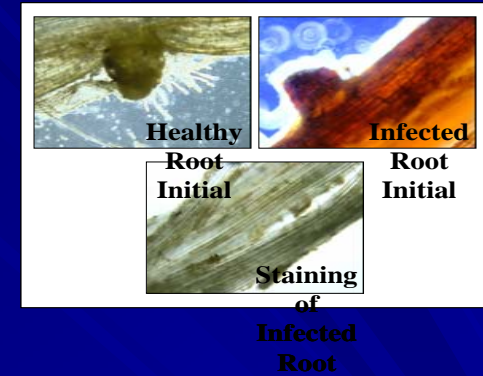
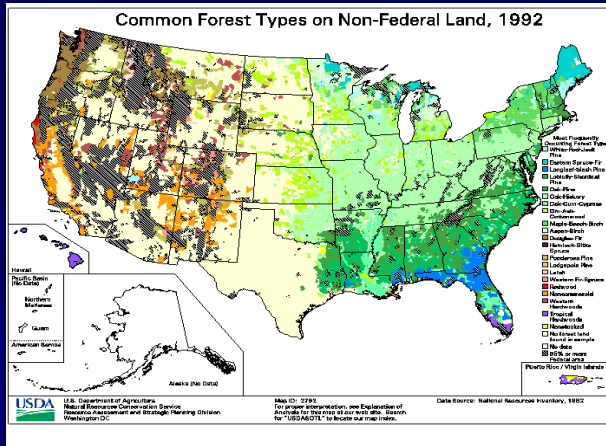


SOIL CHARACTERISTICS OF LOBLOLLY PINE DECLINE SITES IN ALABAMA

Emily Carter, Nolan Hess, Art Goddard,
Lori Eckhardt, J.P. Jones

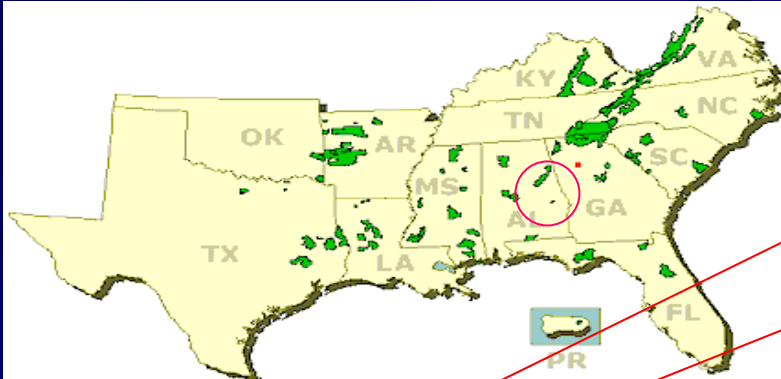


LOBLOLLY PINE DECLINE



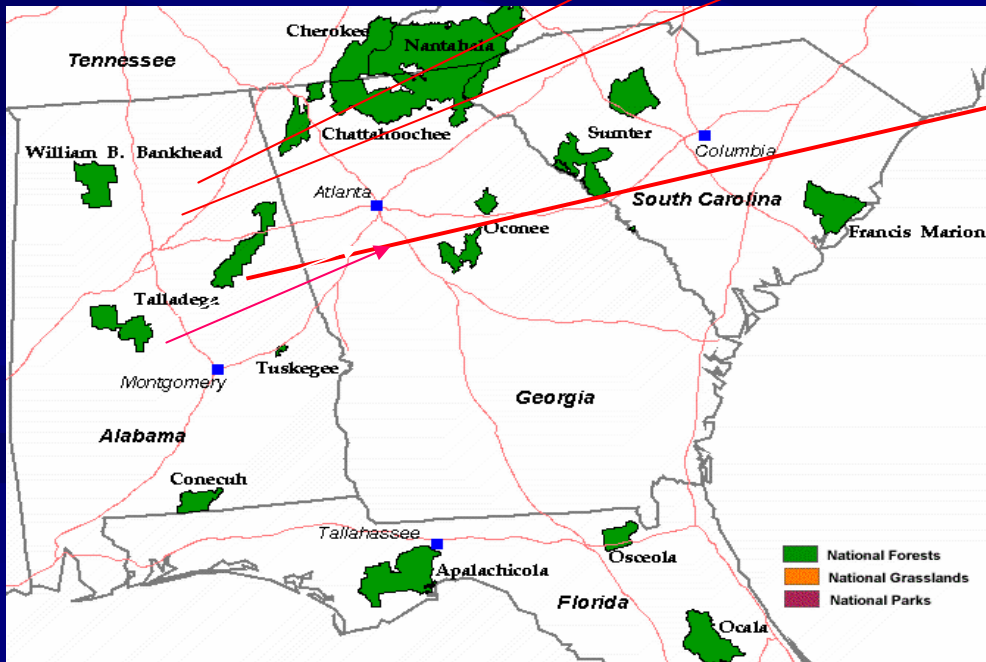
Decline of loblolly pine (*P. taeda* L.) has been noted for many years. Symptoms include sparse crowns, chlorotic needles, reduced radial growth, and mortality within 6 years after appearance of symptoms.

PLOT LOCATIONS



INDUSTRIAL LAND
9 DECLINE SITES

CHOCOLOCCO STATE FOREST
2 DECLINE PLOTS
1 CONTROL PLOT

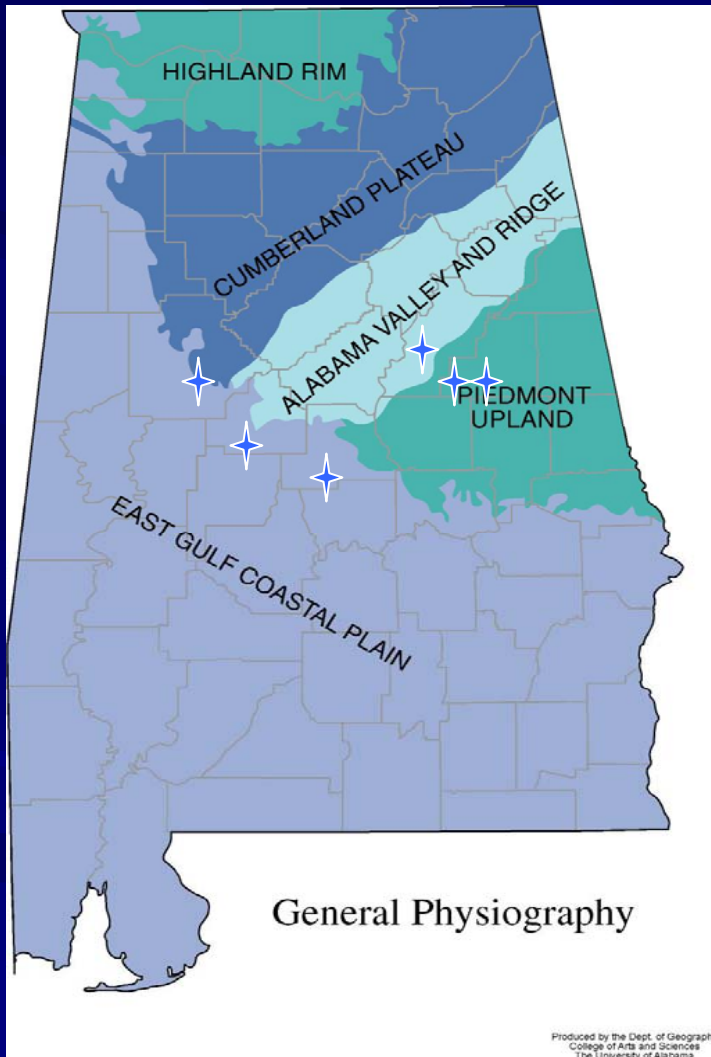


TALLADEGA NATIONAL FOREST
SHOAL CREEK RD
7 DECLINE PLOTS
2 CONTROL PLOTS

TALLADEGA RD
2 DECLINE PLOTS

OAKMULGEE RD
12 DECLINE PLOTS
4 CONTROL PLOTS

SOIL PHYSIOGRAPHIC REGIONS



PIEDMONT

A DISSECTED GEOLOGIC SURFACE DEVELOPED FROM IGNEOUS AND METAMORPHIC ROCKS. SOILS POSSESS LOAMY OR CLAYEY SUBSOILS, UDIC SOIL MOISTURE, AND KAOLINITIC, MIXED, OR OXIDIC MINERALOGY.

VALLEY & RIDGE

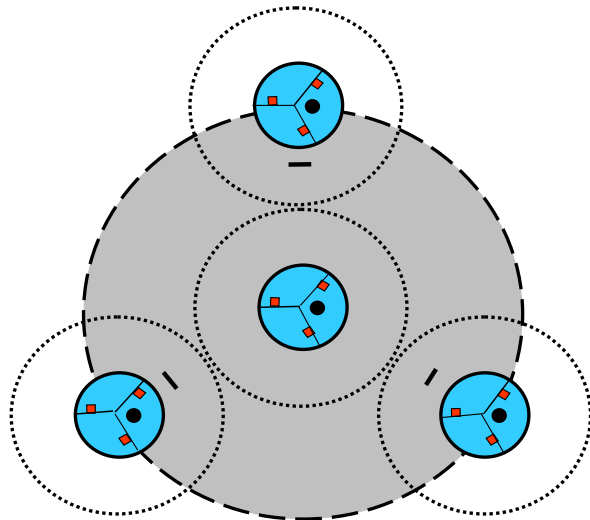
A SERIES OF PARALLEL RIDGES AND VALLEYS UNDERLAIN BY FAULTED AND FOLDED ROCKS. SOILS ARE FORMED ON SHALE OR SANDSTONE RIDGES, DEEP VALLEYS, OR LIMESTONE RIDGES. SOILS ARE WELL-DRAINED, ACIDIC, AND CLAY ENRICHED SUBSOILS.

COASTAL PLAIN

A GEOLOGIC SURFACE UNDERLAIN BY SEDIMENTARY DEPOSITS. SOILS ARE DEEP WITH A LOAMY OR SANDY SOIL SURFACE UNDERLAIN BY LOAMY OR CLAYEY SUBSOIL.

SOIL SAMPLING PROCEDURES

Phase 2/Phase 3 Plot Design



- | | |
|---------------------|---------------------------|
| ● Subplot | 24.0 ft (7.32 m) radius |
| ● Microplot | 6.8 ft (2.07 m) radius |
| ○ Annular plot | 58.9 ft (17.95 m) radius |
| ● Lichens plot | 120.0 ft (36.60 m) radius |
| ■ Vegetation plot | 1.0 m ² area |
| — Soil Sampling | (point sample) |
| — Down Woody Debris | 24 ft (7.32 m) transects |

SOIL CHEMICAL PROPERTIES

EXCHANGEABLE BASES

EFFECTIVE CATION EXCHANGE
CAPACITY (ECEC)

Al/Ca

pH

N

P

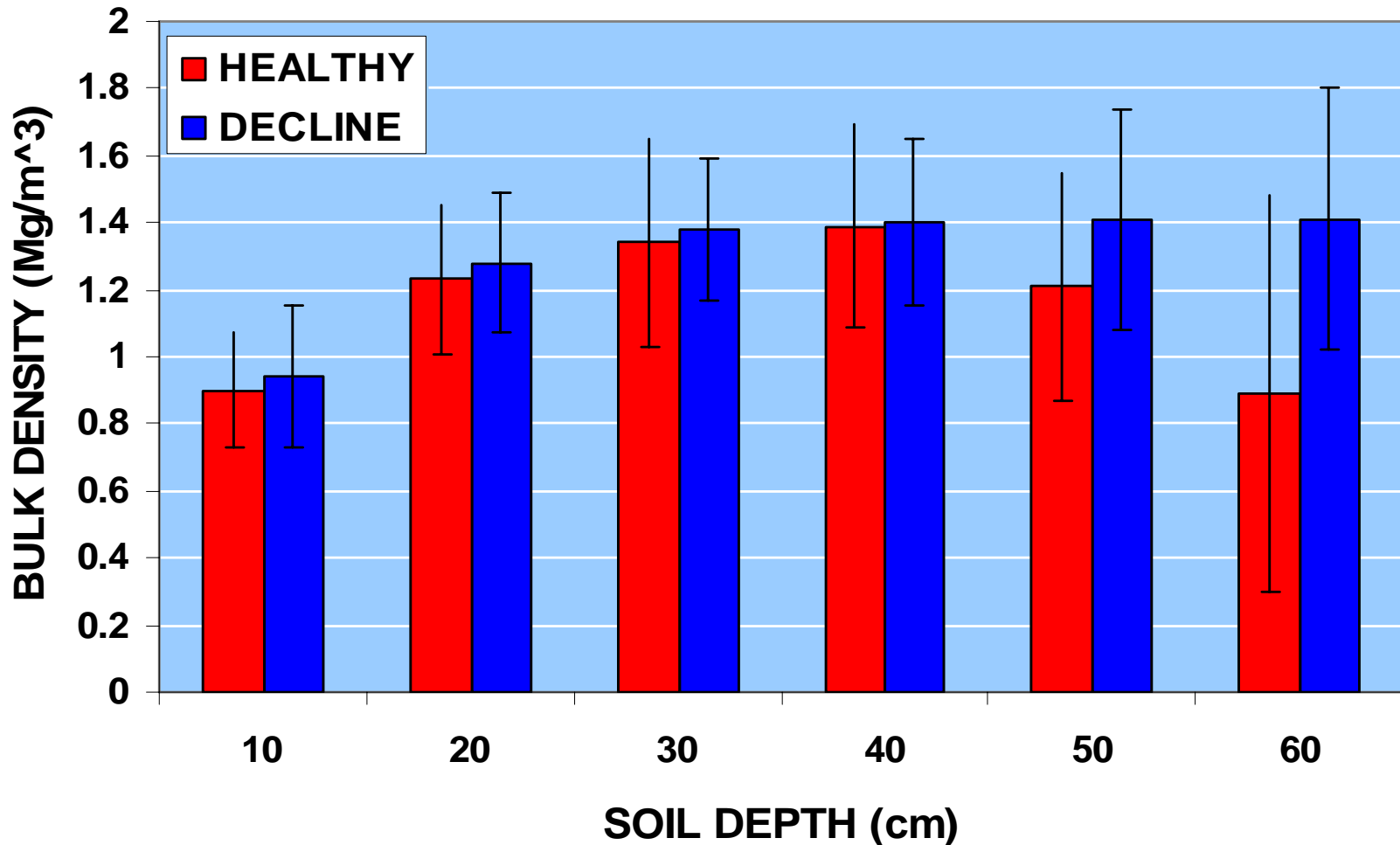
SOIL PHYSICAL PROPERTIES

BULK DENSITY

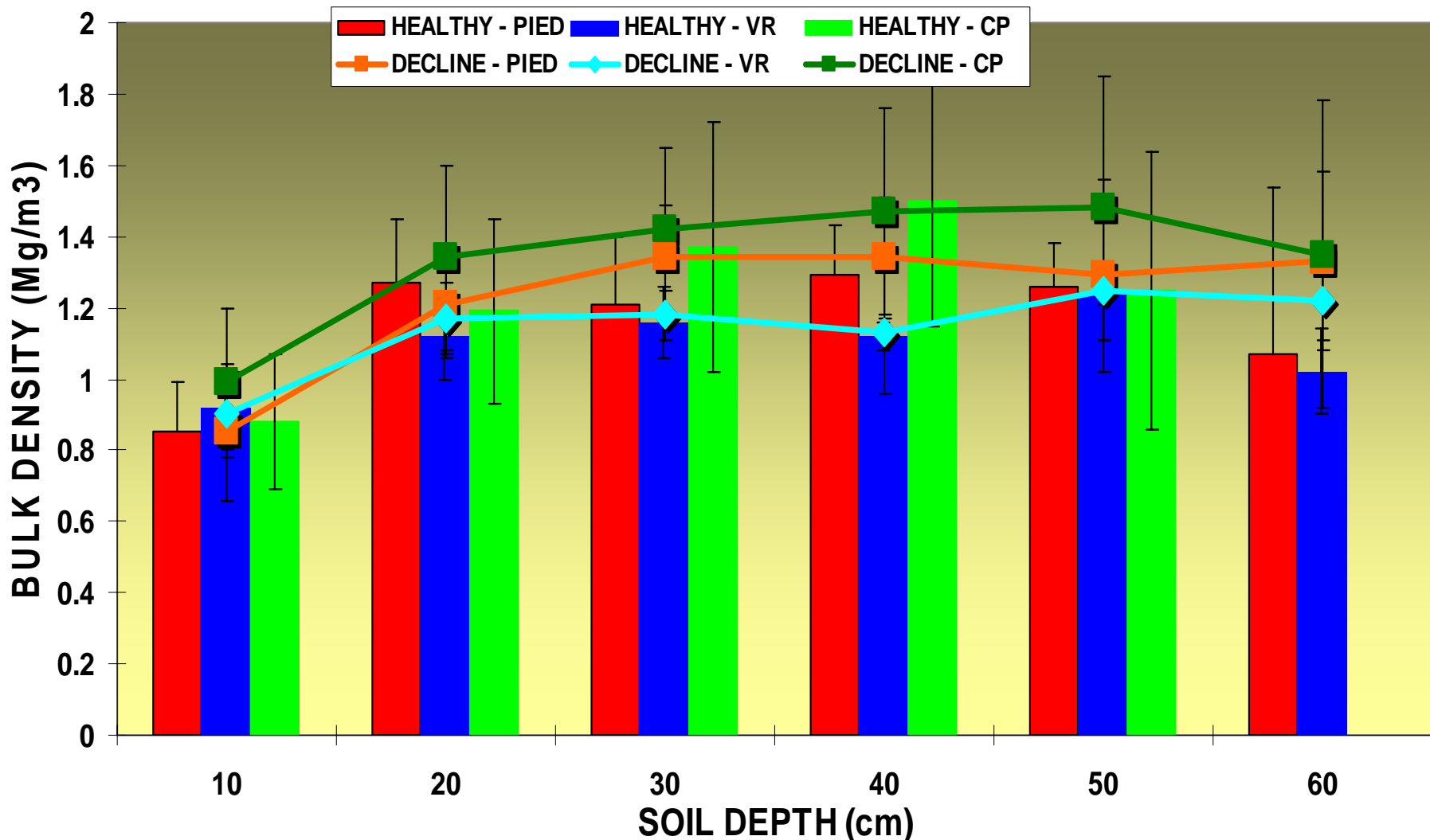
PARTICLE SIZE

SOIL MOISTURE CONTENT (w/w)

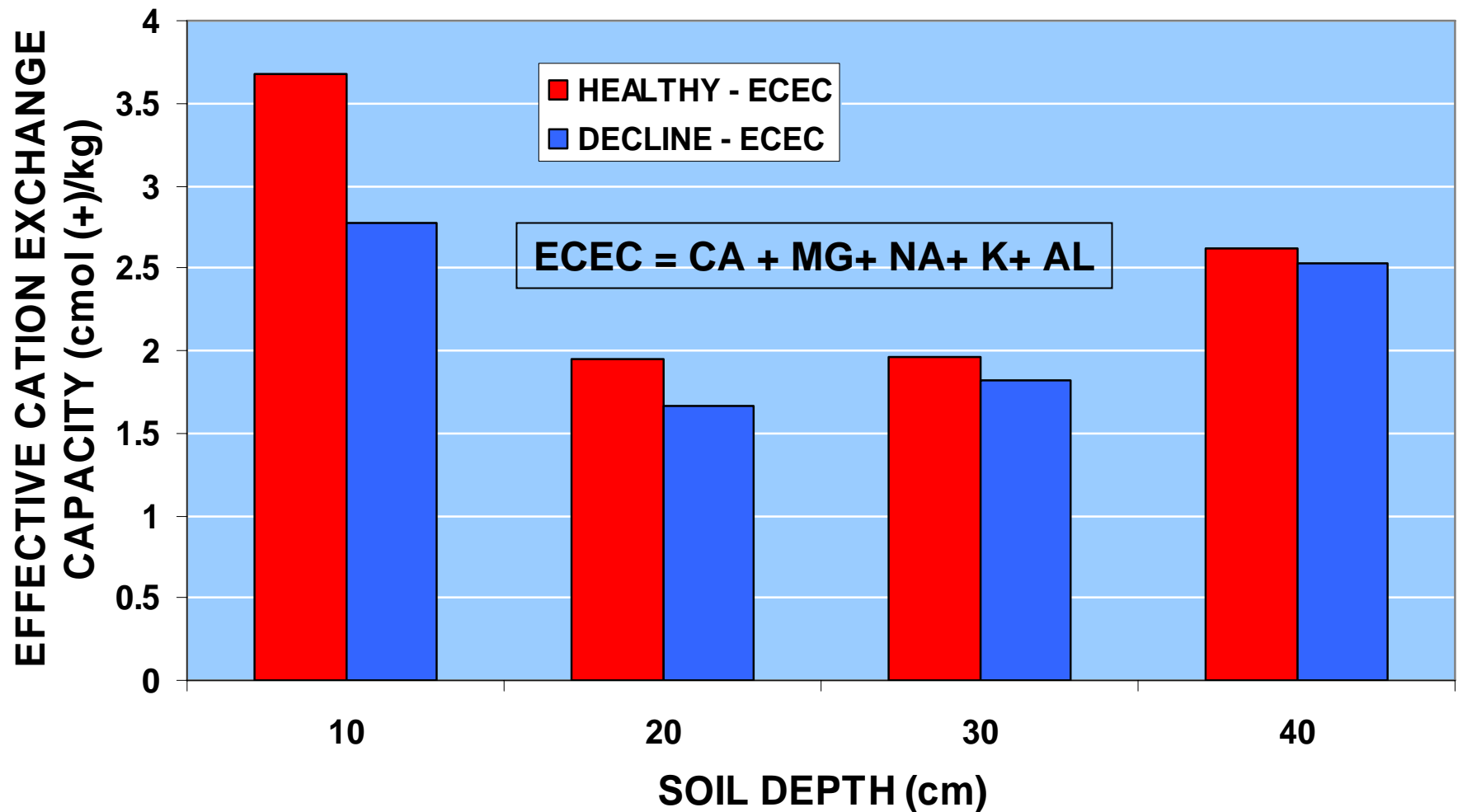
HEALTHY VS. DECLINE - SOIL PHYSICAL PROPERTIES



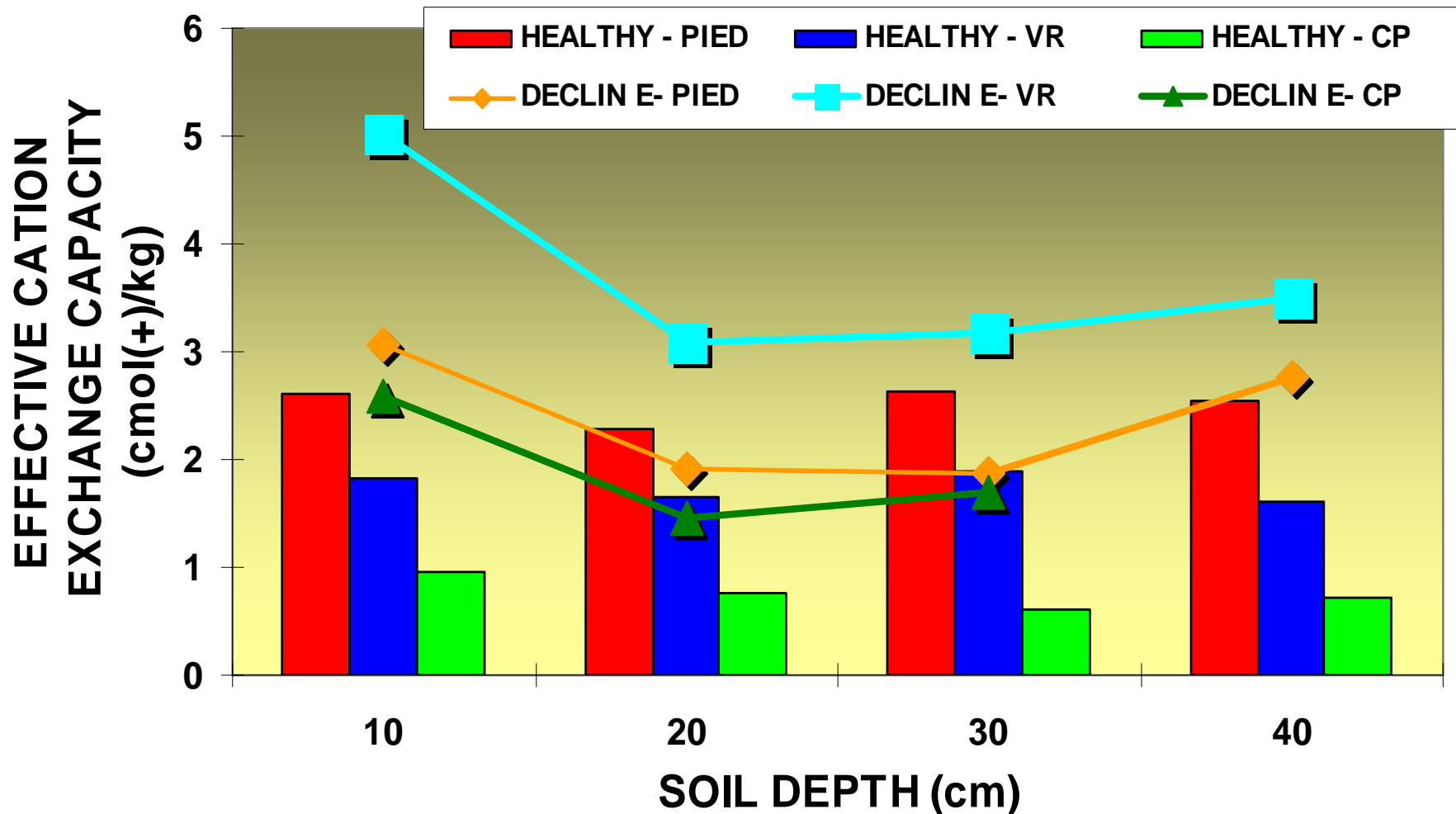
HEALTHY VS. DECLINE - SOIL PHYSICAL PROPERTIES



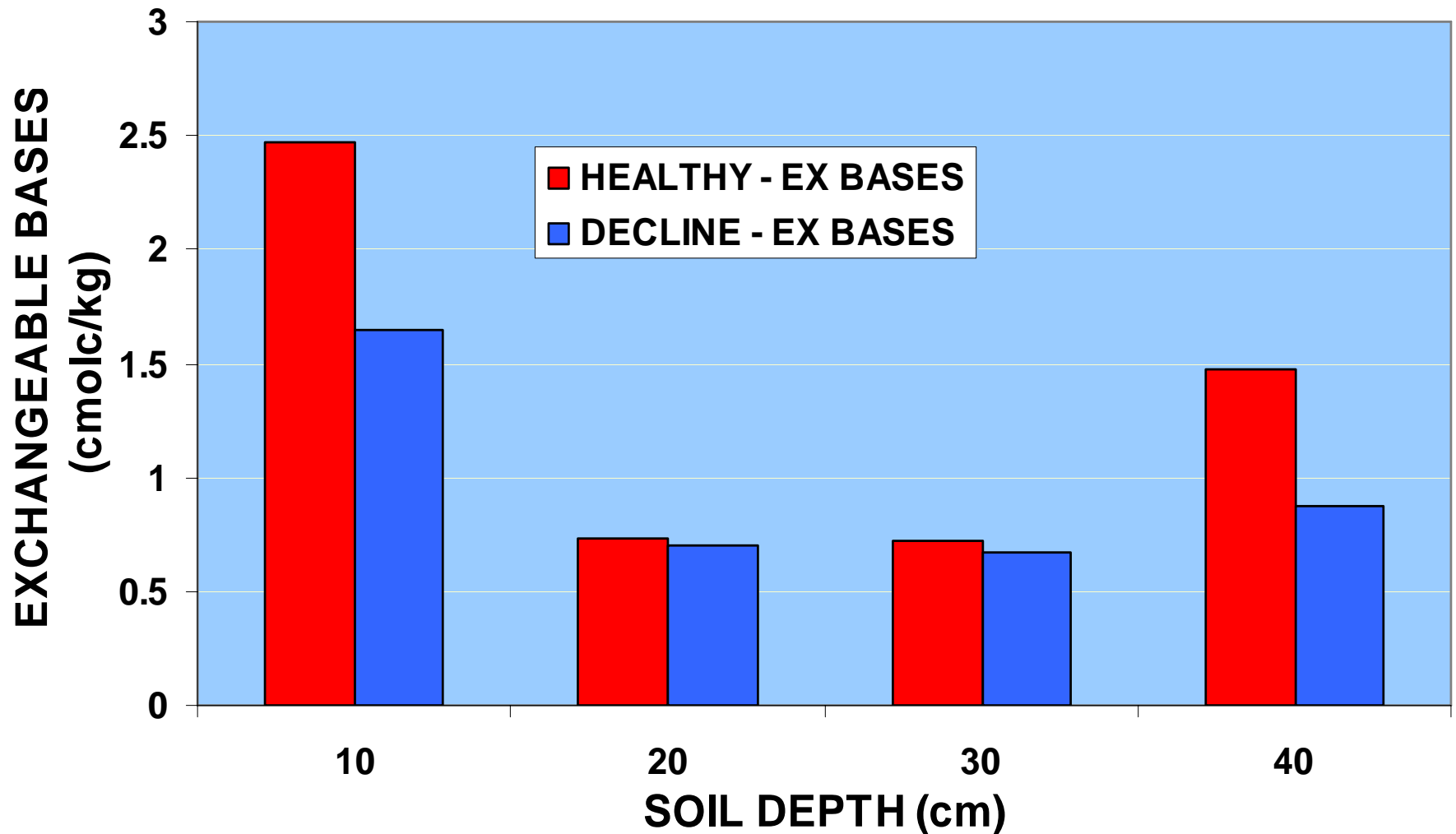
HEALTHY VS. DECLINE - SOIL CHEMICAL PROPERTIES



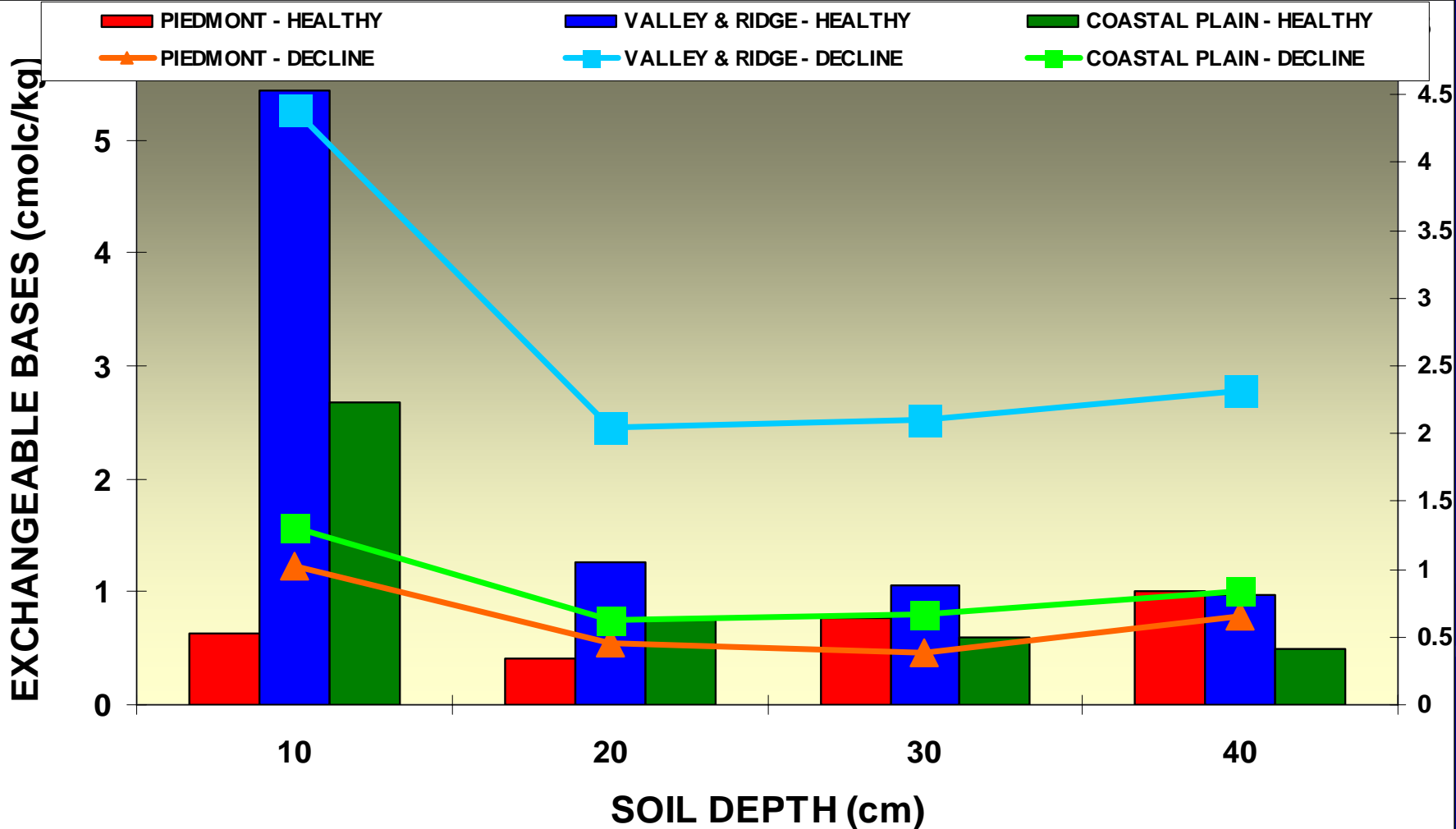
HEALTHY VS. DECLINE - CHEMICAL PROPERTIES



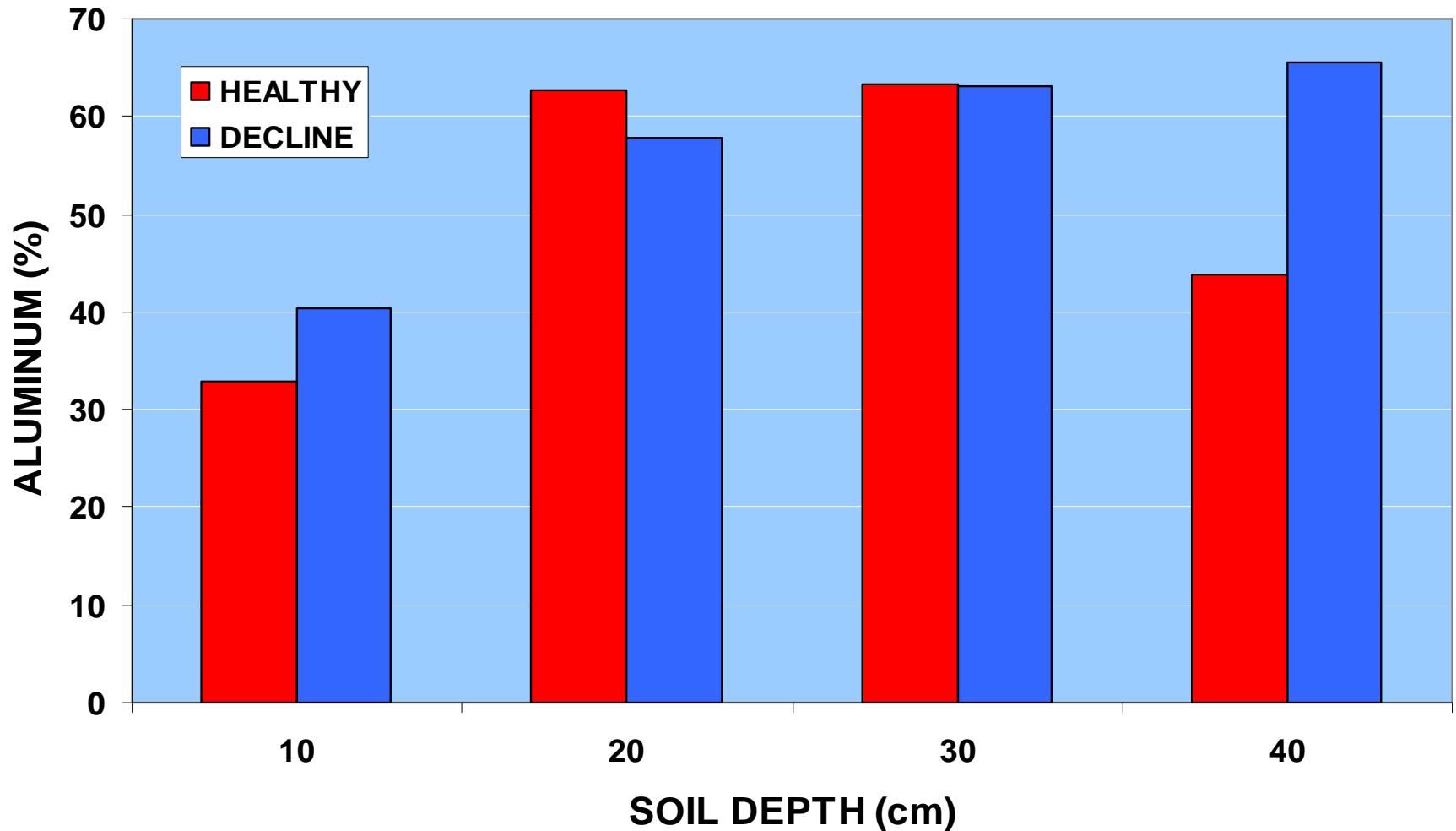
DECLINE VS. HEALTHY - CHEMICAL PROPERTIES



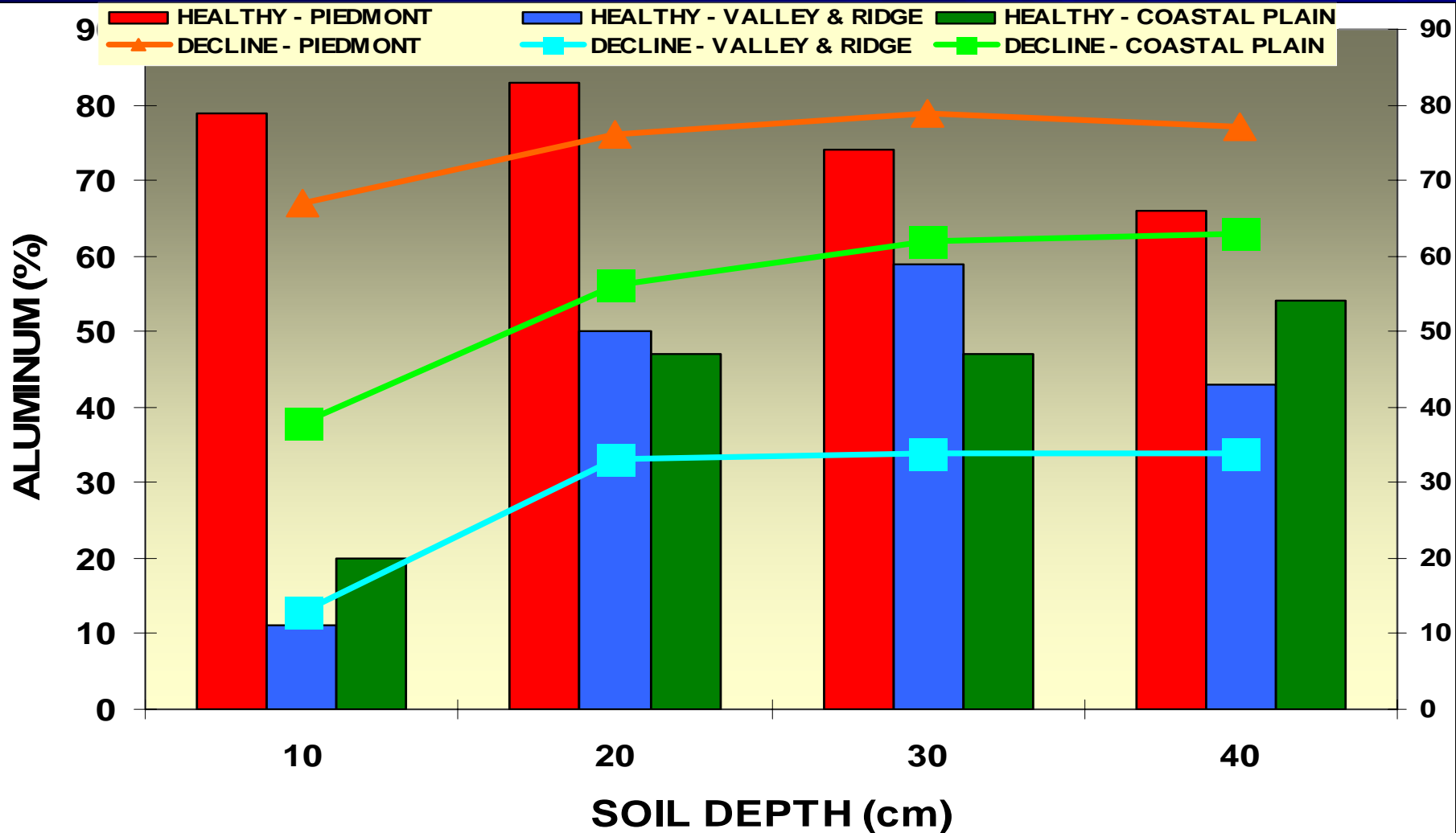
DECLINE VS. HEALTHY - CHEMICAL PROPERTIES



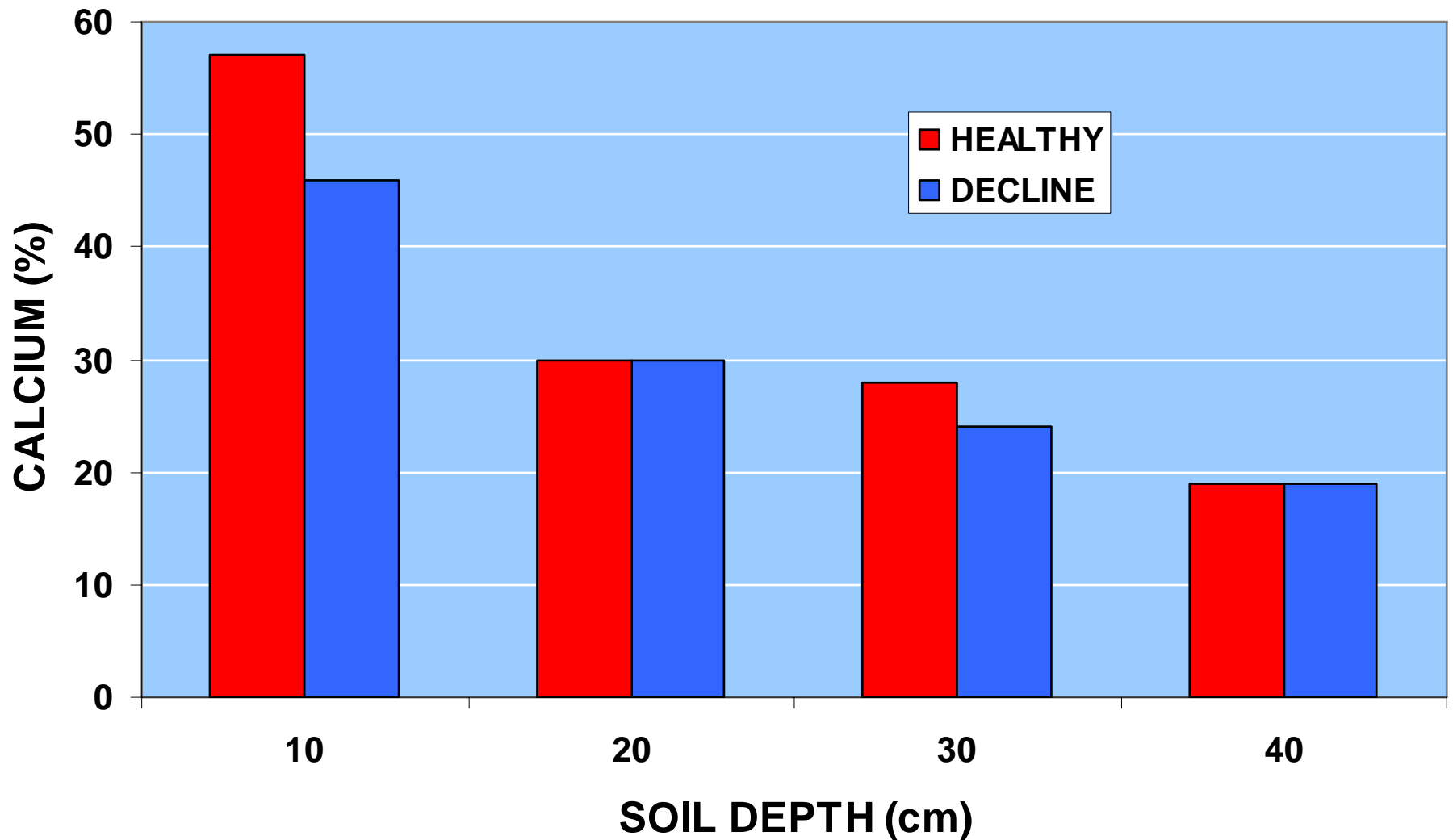
DECLINE VS. HEALTHY - CHEMICAL PROPERTIES



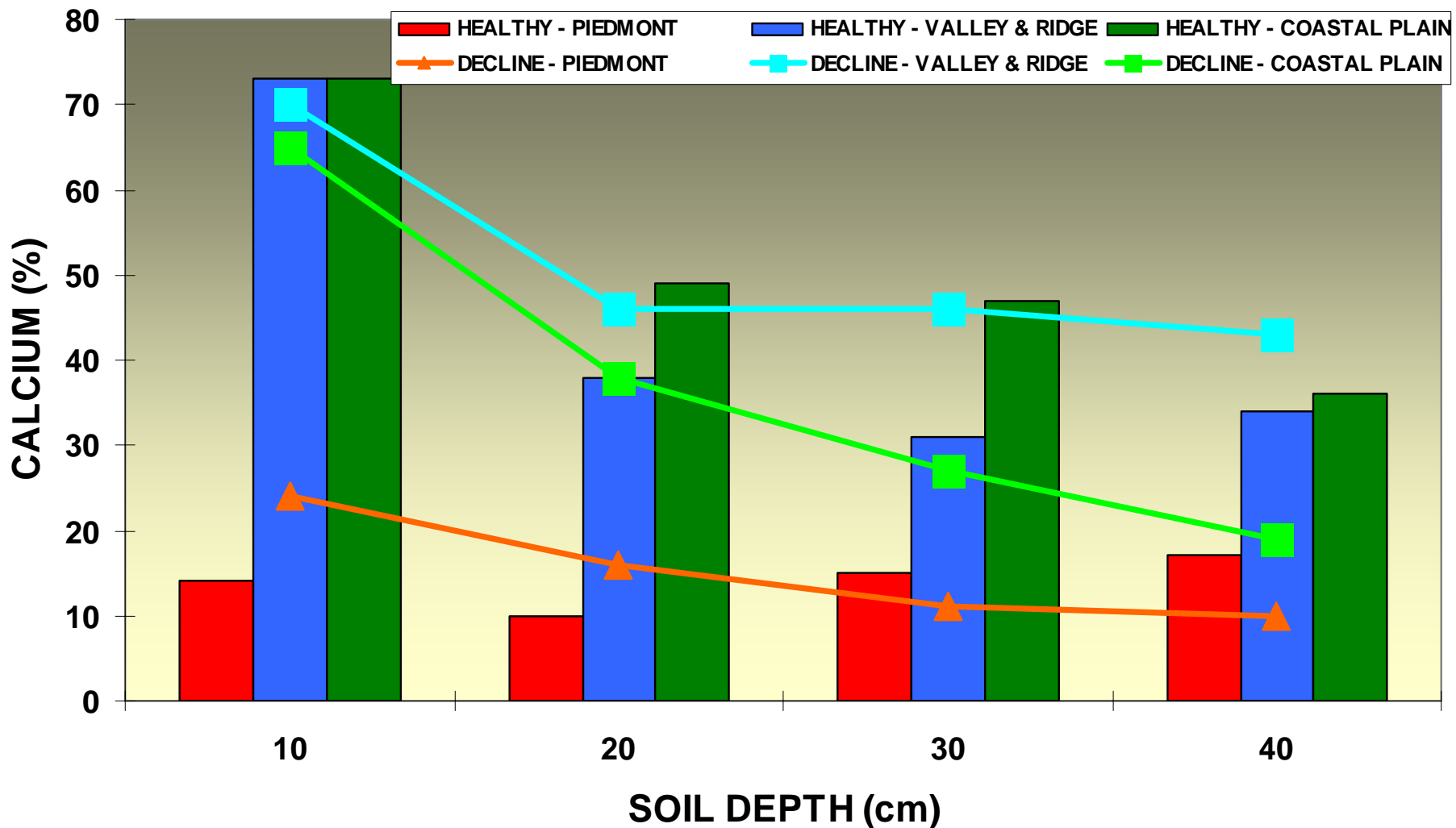
HEALTHY VS. DECLINE - SOIL CHEMICAL PROPERTIES



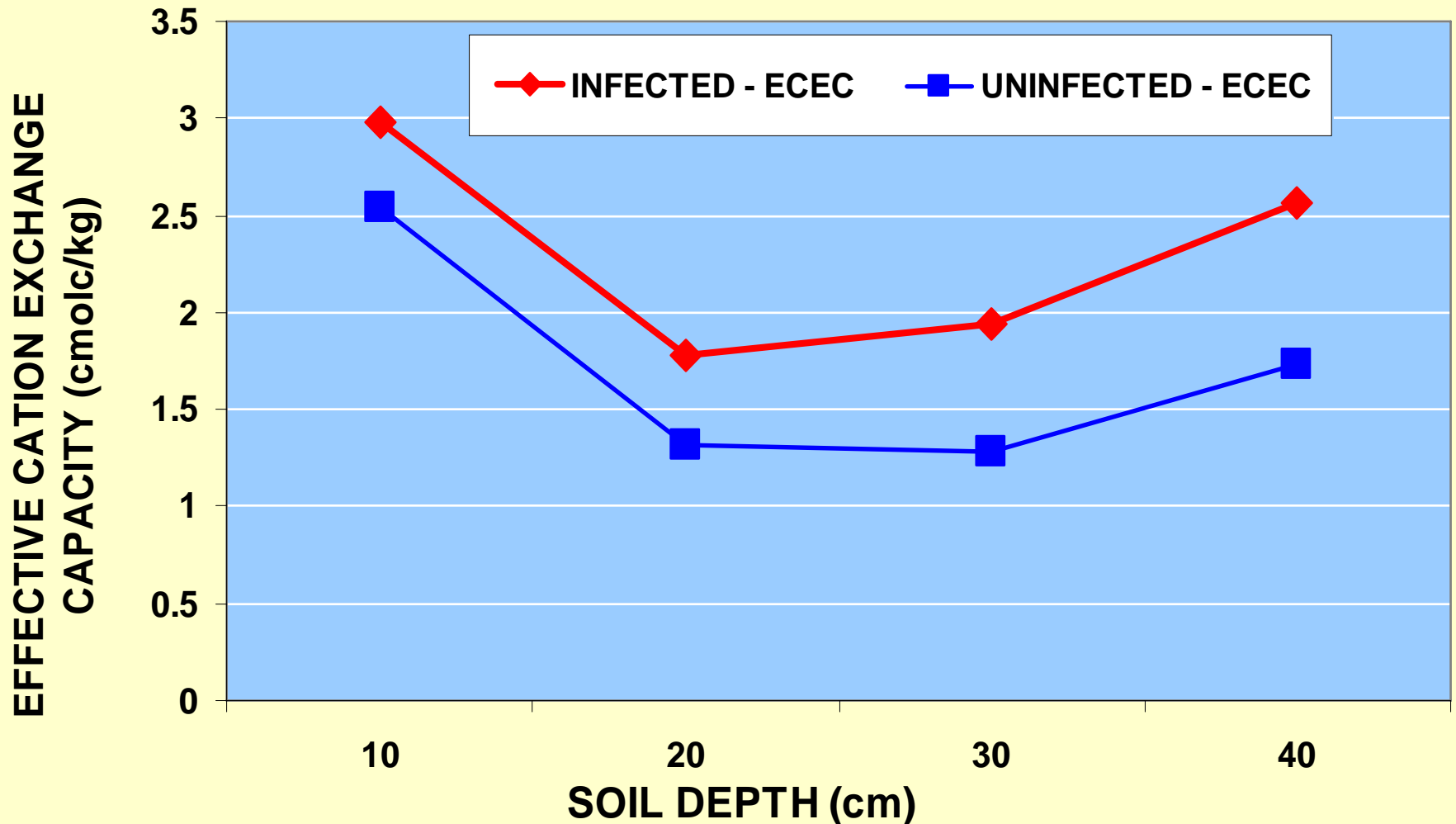
HEALTHY VS. DECLINE - SOIL CHEMICAL PROPERTIES



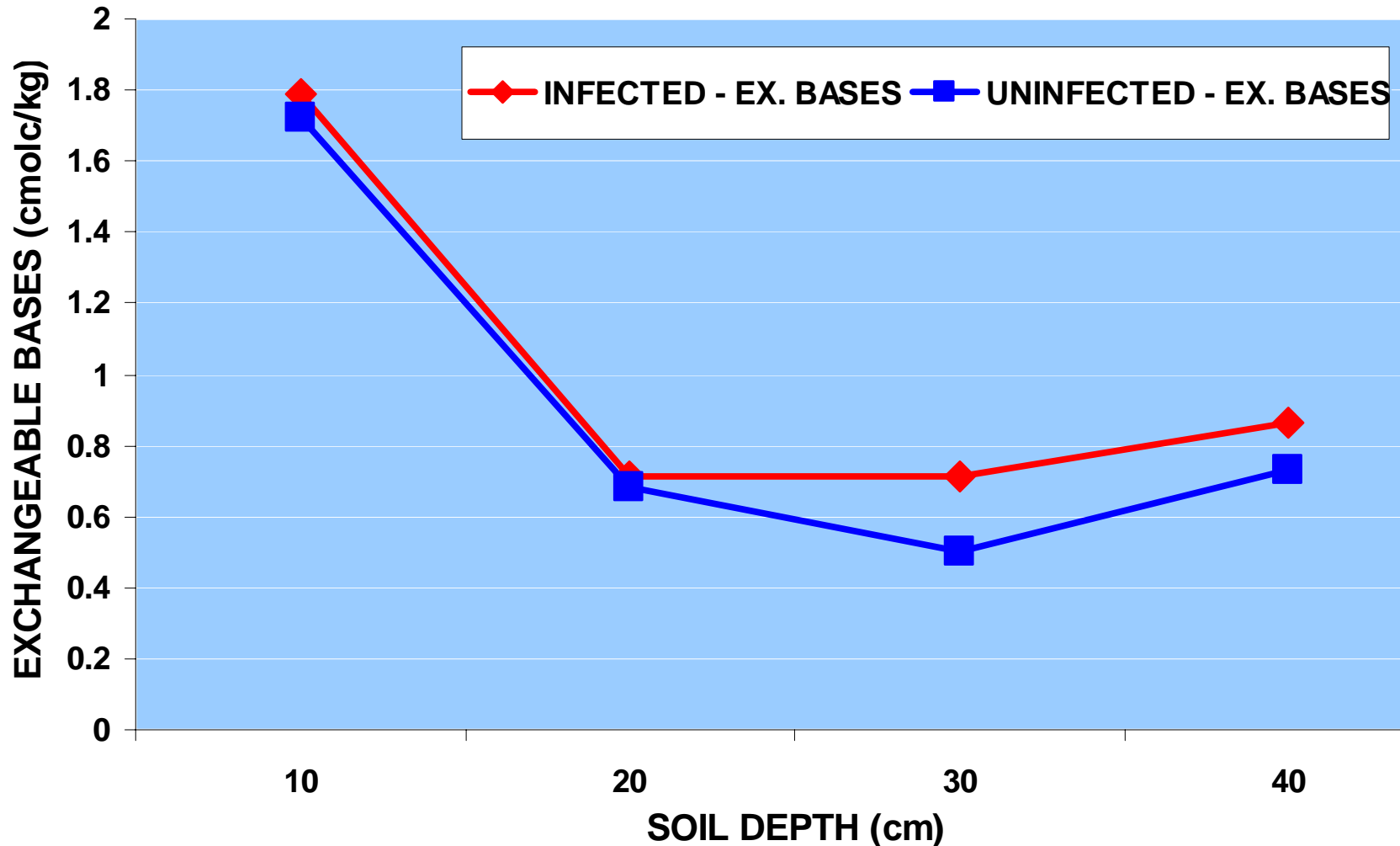
HEALTHY VS. DECLINE - SOIL CHEMICAL PROPERTIES



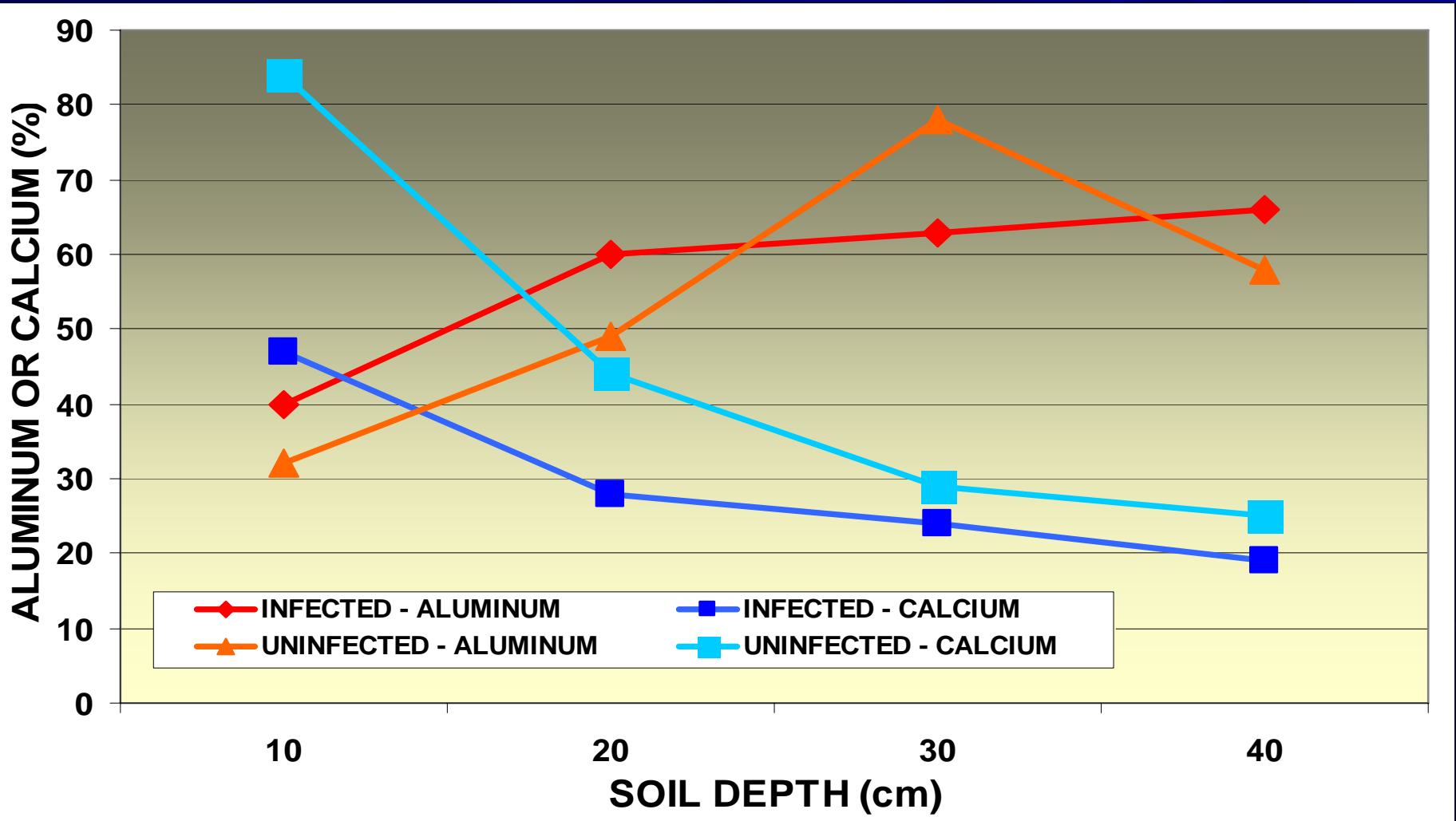
HEALTHY VS. DECLINE - CHEMICAL PROPERTIES



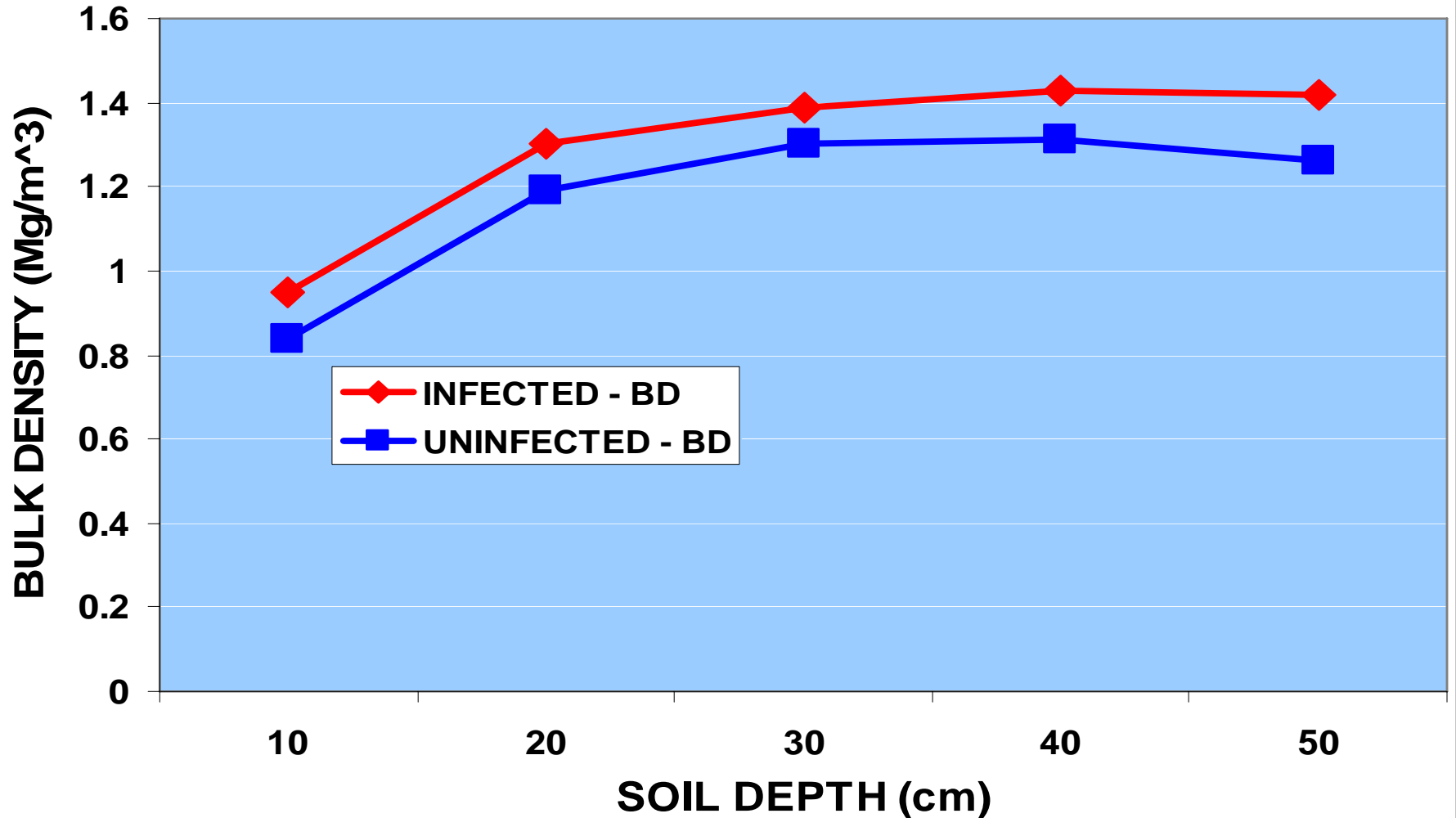
HEALTHY VS. DECLINE - CHEMICAL PROPERTIES



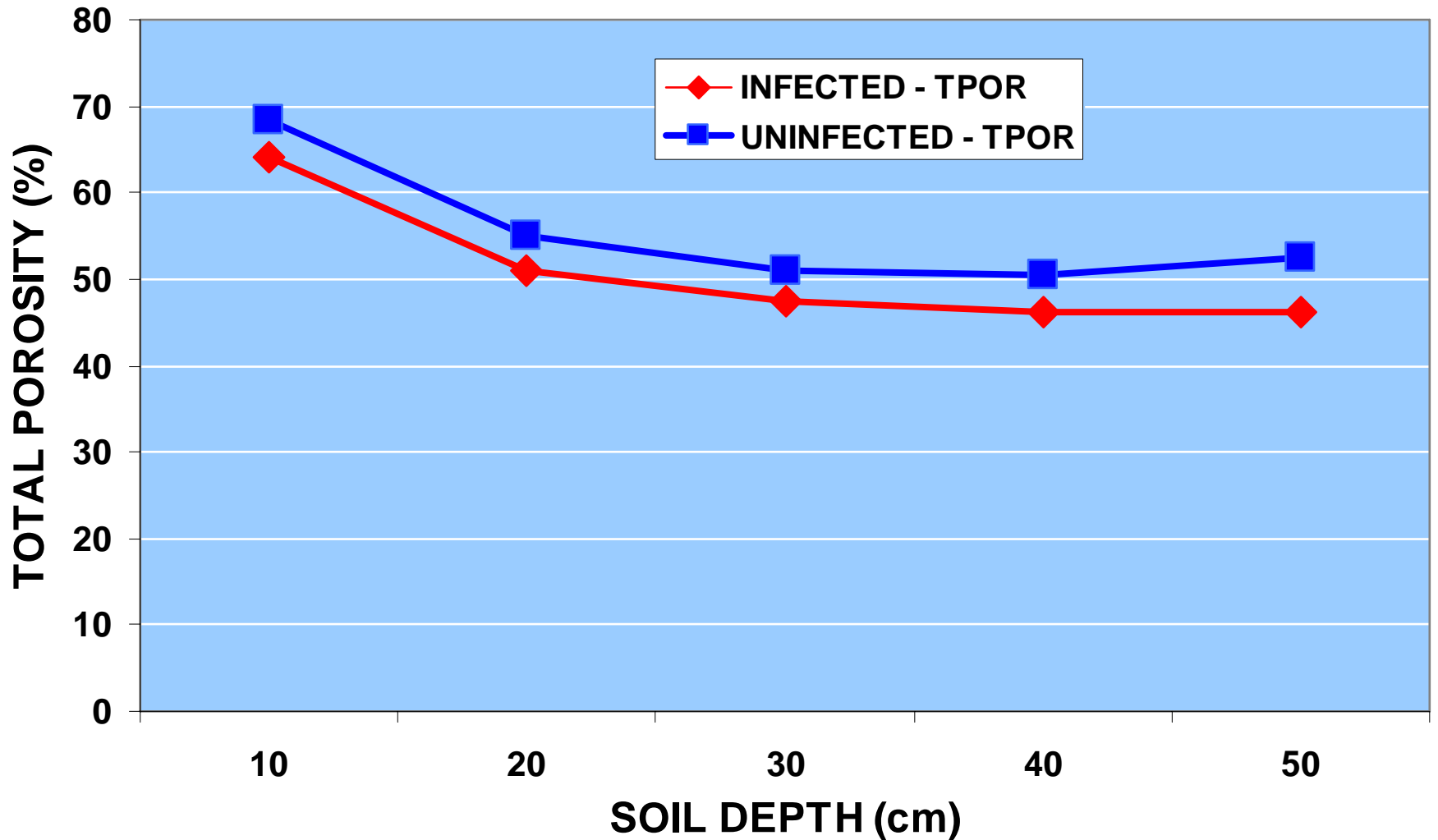
HEALTHY VS. DECLINE - CHEMICAL PROPERTIES



HEALTHY VS. DECLINE - PHYSICAL PROPERTIES



HEALTHY VS. DECLINE - PHYSICAL PROPERTIES



REGRESSION ANALYSIS - PHYSICAL PROPERTIES

BD10	<u>0.12</u>
BD20	0.17
BD30	0.24

REGRESSION ANALYSIS - CHEMICAL PROPERTIES

CA10 0.95

CA20 0.73

CA30 0.65

NA10 0.42

NA20 0.64

NA30 0.73

MG10 0.45

MG20 0.30

MG30 0.31

K10 0.24

K20 0.04

K30 0.08

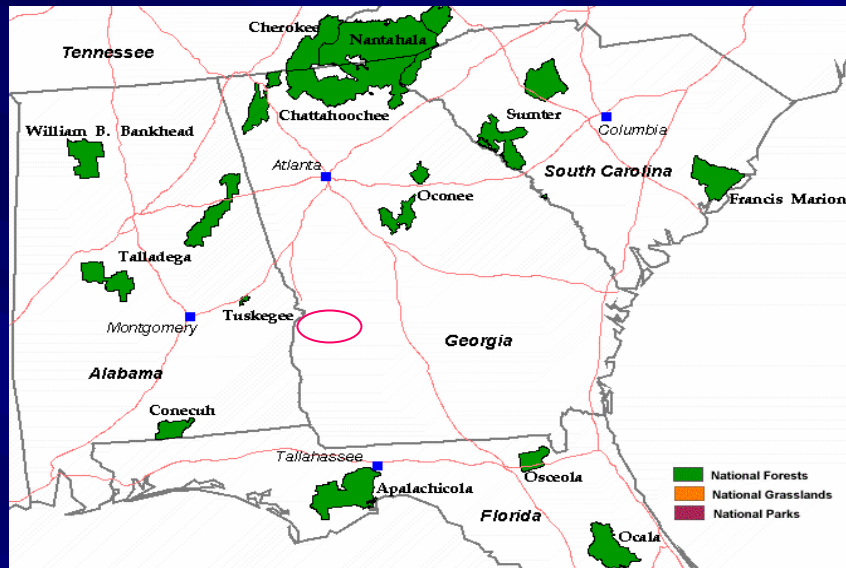
REGRESSION ANALYSIS - CHEMICAL PROPERTIES

AL10	0.30	ECEC10	<u>0.09</u>
AL 20	<u>0.11</u>	ECEC20	<u>0.11</u>
AL30	0.16	ECEC30	<u>0.09</u>

SUMMARY

- PHYSICAL AND CHEMICAL CONDITIONS VARIED BY PHYSIOGRAPHIC REGION;
- BULK DENSITIES APPEARED TO BE HIGHER IN DECLINE SITES;
- A HIGHER NUTRIENT LEVEL IN THE SOIL GENERALLY APPEARED TO BE ASSOCIATED WITH DECLINE SITES; HIGHER PERCENTAGES OF ALUMINUM ON THE EXCHANGE COMPLEX SOMETIMES APPEARED TO FAVOR HEALTHY SITES;
- INFECTED PLOTS WERE INFLUENCED BY PHYSICAL CONDITION AND CHEMICAL CONDITIONS RELATED TO ALUMINUM CONTENT AND POTASSIUM CONTENT.

FT BENNING MEASUREMENTS



- CONE PENETROMETER
- SOIL MOISTURE CHARACTERIZATION
- NEEDLE ANALYSIS

**THANK YOU FOR
YOUR ATTENTION**