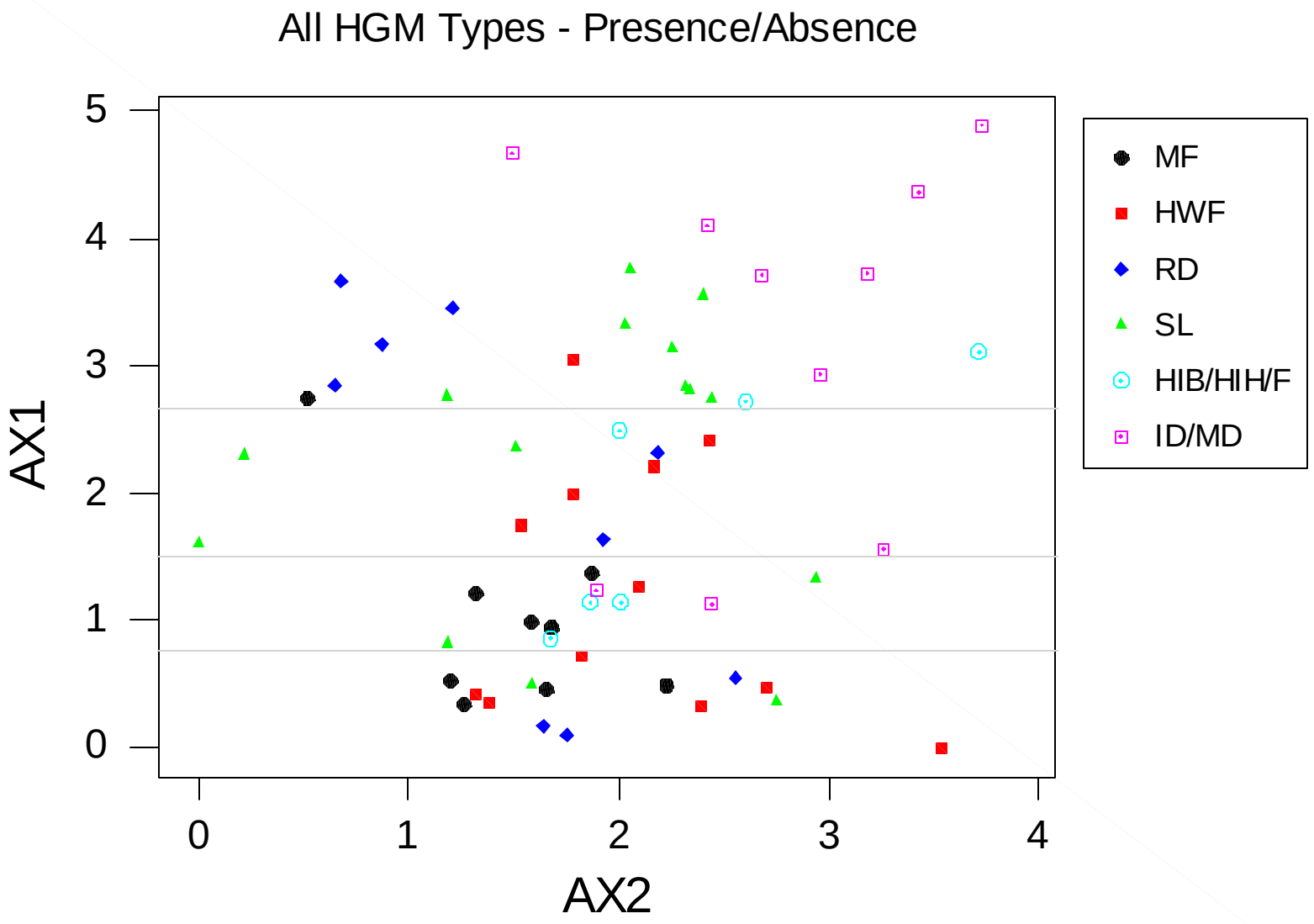
Headwater Floodplain

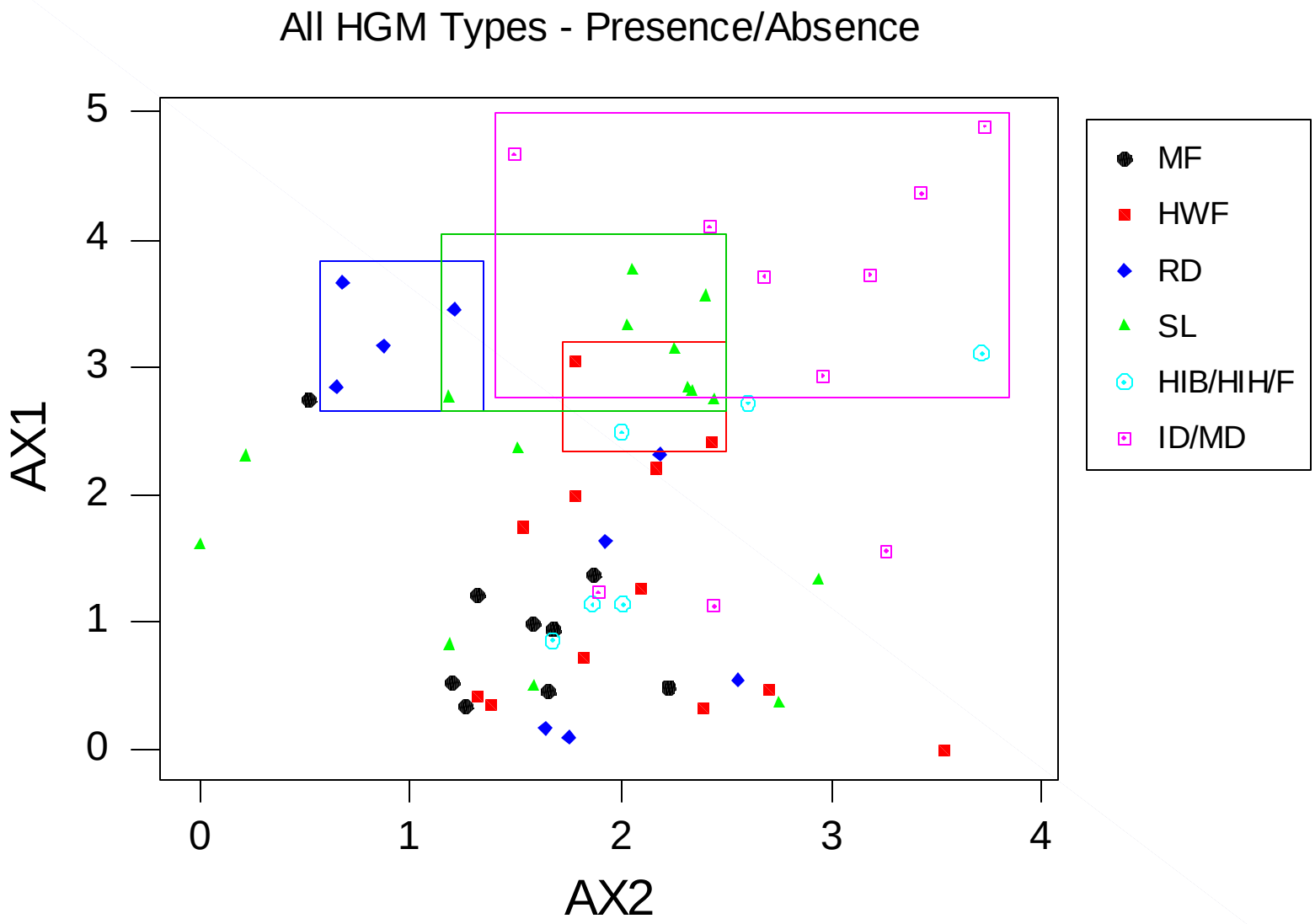
Riparian Depression

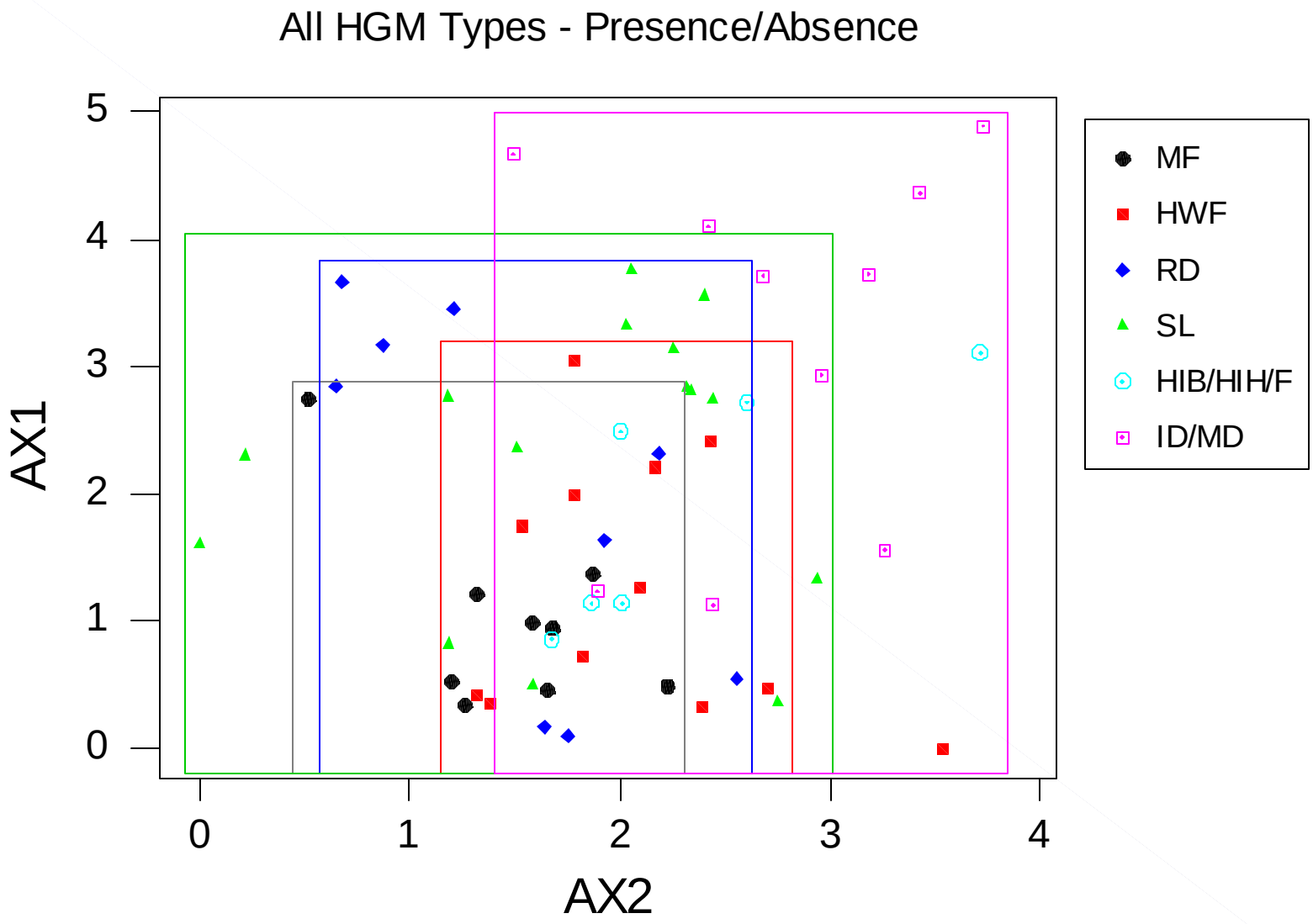


Mainstem Floodplain

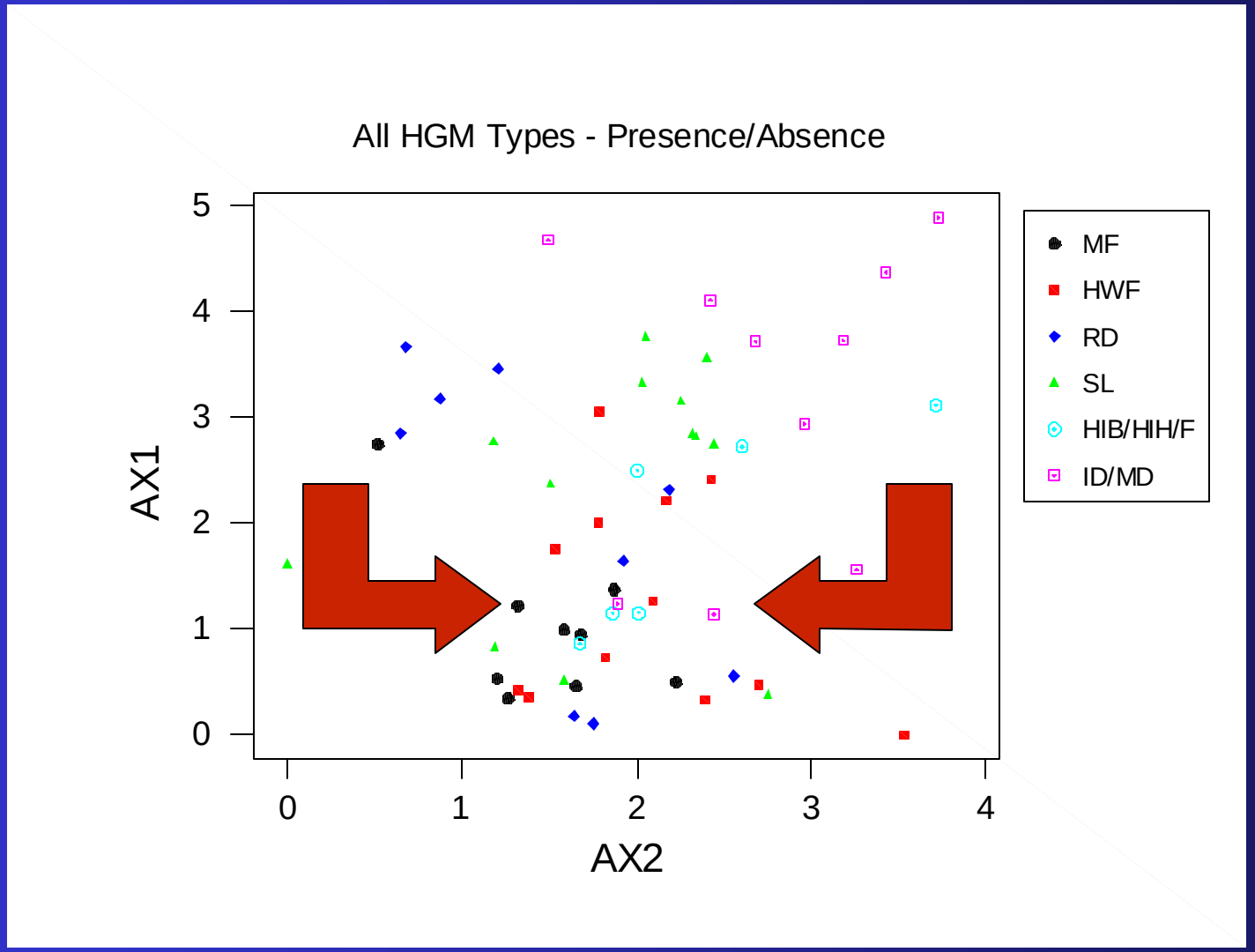
Slope

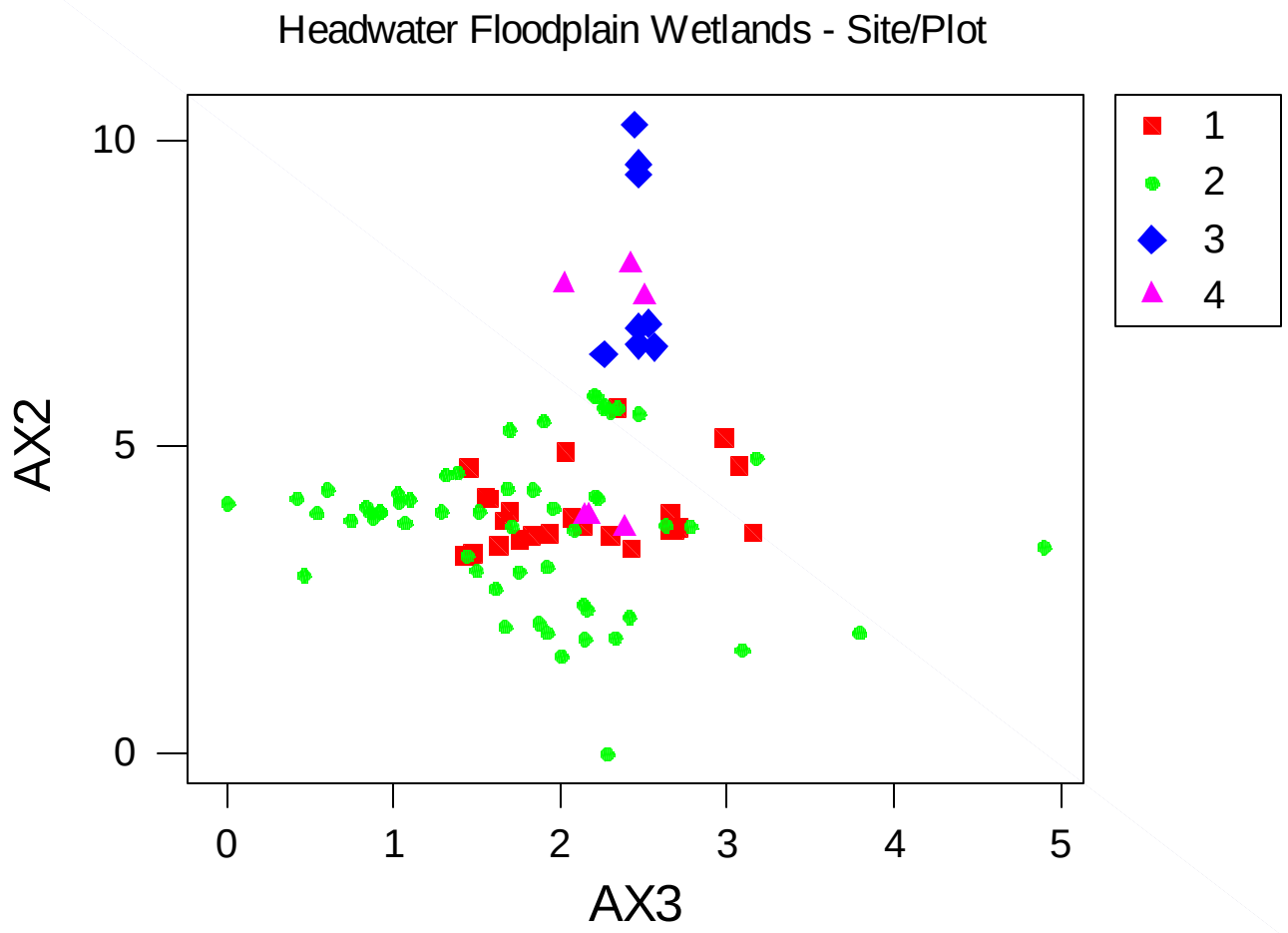

All HGM Types - Presence/Absence
AX1
AX2
0
1
2
3
4
5
MF
HWF
RD
SL
HIB/HIH/F
ID/MD


All HGM Types - Presence/Absence
AX1
AX2
0
1
2
3
4
5
MF
HWF
RD
SL
HIB/HIH/F
ID/MD

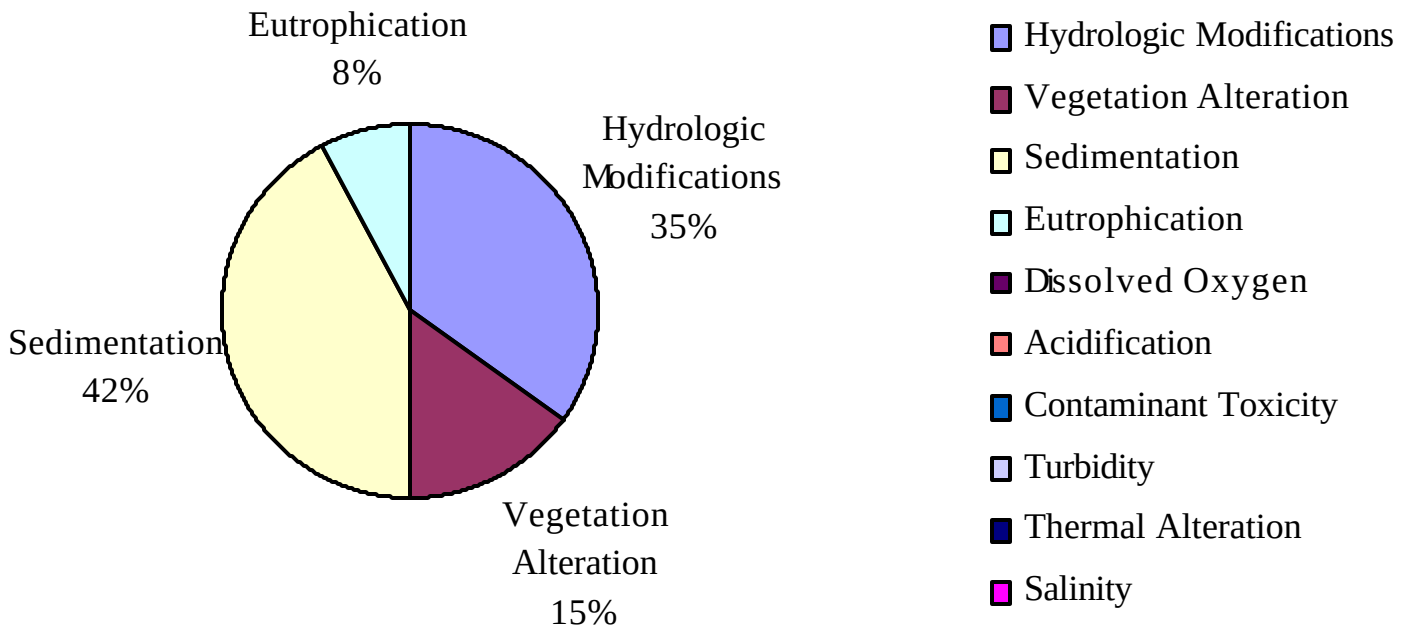

All HGM Types - Presence/Absence
AX1
AX2
0
1
2
3
4
5
MF
HWF
RD
SL
HIB/HIH/F
ID/MD

Disturbance Narrows the Possibilities

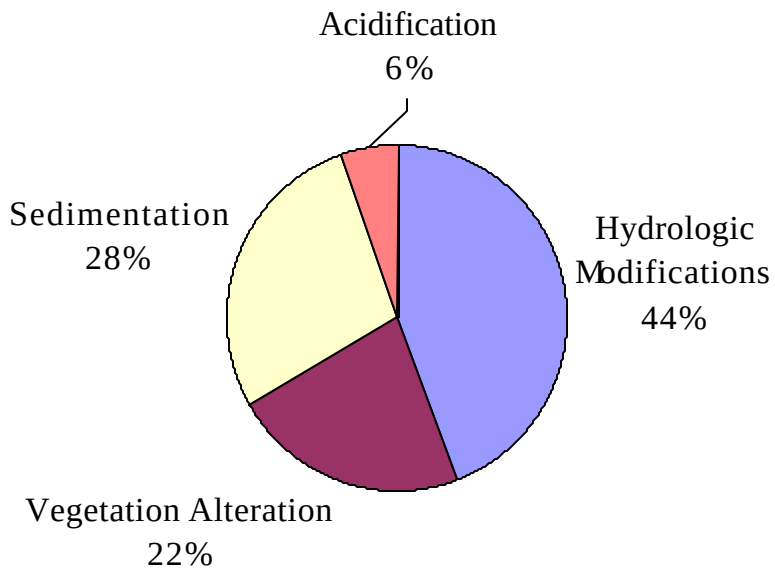



Headwater Floodplain Wetlands - Site/Plot
AX2
AX3
10
5
0
0
1
2
3
4
5
1
2
3
4

Reference Sites - Stressors
Headwater Floodplains

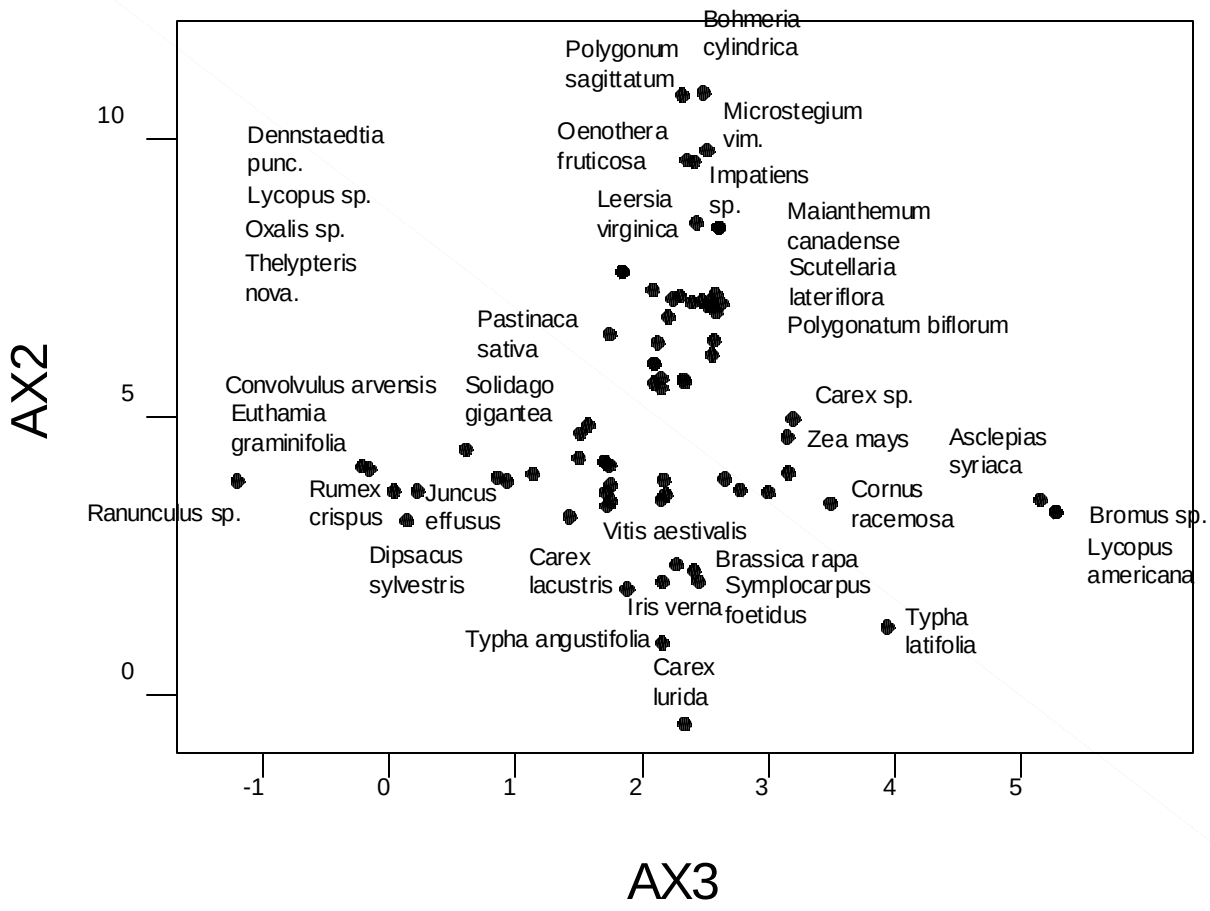


Reference Sites - Stressors
Riparian Depression



- Hydrologic Modifications
- Vegetation Alteration
- Sedimentation
- Eutrophication
- Dissolved Oxygen
- Acidification
- Contaminant Toxicity
- Turbidity
- Thermal Alteration
- Salinity

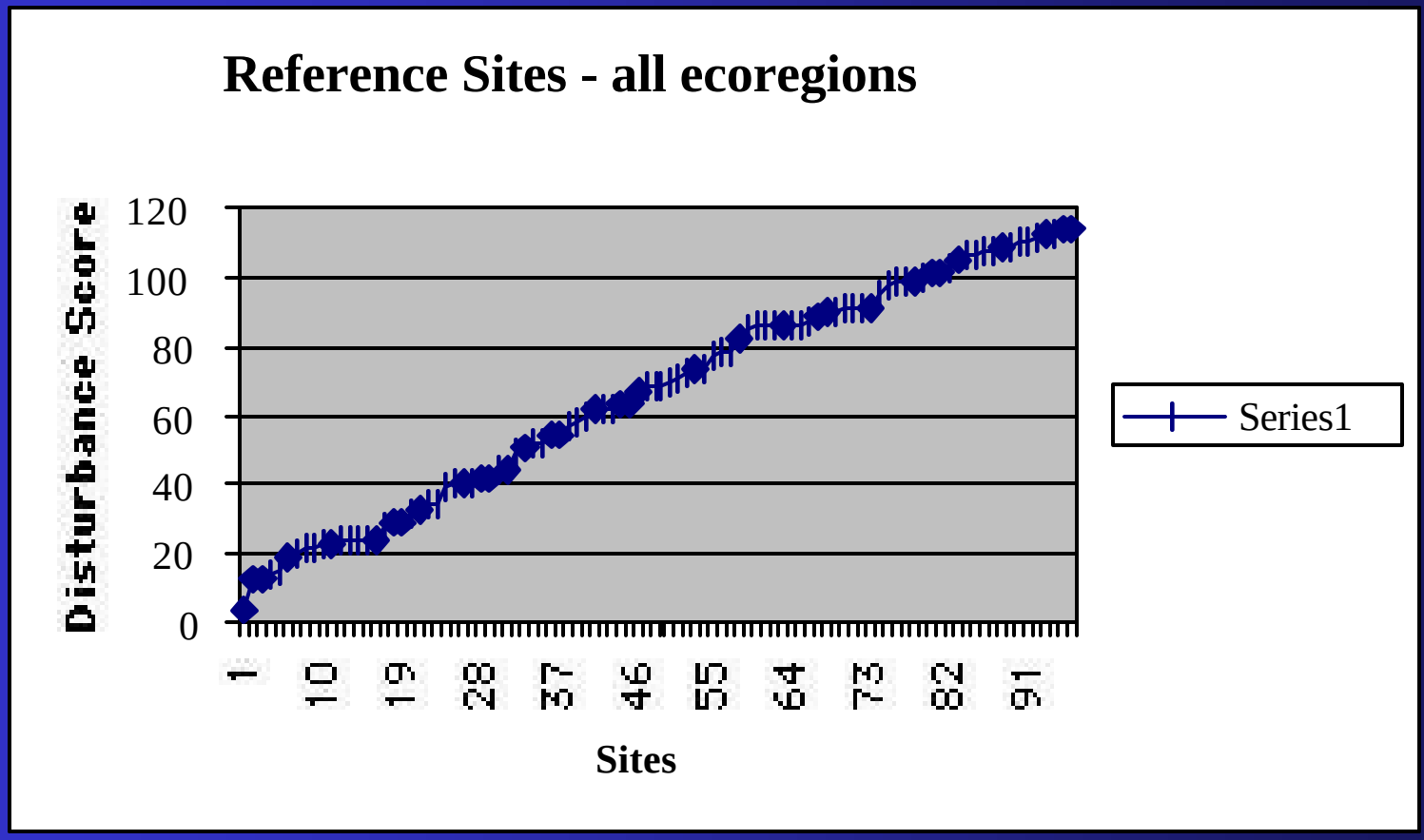
HWF Wetlands - Dominance



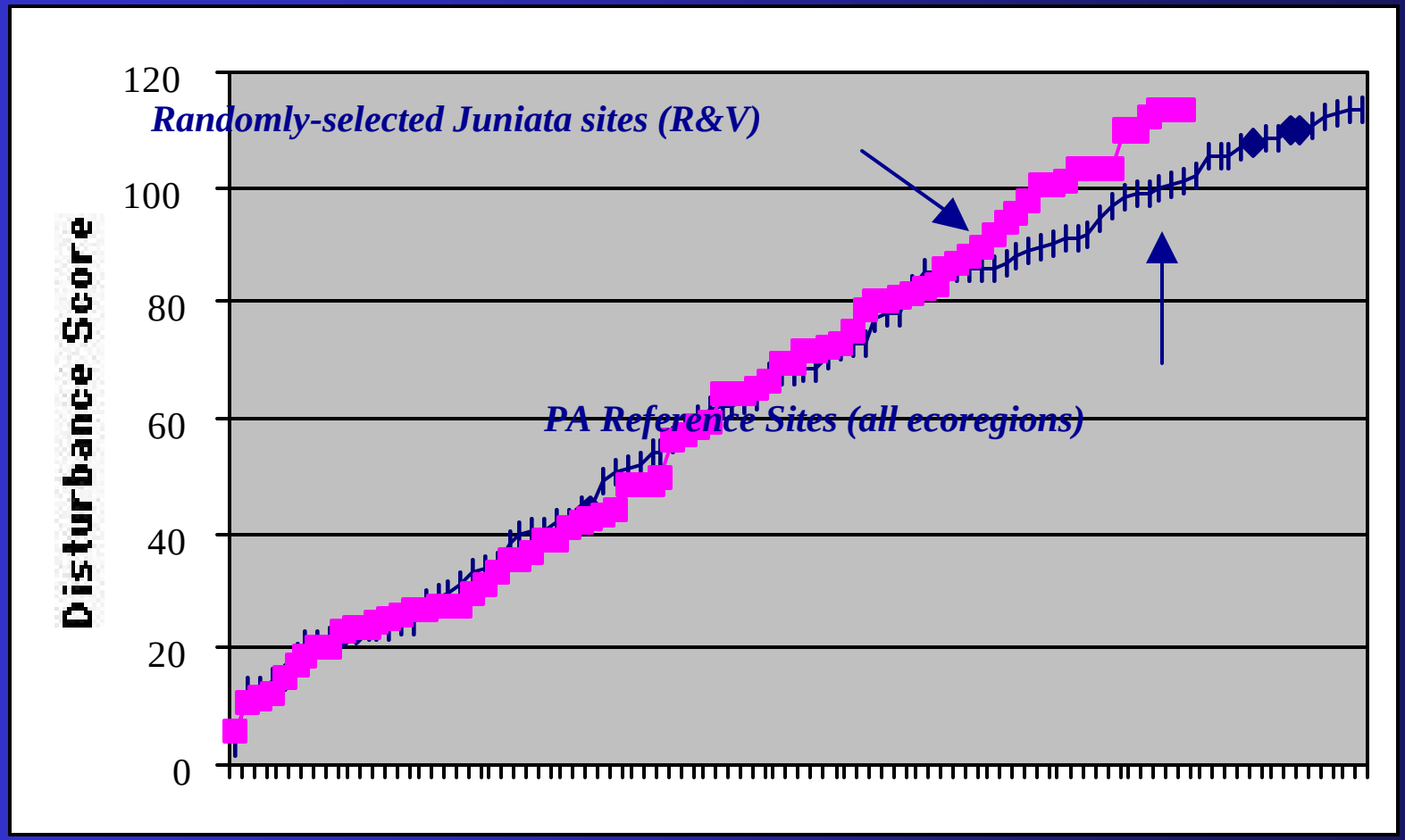
Disturbance Score

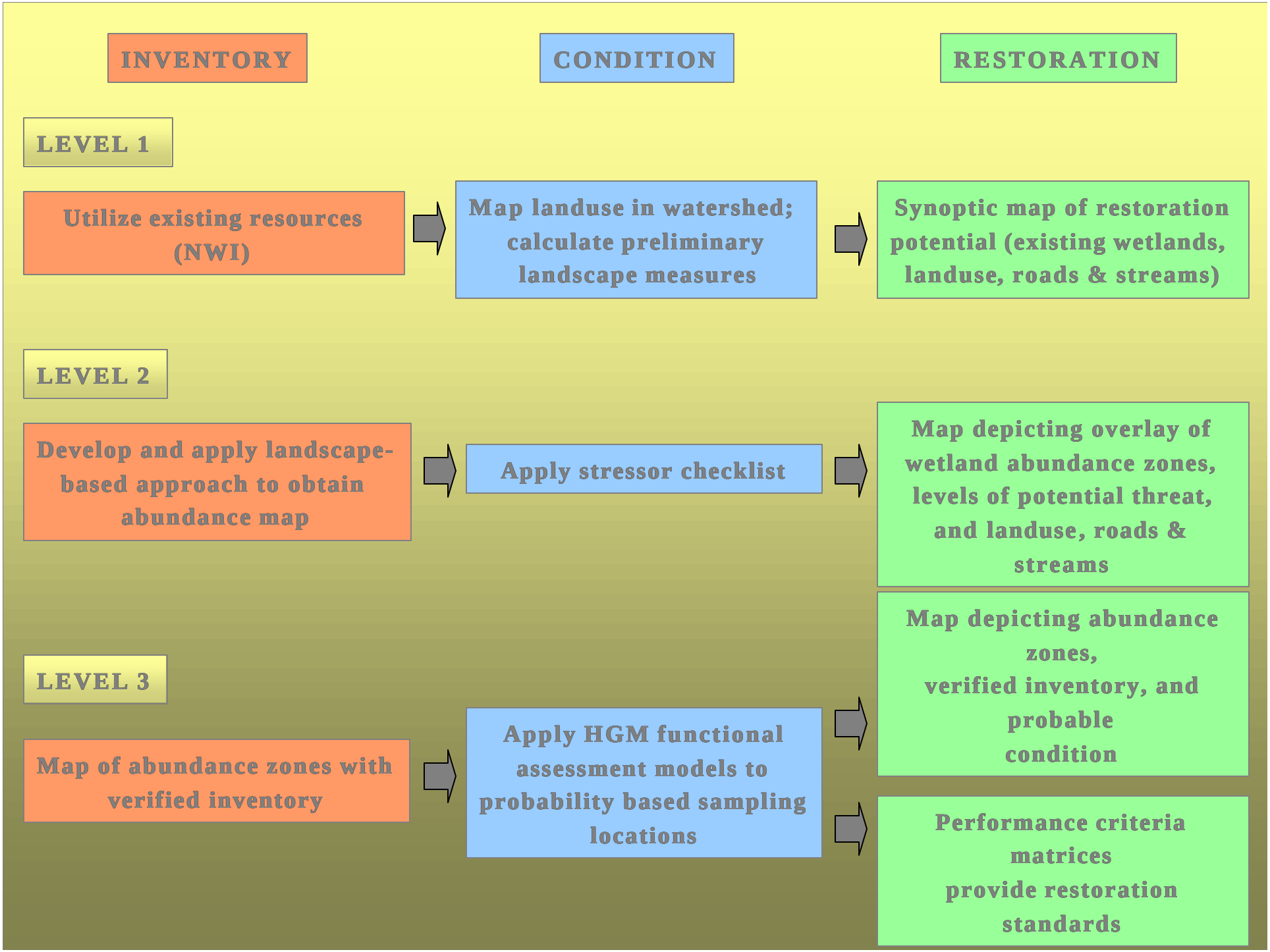
- Combination of landscape, buffer, and site-specific
- Dist=Buffer+(%For*WF)-Buffer Hits
- % Land use
- Buffer type and width
- Site-specific stressors
- Buffer penetrations

Disturbance Score for Reference Sites (98)



Disturbance Scores for All Sites (98 PA Ref. + 83 Juniata)




INVENTORY
CONDITION
RESTORATION
LEVEL 1
Utilize existing resources (NWI)
Map landuse in watershed; calculate preliminary landscape measures
Synoptic map of restoration potential (existing wetlands, landuse, roads & streams)
LEVEL 2
Develop and apply landscape-based approach to obtain abundance map
Apply stressor checklist
Map depicting overlay of wetland abundance zones, levels of potential threat, and landuse, roads & streams
LEVEL 3
Map of abundance zones with verified inventory
Apply HGM functional assessment models to probability based sampling locations
Map depicting abundance zones, verified inventory, and probable condition
Performance criteria matrices provide restoration standards