

**Volcanic Ash and Sulfate Sorption
in Inland Northwest Soils:
Implications for Forest Health Management**

**Intermountain Forest Tree Nutrition Cooperative
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Presented by

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OUTLINE

1. Volcanic Ash:

- i. Origin**
- ii. Distribution**

2. Properties of Ash

- i. Physical**
- ii. Chemical**

3. Implications for Forest Nutrition

- i. Nutrient Deficiencies?**
- ii. Improved Nutrient Management**



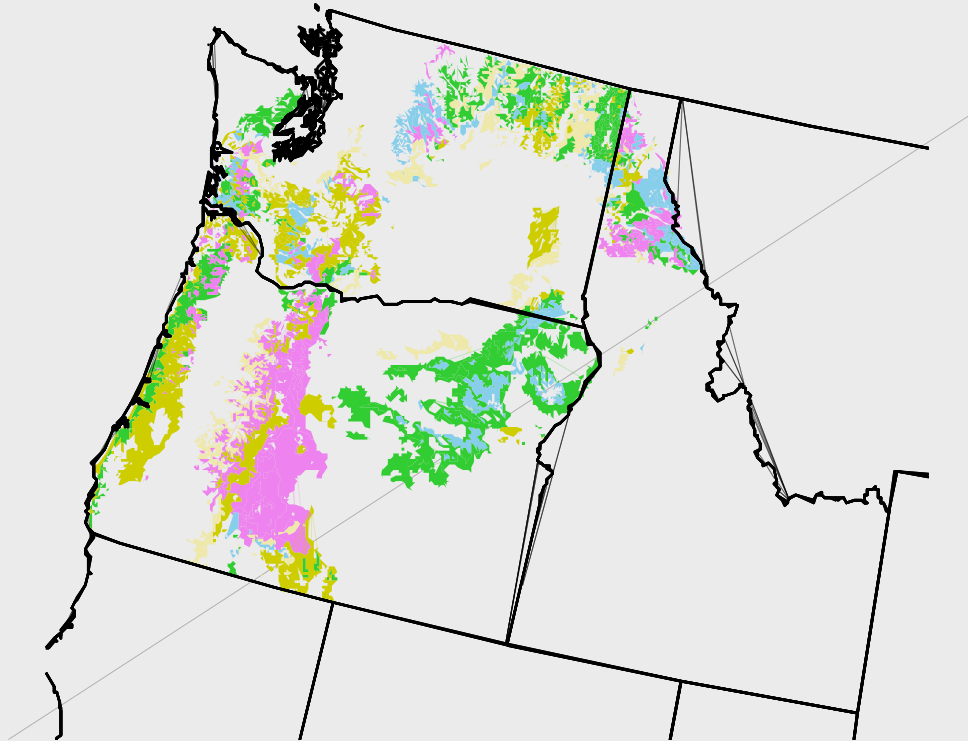
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Andisols in the Pacific NW





Glass content of Andic horizons

eastern Washington

eastern Oregon

northern Idaho

western Montana

x

39.2 %

30.8 %

min.

3

1

max.

88

67

n

37

77

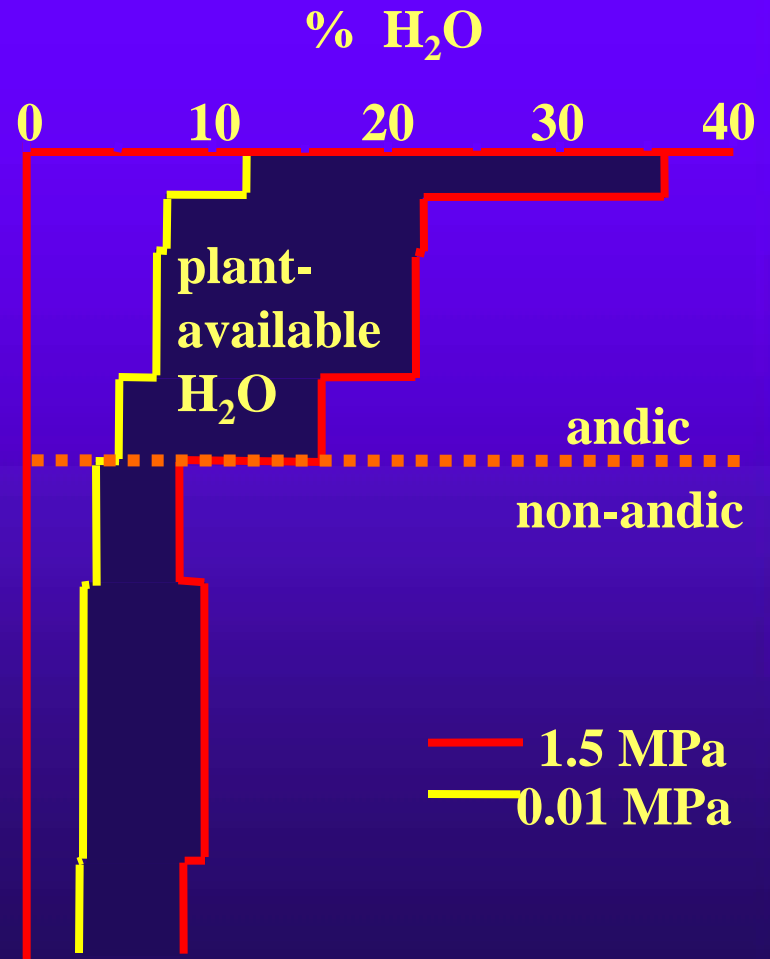
(source: NRCS soils database)



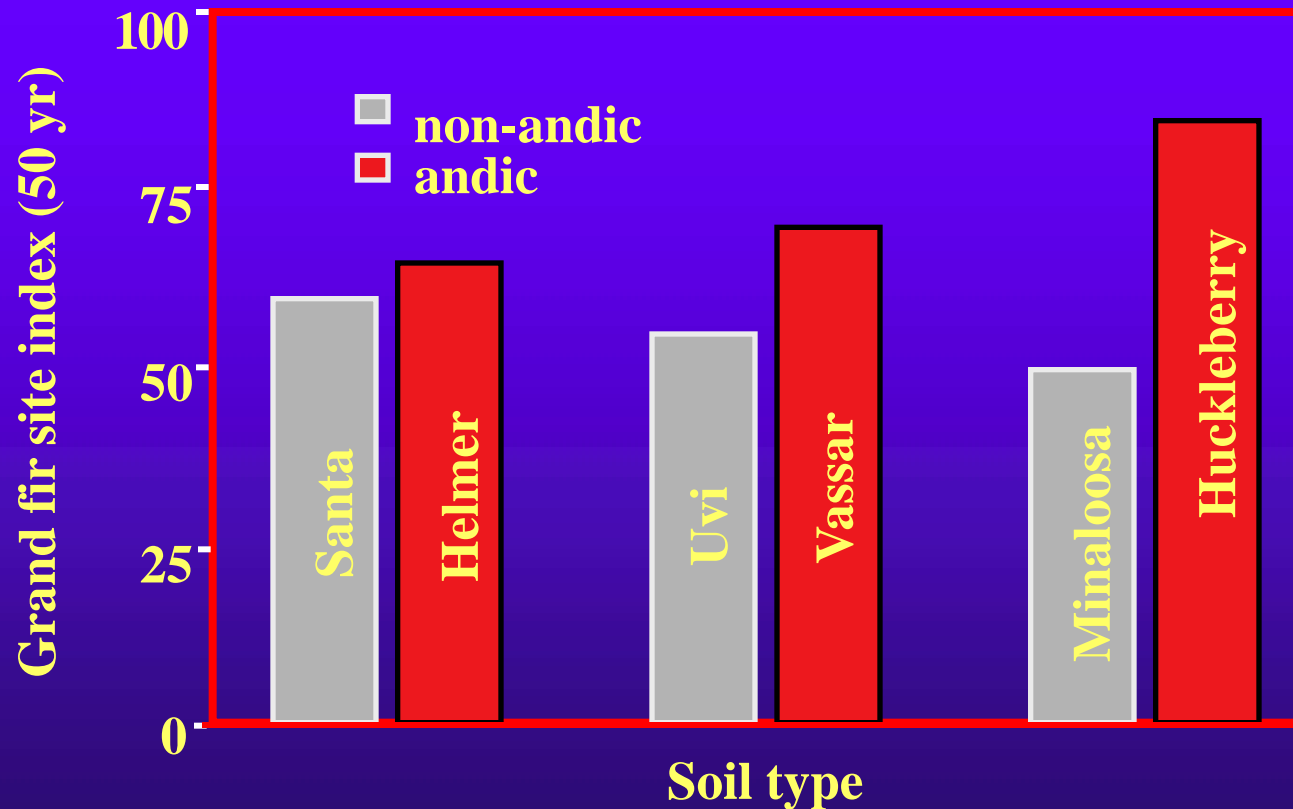
PHYSICAL PROPERTIES OF ASH



A
Bw1
Bw2
Bw3
2BC
2C1
2C2



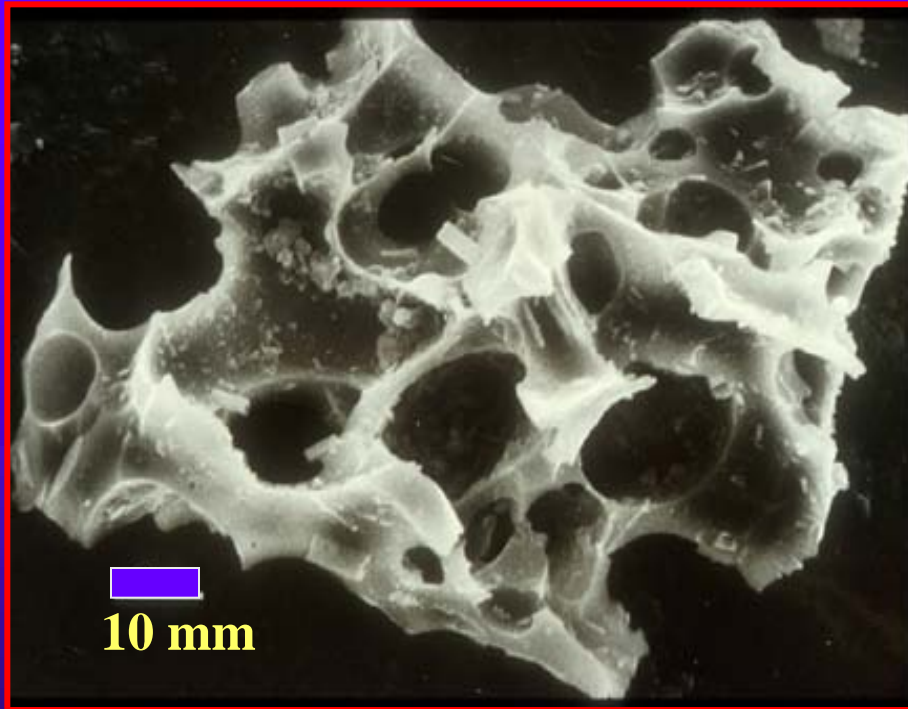
PHYSICAL PROPERTIES OF ASH



(from SCS Soil Survey of Latah County Area, Idaho)

CHEMICAL PROPERTIES OF ASH

Mazama glass



<u>Element</u>	<u>%</u>
SiO ₂	72.0
Al ₂ O ₃	14.4
Na ₂ O	5.1
Fe ₂ O ₃	2.1
K ₂ O	2.7
CaO	1.6
MgO	0.5
TiO ₂	0.4



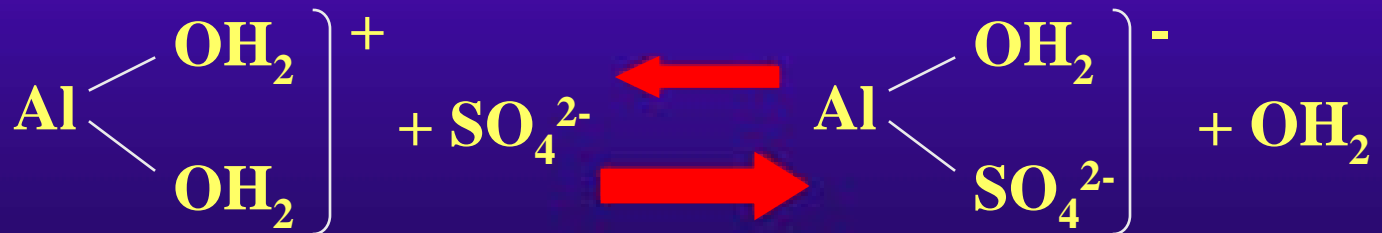
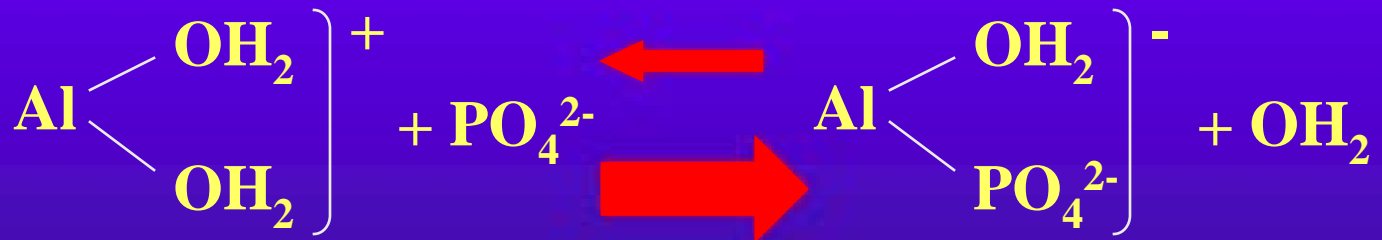
CHEMICAL PROPERTIES OF ASH

- ❖ **pH variable charge due to deprotonation/protonation of Fe and Al hydroxyl groups**
- ❖ **Net positive electrical charge in most Inland Northwest forest soils**
- ❖ **Positive electrical charge allows specific adsorption of anions; primarily, phosphate and sulfate.**

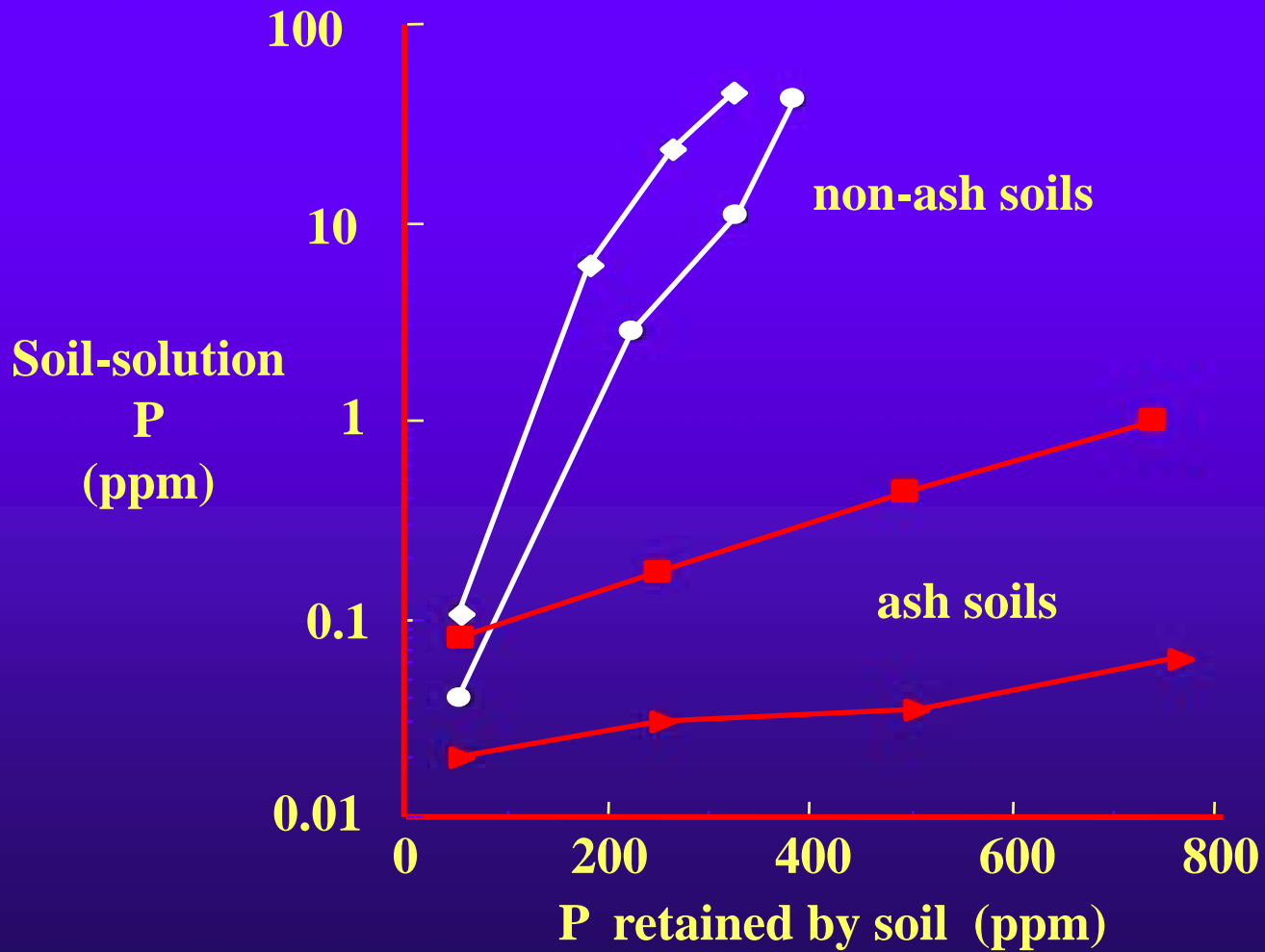
CHEMICAL PROPERTIES OF ASH

❖ Mode of specific adsorption

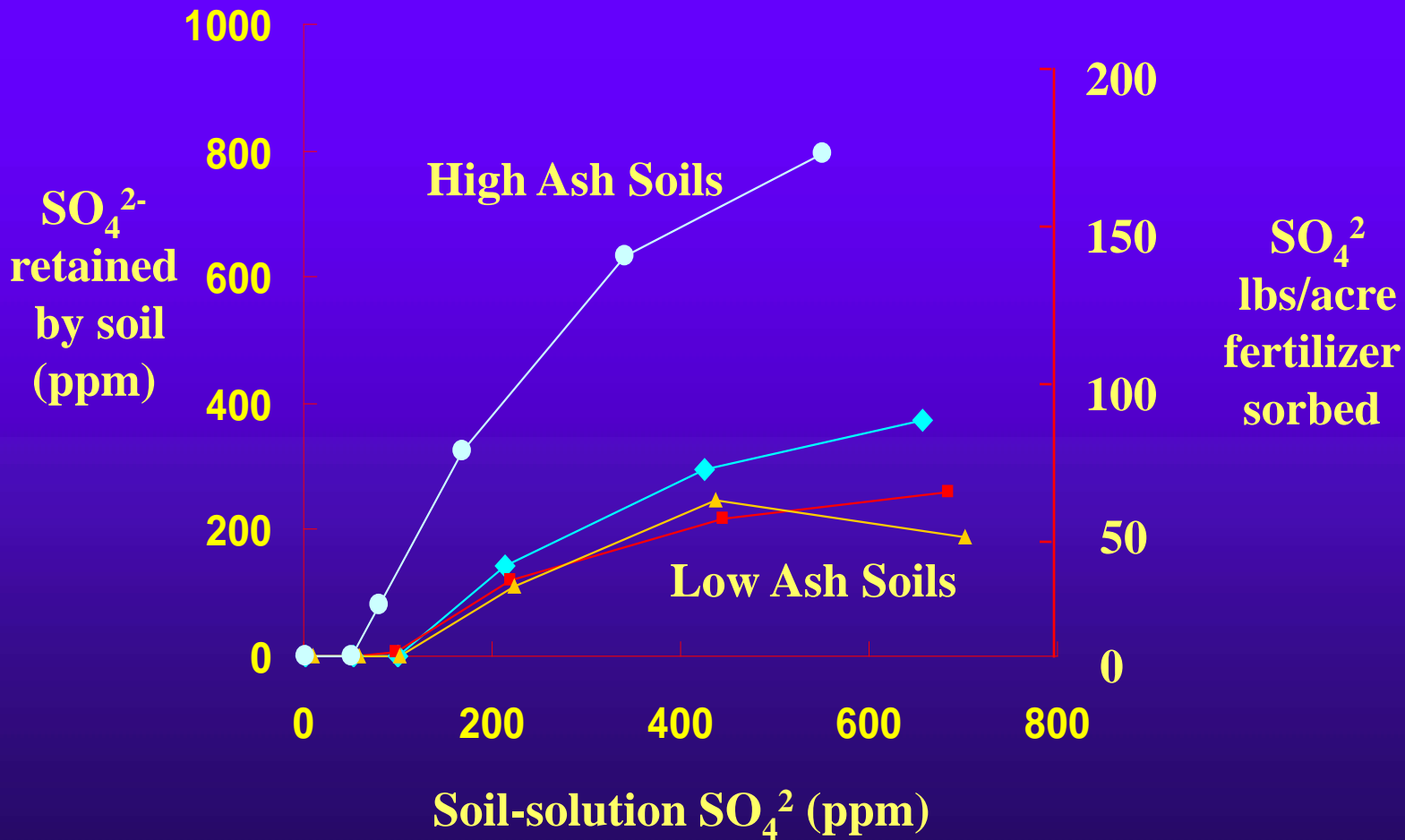
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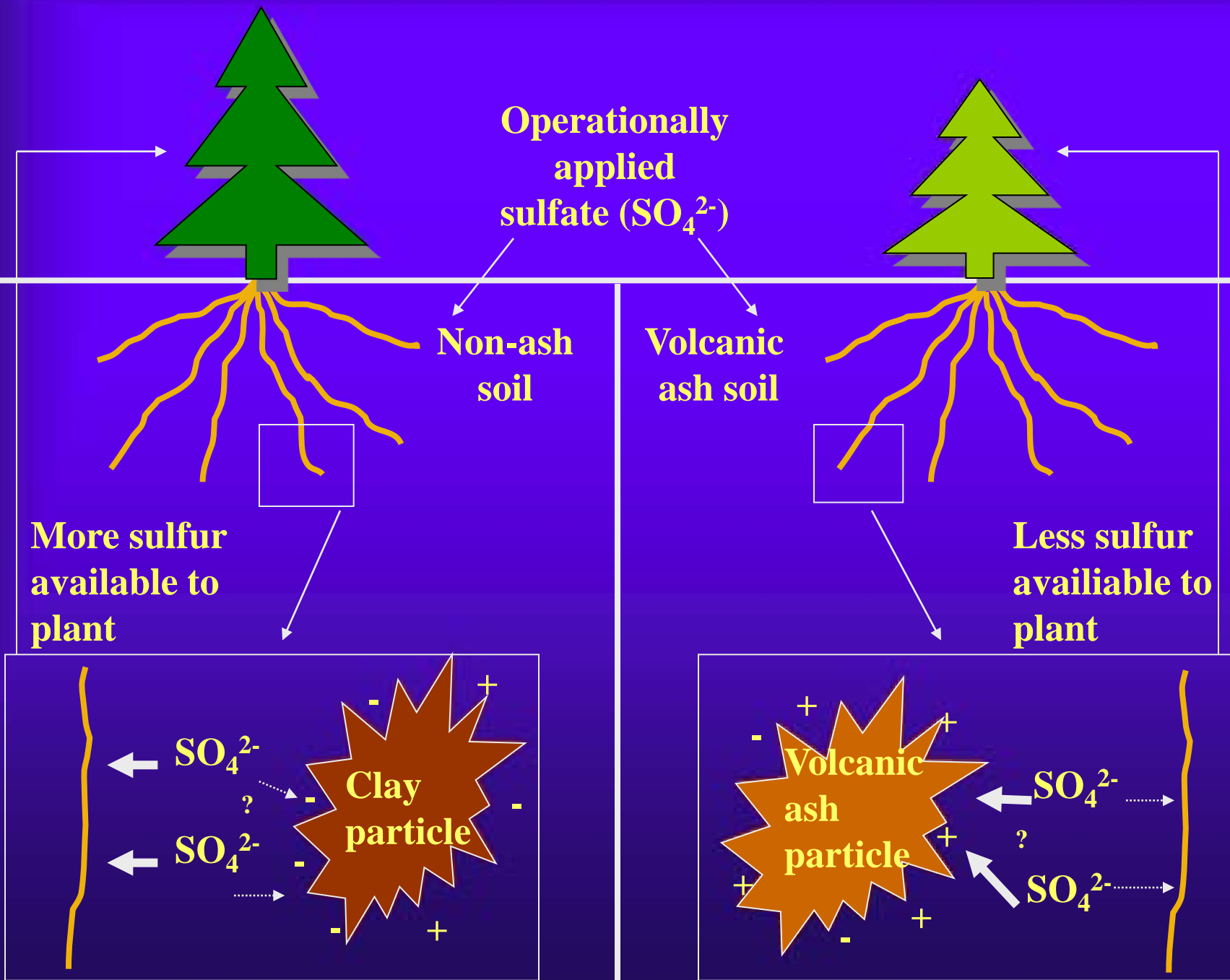


ASH INDUCED PO₄ DEFICIENCIES



ASH INDUCED SO₄ DEFICIENCIES?







STUDY IMPLICATIONS

- ❖ Obtain and determine the SO_4^{2-} sorption characteristics of a wide range of volcanic ash-influenced soils of Inland Northwest forests
- ❖ Determine the relationship between volcanic ash influence and SO_4^{2-} sorption
- ❖ Develop preliminary guidelines for SO_4^{2-} fertilization on andic soils of the region



THANK YOU



ANY QUESTIONS?