Assignment I

• Using only your knowledge tear two regions from the newsprint paper to adhere to the blue construction paper background: Meso/Central America (from Mexico to Panama) and South America. You may use pencil for a draft but the finished product should be in pen.

• Corrected Version due next class

• Label:
Names of group members, Title of map, Scale, Compass,

• Major geographical features:
Country boundaries, Country capitals, Mountain chains, Rivers, Lakes. Forests, Deserts, Important cities

• Other:
A political, economic, historical or cultural fact for each country

© T. M. Whitmore
Part I Class I

- Introduction
- Latin American Map: You set the foundations for the study of human-environment relations in Latin America.
- Course Syllabus: Course objectives, evaluation, and assignments
Part II Class I

• What is Geography?
• Latin American Diversity: Introduction

• Physical Geography of Latin America:
  A. Central/Meso-America
  B. South America
What is Geography?

• The study of phenomena relative to space, scale and place
  -this is the “lens” through which geographers study virtually any phenomena using a host of methods.

• The study of human-environment interactions
  -This is a core theme of geographical inquiry

• THESE SHOULD BE THE LENSES THROUGH WHICH YOU ORGANIZE INFORMATION IN THIS CLASS!!
Latin America Diversity I

• Great size, especially N-S (e.g. Chile)
• Topographic - land forms and elevation
• In many places diversity is very close spatially - many LA countries are quite diverse (e.g. Ecuador)
• Biotic diversity - from deserts to tropical rainforests.
Latin America Diversity II

- **Geographic diversity** - vast differences in size of countries, resource wealth, etc.
- **Economic diversity** - vast differences in wealth among and within countries
- **Pre-Columbian cultural diversity** - Amerindian cultures from empires to hunting-gathering bands
- **Diverse immigration experience** and resulting population patterns - Amerindians plus Africans (as slaves), Asians, and Europeans
Commonality: Roughly common historical and cultural experience - unites

• Roughly similar economic experience of Iberian colonialism
• Broadly similar language, religion, cultural values (but with important exceptions)
• Common physical environmental regions overlap multiple countries
Physical Geography in Latin America

• **Climate** (long term norms of weather) - temperature, precipitation, seasonality, etc.

• **Natural vegetation** - super diverse due to elevation, latitude, and precipitation

• **Soils** - great variation but with patterns

• **Land forms and elevation** - the latter is very important to climate and natural vegetation

• **THESE 4 INTERACT SYMBIOTICALLY**

• **HOW? AND HOW WITH SOCIETY?**
A. CENTRAL/MESO-AMERICA

1. Mexican drylands
2. Mesoamerican Highlands
3. Coastal Lowlands
Latin American Environmental Subregions:
I. Northern Mexican drylands

• ~ Mexico North of tropic of Cancer
• Climate - desert and steppe climate (Bw & Bs)
  ➤ very little precipitation
  ➤ wide seasonal temperature swings
• Vegetation: mostly arid adapted (except at elevation)
• Soils - variable
Climate:
Northern Mexican drylands

- Climographs (e.g., compare with San Francisco)
- Very little precipitation
  - Dry
  - And drier!
- Wide seasonal temp swings
- Examples
Northern Mexican drylands

• Vegetation: mostly arid adapted (except at elevation)
• Soils - quite variable
• Mountain and plateau land forms
  ➢ Sierra Madre (Oriental & Occidental)
Environmental Sub-region II: Middle American highlands

- **Land forms** - very complex & tectonic
- Soils - micro-variability
- Vegetation types vary with elevation
- Landscapes
Environmental Sub-regions II

Middle American highlands

- Climate - role of the “tropics” and elevation key to understanding
- Vegetation types vary with elevation
- Tropical seasonality of rainfall (summer)
- Example: Mexico City
Sub Region III: Middle American & Caribbean *lowlands*

- Land forms and soils
  - Limestone (karstic) & tectonic (volcanic)
Middle American & Caribbean lowlands

- **Climate** (Köppen class Aw & Af)
  - *tierra caliente* the hot and humid lands one thinks of as “tropical”
  - “high sun” precipitation - a tropical characteristic
  - *Hurricanes*
Middle American & Caribbean lowlands

- Vegetation - varies with windward/leeward slopes and rain “shadows”
  - “Rain forests”
  - Savannas
Elevated house (against floods) in Belize
Destination of UCSB students?
Latitude/Longitude = 37.45° N; 122.26° W
Average Annual Temperature (°C) = 13.75
Annual Temperature Range (°C) = 9
Total Annual Precipitation (mm) = 475
Summer Precipitation (mm) = 54
Winter Precipitation (mm) = 421
Arid Northern Mexico

Chihuahua, Mexico; 392 mm annual precipitation; 1418 m elevation;
SONORAN DESERT

Parker, AZ; Annual precipitation 9.1mm;

- Precipitation
- Temperature
1: Sierra Madre Occidental from Chihuahua
2: Sierra Madre Occidental: Copper Canyon
3: Sierra Madre Occidental (Sonora)
4: Coastal Plain looking E towards Sierra Madre Occidental
5: Sierra Madre Oriental (Coahuila- Nuevo Leon)
Xochicalco, Mexico
Black soils near Xela, Guatemala
Fields near Xela, Guatemala
Volcano near Antigua, Guatemala
Hurricane Mitch (1998) pounded the rimland of Honduras and Nicaragua, killing at least 10,000 people and leaving 2.5 million homeless.

Montserrat. Volcanic eruptions since 1995 have forced the evacuation of the inhabitants.

Barbados and Antigua. These small, low-lying islands with a volcanic base and a limestone overlay possess some of the region’s finest soils. Ideal for growing sugarcane, these islands emerged as early centers for the sugar-driven plantation economy that spread throughout the region.

Guiana Shield. The ancient, exposed rock surfaces of the Guiana Shield make very poor soils, thus limiting agriculture. The narrow coastal plain is where most of the commercial agriculture occurs.
Mexico City, Mexico; elevation 2,238 m; annual precipitation 1,062 mm
Middle American Lowlands

Veracruz, Mexico; annual precipitation 1557 mm; elevation 9 m
Hurricane season
Southern (rain shadowed) Dominican Republic
Orographic precipitation and drought on a Caribbean island.
5 Minute Break
B. SOUTH AMERICA

• I. Coastal deserts of South America
• II. Andean highlands
• III. Dry & Mediterranean lands of Southern Cone
• IV. Humid “temperate” southeastern SA
• V. Amazonia
I. Coastal deserts of South America

~ 3º S in Peru to ~ 30º S in Chile

- Climate is the main story here
  - Southern parts called the Atacama
  - Unlike most of world’s deserts that lie in bands ~ 30º N & S this runs from ~ 3º to 30º S
Coastal deserts of South America
~ 3º S in Peru to ~ 30º S in Chile

- Causes of aridity are complex but 2 major ones
  - Trade winds from SE blocked by Andes
  - Cold water coast due to S. Pacific gyre
  - Role of global climatic phenomena called the El Niño - Southern Oscillation
Coastal deserts of South America
3º S in Peru to ~ 30º S in Chile

• Vegetation
  – In places virtually none
  – Most are xerophytic (aridity adapted)

• Land forms
  – Andes near sea
  – narrow coastal plane - more like a ledge in N
    wider in S
  – Along tectonic plate edge => earthquakes
II. Andean highlands

- Landforms:
  - parallel mtn chains extending from Venezuela at 10º N to S tip of S.A. (Tierra del fuego at 50º S) - many > 6,000 meters (20,000') peaks

- Climate:
  - Varies with elevation!

- Vegetation:
  - varies with elevation and rainfall (aspect)
  - 2 distinctive eco-communities of note

- Soils:
  - many good volcanic andisols
Andean highlands

• **Landforms**
  – parallel mtn. chains extending from 10° N to 50° S
  – **Altiplano**
    • 3,000-4,000m elevation (11,000-13,000 ft)
    • Ancient culture core of the Inka (Inca)

• **Tectonic**: a classic “convergent plate boundary”
  – many > 6,000 meters (20,000') peaks
  – Mostly volcanic with some folded mtns.

• **Rivers**
  – Short intermittent in west
  – Large east-flowing
Andean highlands: Climate

- Köppen “H” (*highlands*) climate
  - Does not say much!
- Key here is *elevation*
  - Temp of 6°C/1000m (3°F/1000ft)
    - Annual vs diurnal temp range
- Wetter N; drier center; wetter S
Andean highlands: Climate

- More complex than elevation alone
  - Aspect
  - Relative relief
  - Terraces
  - Diurnal differences
Andean highlands

• Vegetation
  – varies with elevation and rainfall (aspect)
  – 2 distinctive eco-communities of note: páramo (tall grasses in Ecuador and Venezuela) and puna (short grasses mostly in Peru and Bolivia)

• Soils – many are good volcanics
III. Dry lands of the Southern Cone

• **Patagonia**
  – leeward rain shadow; *little precip* (Bs or Bw); seasonal temp swing; step-like plateaux with very steep canyons and spectacular mtns; very windy

• **Chaco and Eastern Andes piedmont**
  – sloping plains and piedmonts, grasslands with scrub
NATURAL VEGETATION REGIONS OF THE WORLD

Based on maps of S.R. Eyre, 1968

KEY TO MAP COLORS:
- Low-latitude rainforests
  - Fe, Fmt
- Subtropical evergreen forests
  - Fbe, Fsp
- Midlatitude deciduous forest
  - Fd
- Coastal forest
  - Fc
- Cold needleleaf forests
  - Fbo, Fbd, Fbl, Fl
- Sclerophyllous vegetation
  - Fsm, Fss, Fsa, Ssa
- Tropical rainforest
  - Fmo, Sw, Stg
- Tall-grass prairie
  - Gp
- Short-grass prairie (steppe)
  - Gs
- Semidesert
  - Dtw, Dtg, Dsd
- Desert shrub and desert
  - Dss, Dsp, D
- Tundra
  - T
- Alpine tundra with boreal forest
  - Ta
- Ice Sheet

© John Wiley & Sons
IV. Humid temperate South America

• **Landforms**— famous location of Pampas
  – plains and low sloping uplands

• **Climate:**
  – *moderate seasonal temp swing; little seasonal precip difference*

• **Vegetation**
  – not a forest landscape but tall grasses

• **Soils**
  – superior soils (mollisols) on Pampas with great stored natural fertility
SOILS OF THE WORLD

U.S. Comprehensive Soil Classification System.
Based on data of Soil Conservation Service,
U.S. Dept. of Agriculture.

KEY TO MAP COLORS:

S  Spodosols (with related Histosols, H)
   A  Alfisols
      A1  Boralfs (with related Histosols, H)
      A2  Udalfs (with related Inceptisols, I, and Entisols, E)
      A3  Ustalfs (with related Inceptisols, I, and Entisols, E)
      A4  Xeralfs (with related Entisols, E)
      U  Ultisols (with related Inceptisols, I, and Entisols, E)
      O  Oxisols (with related Inceptisols, I, and Entisols, E)
      V  Vertisols
      M  Mollisols (with related Entisols, E, and Inceptisols, I)

For complete map legend see Plate D.7.

© John Wiley & Sons
Mollisol
V. Amazonia & central lowland South America

• **Landforms**
  – “highlands”
  – vast low lying river basins

• **Climates**
  – Equatorial:
    • Af – warm & wet constantly Tropical
  – Aw – warm with seasonal rain
Amazonia & central lowland S. Am.

- Wet-dry tropical vegetation: open forests & savannas
- Equatorial rainforests
Equatorial rainforests

- Richest terrestrial biome on earth
- > 1 million higher plant and animal species (10 – 20% of world’s total); even more if micro fauna and flora and insects added
- Very diverse (>60 different species of large trees in 1 ha); > 600 total species/ha
  - Diversity => relative scarcity of any particular species in any area
- highest total of biomass per ha on earth
Equatorial rainforests Cont.

- **Broadleaved** trees in multi-story canopy

- Rapid “recycling” of plant nutrients
  - Warm temps and much rain => “leaching” of nutrients from soils
    (many of these are among the world’s worst)
Nutrient flows in forests

- Rain
- Solar energy
- Biomass storage
- Litter decomposition
- Top soil storage
- N₂ fixation
- Sub soil storage
- Leaching
- Runoff
- Root decomposition
Amazonian Soils

- *Terra firme soils* in Amazonia
  - ancient “shield” rocks
  - Rapid nutrient recycling
  - Called “oxisols” or “ultisols”

- **Alluvial soils** based on silt deposited along river flood plains of Amazon and its tributaries
  - White water rivers
  - Várzea
Amazonian Soils II

• Anthropogenic soils
  – Raised fields
  – *Terra preta do Indio* soils
Soils and fertility

- 4 major parts to soils
  - organic matter (partly decomposed = **humus**)
  - inorganic matter — sand, silt, and clay
  - moisture
  - air
Soils and fertility II

- Major **plant nutrients**
  - Solar energy
  - From air: CO₂
  - From water: hydrogen (H); oxygen (O);
  - From soils (and fertilizers): phosphorus (P); nitrogen (N); and potassium (K)
Soil nutrients

• Must be dissolved for roots to absorb

• Available to plants only in the form of cations (+ charge) and anions (- charge) (in solution)
Soil nutrients

- Most important nutrients are:
  - Nitrogen (N)
  - Potassium (K)
  - Phosphorus (P)
  - Plus about 10 micro-nutrients

- Importance of clay and humus (serve as sites to which cations and anions attach)

- Note role of nitrogen-fixing bacteria
Cation Exchange Capacity CEC

- Measure of ability of a soil to retain and exchange nutrient cations
- CEC associated with some clays and humus
- Storage of basic cations defines fertile soils
- Aluminum is especially toxic and found in acidic soils

THE END OF CLASS 1
COASTAL DESERT OF SOUTH AMERICA

Lima, Peru; annual precipitation 10 mm; elevation 11 m
Ecuador
Áltiplano (~ 14,000’ with Puná) near Tarma in C. Peru
Classic Convergent Plate Collision
Andes
Dry Southern Cone

Sarmiento, Argentina; elevation 266 m; annual precipitation 153 mm; ~ 45° S

Graph showing precipitation and temperature over the year.
New York City (~ 40° N)

Precipitation
Temperature

New York; elevation 40 m; annual precipitation = 1062 mm
Temperate East Coast of South America

Montevideo, Uruguay; elevation 25 m; annual precipitation 980 mm
Latitude/Longitude = 37.45° N; 122.26° W
Average Annual Temperature (°C) = 13.75
Annual Temperature Range (°C) = 9
Total Annual Precipitation (mm) = 475
Summer Precipitation (mm) = 54
Winter Precipitation (mm) = 421
NATURAL VEGETATION REGIONS OF THE WORLD

Based on maps of S.R. Eyre, 1968

KEY TO MAP COLORS:
- Low-latitude rainforests: Fe,Fmt
- Subtropical evergreen forests: Fbe,Fsp
- Midlatitude deciduous forest: Fd
- Coastal forest: Fc
- Cold needleleaf forests: Fbo,Fbd,Fbl,Fl
- Sclerophyllous vegetation: Fsm,Fss,Fsa,Ssa
- Tropical rainforest vegetation: Fmo,Sw,Stg
- Tall-grass prairie: Gp
- Short-grass prairie (steppe): Gs
- Semidesert: Dtw,Dtg,Dsd
- Desert shrub and desert: Dss,Dsp,D
- Tundra: T
- Alpine tundra with boreal forest: Ta
- Ice Sheet

© John Wiley & Sons
Amazon Basin

Iquitos, Peru; elevation 104 m; annual precipitation 2,845 mm
Tropical wet–dry

Corumbá, Brazil;
elevation 116 m;
annual precipitation 1,252 mm
NATURAL VEGETATION REGIONS OF THE WORLD
Based on maps of S.R. Eyre, 1968

KEY TO MAP COLORS:
- Low-latitude rainforests
  Fe,Fmt
- Subtropical evergreen forests
  Fbe,Fsp
- Midlatitude deciduous forest
  Fd
- Coastal forest
  Fc
- Cold needleleaf forests
  Fbo,Fbd,Fbl,Fl
- Sclerophyllous vegetation
  Fsm,Fss,Fsa,ssa
- Tropical rainforest vegetation
  Fmo,Sw,Stg
- Tall-grass prairie
  Gp
- Short-grass prairie (steppe)
  Gs
- Semidesert
  Dtw,Dtg,Dsd
- Desert shrub and desert
  Dss,Dsp,D
- Tundra
  T
- Alpine tundra with boreal forest
  Ta
- Ice Sheet

© John Wiley & Sons
Amazon meeting the Río Negro
5. Vegetation structure in various ecological zones. (Chapter 7).
SOILS OF THE WORLD
U.S. Comprehensive Soil Classification System.
Based on data of Soil Conservation Service,
U.S. Dept. of Agriculture.

KEY TO MAP COLORS:

- S Spodosols (with related Histosols, H)
- A Alfisols
  - A1 Boralfs (with related Histosols, H)
  - A2 Udalfs (with related Inceptisols, I, and Entisols, E)
  - A3 Ustalfs (with related Inceptisols, I, and Entisols, E)
  - A4 Xeralfs (with related Entisols, E)
- U Ultisols (with related Inceptisols, I, and Entisols, E)
- O Oxisols (with related Inceptisols, I, and Entisols, E)
- D Aridisols (with related Entisols, E, and Inceptisols, I)
Global Distribution of Oxisols

AREA: 9.81 million km²

% GLOBAL: 7.5
Global Distribution of Ultisols

AREA: 11.05 million km²
% GLOBAL: 8.45
Ultisol

Oxisol

(this soil is from NC)
Cleared swidden surrounded by 1 yr re-growth, N. Belize
Terraces in Colca Valley, Peru
Terraces neat Tarma, Peru
Terraces at Pisac, Peru
La Paz, Bolivia; elevation 4,105 m; annual precipitation 564 mm

**Diurnal** temp range ~ 15° C (~ 30° F)

**Annual** temp range ~ 6° C
Quiz 1

1) Name the primary physical geographical regions of Meso/Central America and South America.

2) Name 1 climate, 1 soil, 1 vegetation, and 1 topographical feature for each of these regions.

3) How do we depend on soils for food?