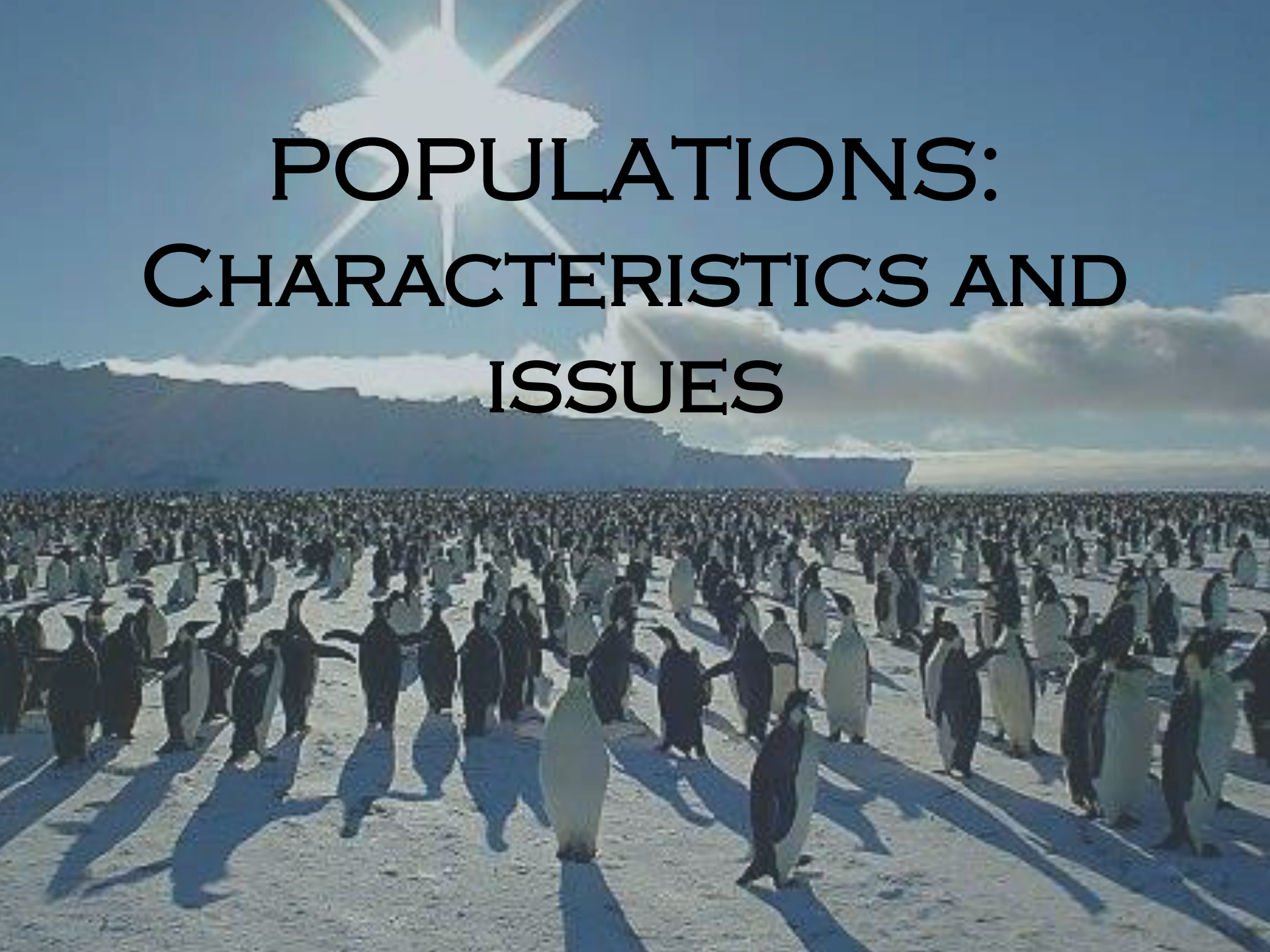


POPULATIONS: CHARACTERISTICS AND ISSUES



INVASIVE SPECIES

- ✦ ALMOST ALL NON-NATIVE (EXOTIC) SPECIES LACK NATURAL PREDATORS OR DISEASE-CAUSING ORGANISMS SO DON'T HAVE THE SAME "CHECKS" AS OTHER SPECIES.
- ✦ MOST ARE GENERALISTS
- ✦ GROW AND MATURE RAPIDLY, PRODUCE MANY OFFSPRING, MANY OFFSPRING SURVIVE
- ✦ VERY EFFECTIVE DISPERSAL MECHANISMS
- ✦ SUCCESSFULLY OUTCOMPETE NATIVE SPECIES



TWO SCENES IN ANZA BORREGO



Without Sahara Mustard



With Sahara Mustard

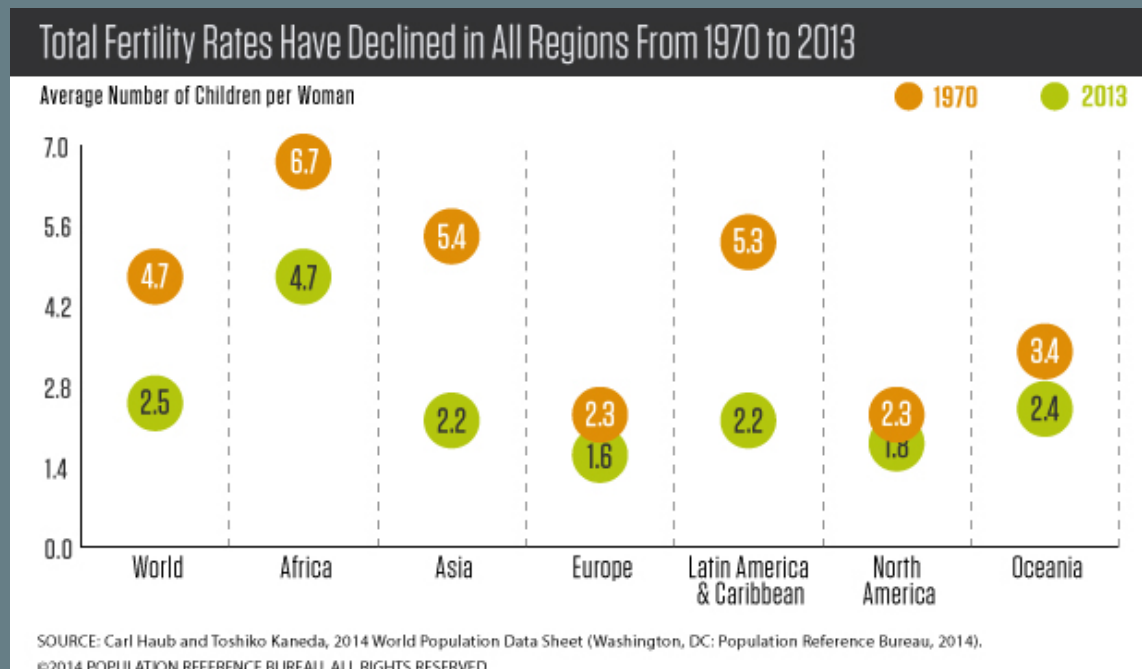
BIRTH AND DEATH RATES

✦ MORTALITY = DEATH RATE

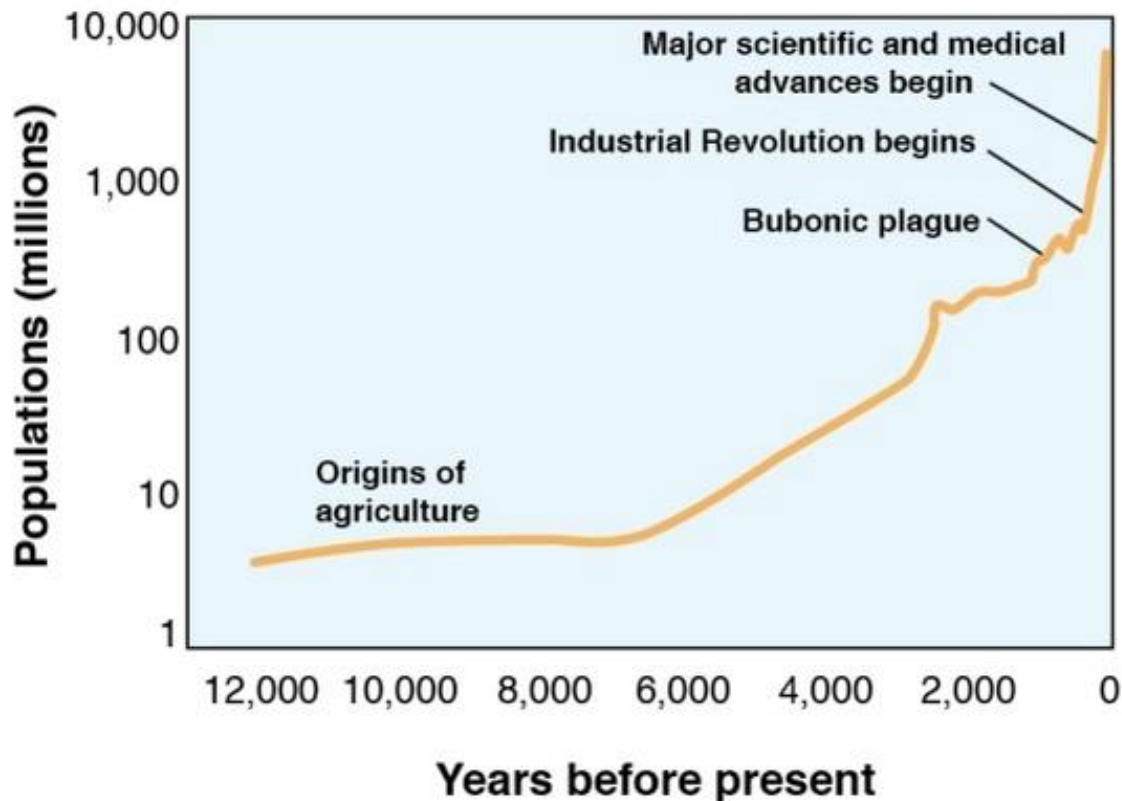
- USUALLY USE “DEATH RATE” FOR HUMANS AND AS # OF PEOPLE WHO DIE PER 1 000.

✦ NATALITY = BIRTH RATE (NUMBER OF INDIVIDUALS ADDED TO A POPULATION THROUGH EITHER ASEXUAL OR SEXUAL REPRODUCTION)

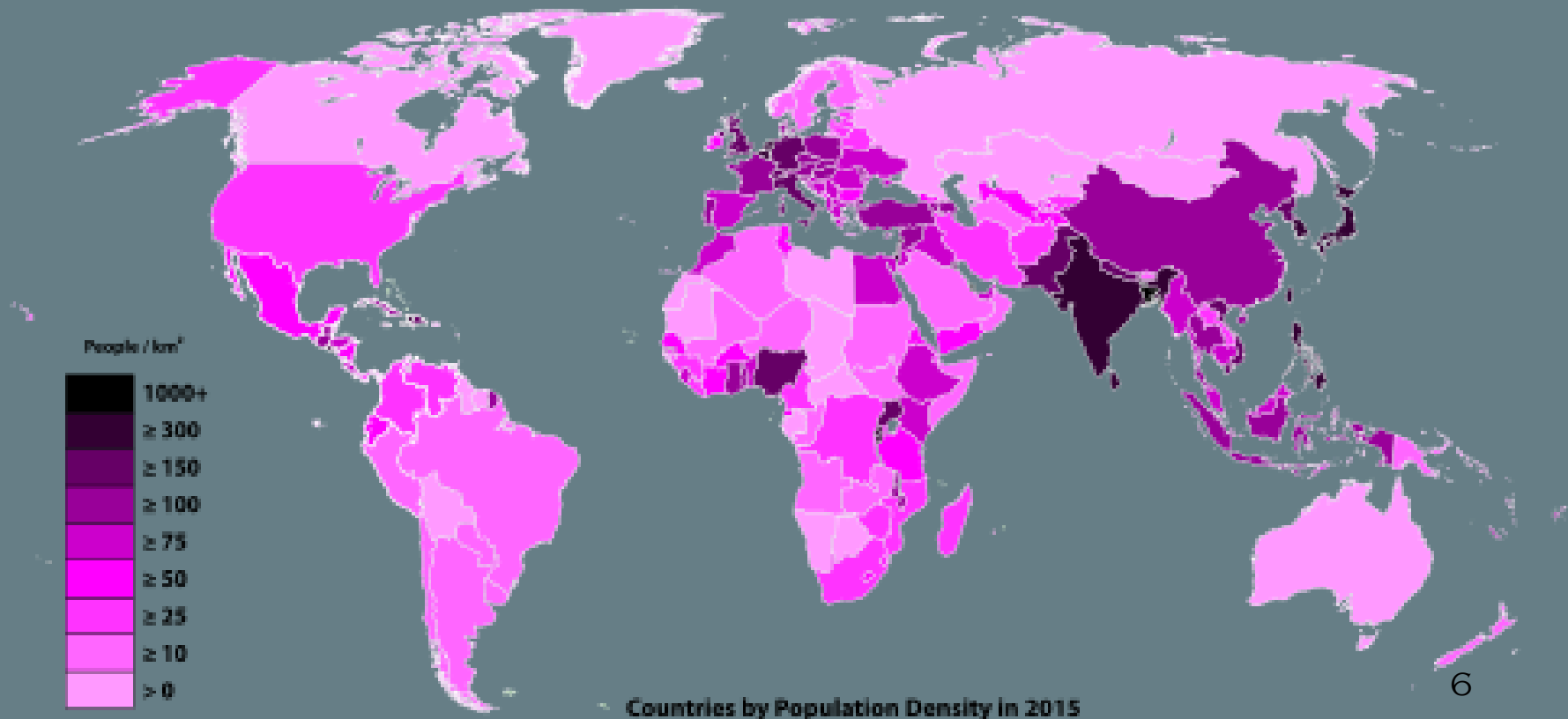
- USUALLY USE “BIRTH RATE” FOR HUMANS AND IT’S USUALLY GIVEN AS # PER 1 000.

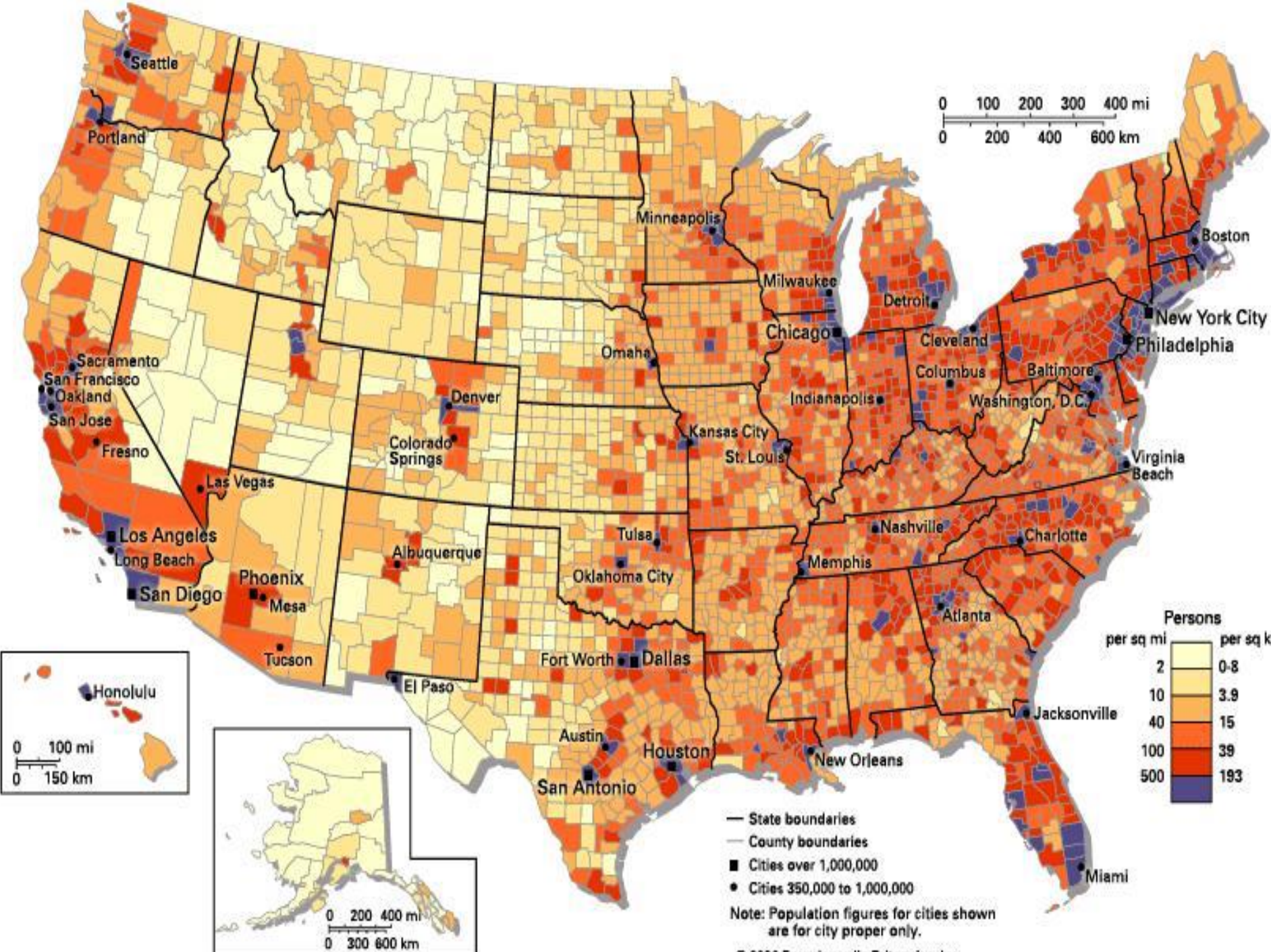


POPULATION SIZE: THE NUMBER OF INDIVIDUAL ORGANISMS PRESENT AT A GIVEN TIME

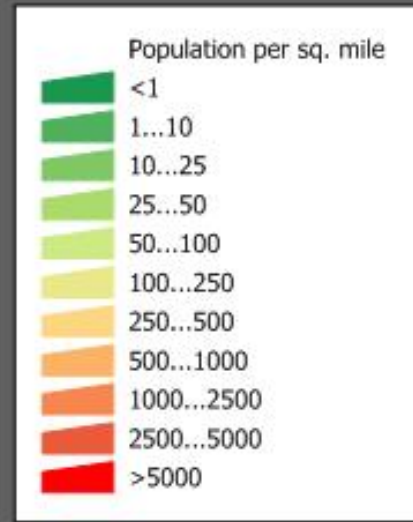


POPULATION DENSITY THE NUMBER OF INDIVIDUAL ORGANISMS PER UNIT AREA OF A GIVEN POPULATION

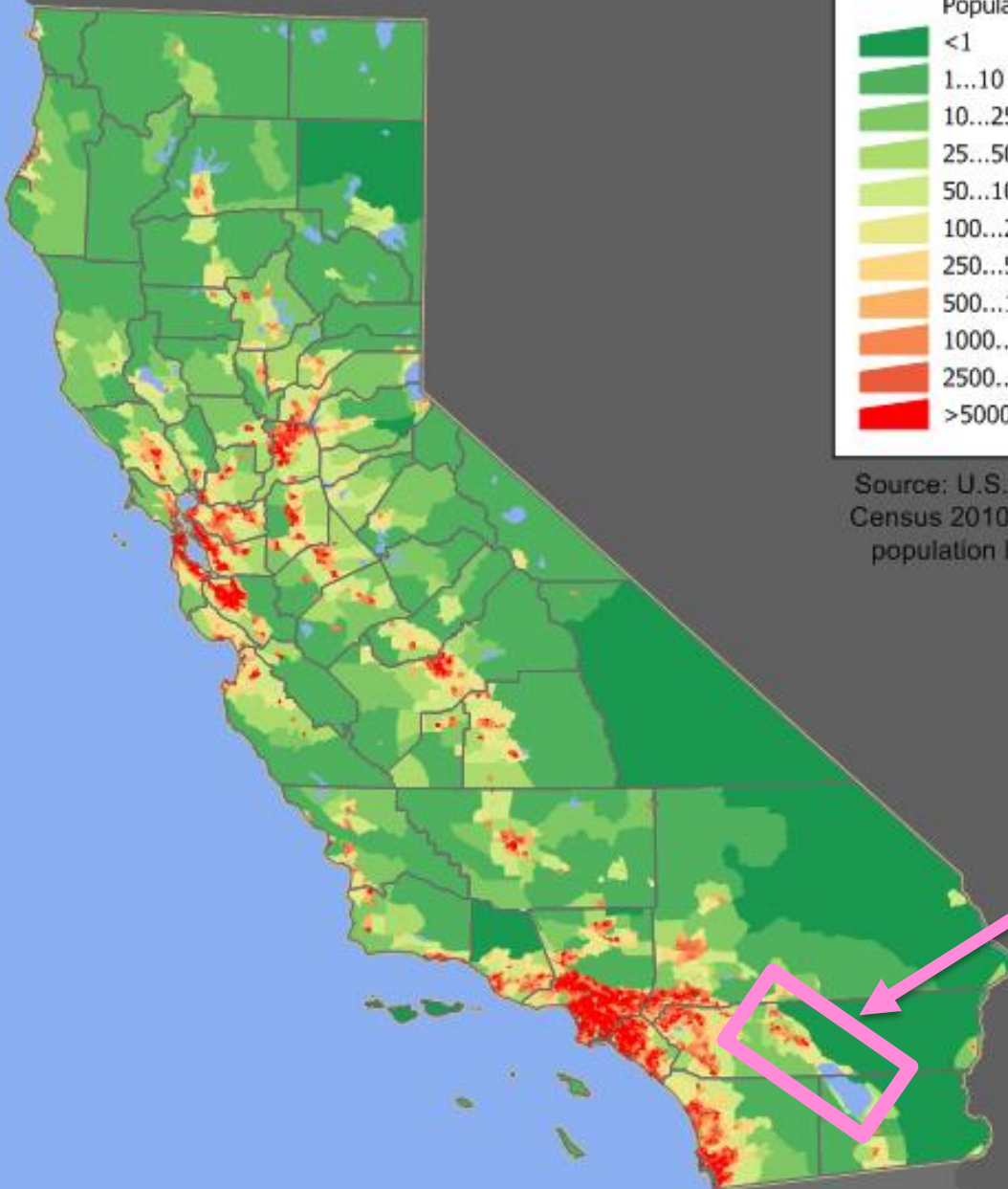




POPULATION DENSITY OF CALIFORNIA



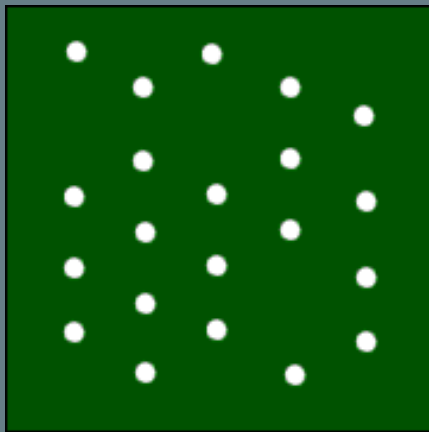
Source: U.S. Census Bureau
Census 2010 Summary File 1
population by census tract



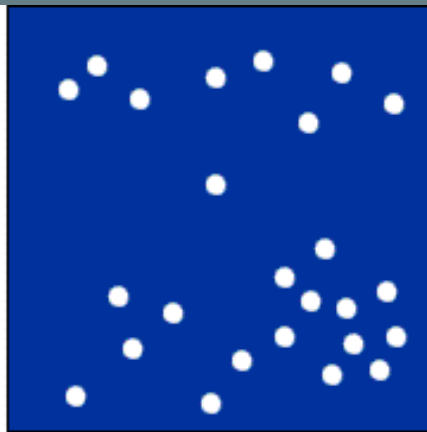
COACHELLA
VALLEY

POPULATION DISTRIBUTION

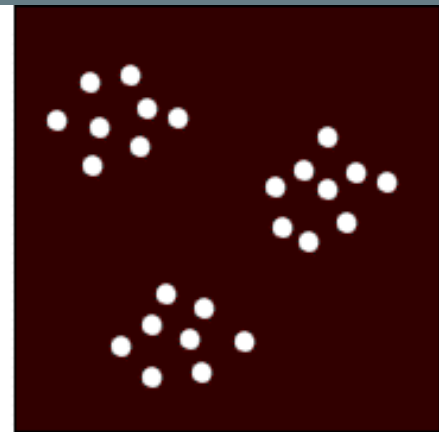
THE SPATIAL ARRANGEMENT
OF ORGANISMS IN AN AREA.



nearly
uniform



random



clumped

Where do we live?
Where don't we live?



POPULATION DISTRIBUTION

THE SPATIAL ARRANGEMENT OF ORGANISMS IN AN AREA.

The population of the United States is not distributed evenly. Instead, we tend to bunch up in communities, leaving the spaces in between more sparsely inhabited. Most Americans live in or near cities; today 53 percent live in the 20 largest cities. 75 percent of all Americans live in metropolitan areas.

This map shows population density. The relative height of each major city reflects its population in 1990.

Source: U.S. Census Bureau

Go West. Nevada is the fastest growing state, followed by Arizona, Idaho, Colorado, and Utah.

Wyoming has the lowest population density of all states in the lower 48 with an average of five people per square mile.

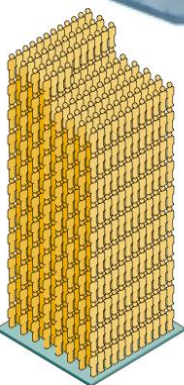
What happens in the empty spaces? Some of it is farming country. More than one quarter of America's crop land is used to grow corn. One third of what is produced is exported to other countries.

Chicago, the country's third largest city, has a population of about three million people. There are 21 states with populations smaller than this city.

Largest metropolitan area includes New York City and Long Island with a total population of 20 million.

Population density is highest in New York City, where there are 23,000 people per square mile.

Approximately one in nine Americans lives in the nation's most populous state—California. More than 15 million people live in the Los Angeles, Riverside, and Orange County metropolitan area.



Distributing our population evenly would put an average of 76 people per square mile.

New Jersey is the most densely populated state with an average of more than 1,000 people per square mile.

Alaska is a sparsely populated state with an average of one person per square mile.

Wet. Some states are full of water. For example, Louisiana includes more than 8,000 square miles of lakes and wetlands. That's an area bigger than Connecticut and Rhode Island combined.

Coastal areas are home to more than half the U.S. population.

POPULATION CHANGE

- ✦ THE FOLLOWING TERMS ARE USED BY POPULATION ECOLOGISTS TO DESCRIBE THESE GROWTHS AND DECLINES WITHIN A POPULATION
 - ✦ NATALITY: BIRTHS WITHIN THE POPULATION
 - ✦ MORTALITY: DEATHS WITHIN THE POPULATION
 - ✦ IMMIGRATION: ARRIVAL OF INDIVIDUALS FROM OUTSIDE THE POPULATION
 - ✦ EMIGRATION: DEPARTURE OF INDIVIDUALS FROM THE POPULATION

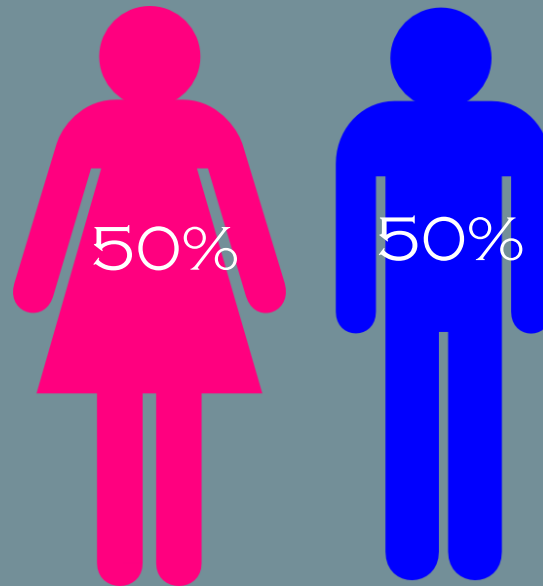
MORE TERMS

★ SEX RATIO: PROPORTION OF MALE TO FEMALE IN A GIVEN POPULATION.

★ AGE STRUCTURE: RELATIVE NUMBER OF INDIVIDUALS OF DIFFERENT AGES WITHIN A POPULATION.

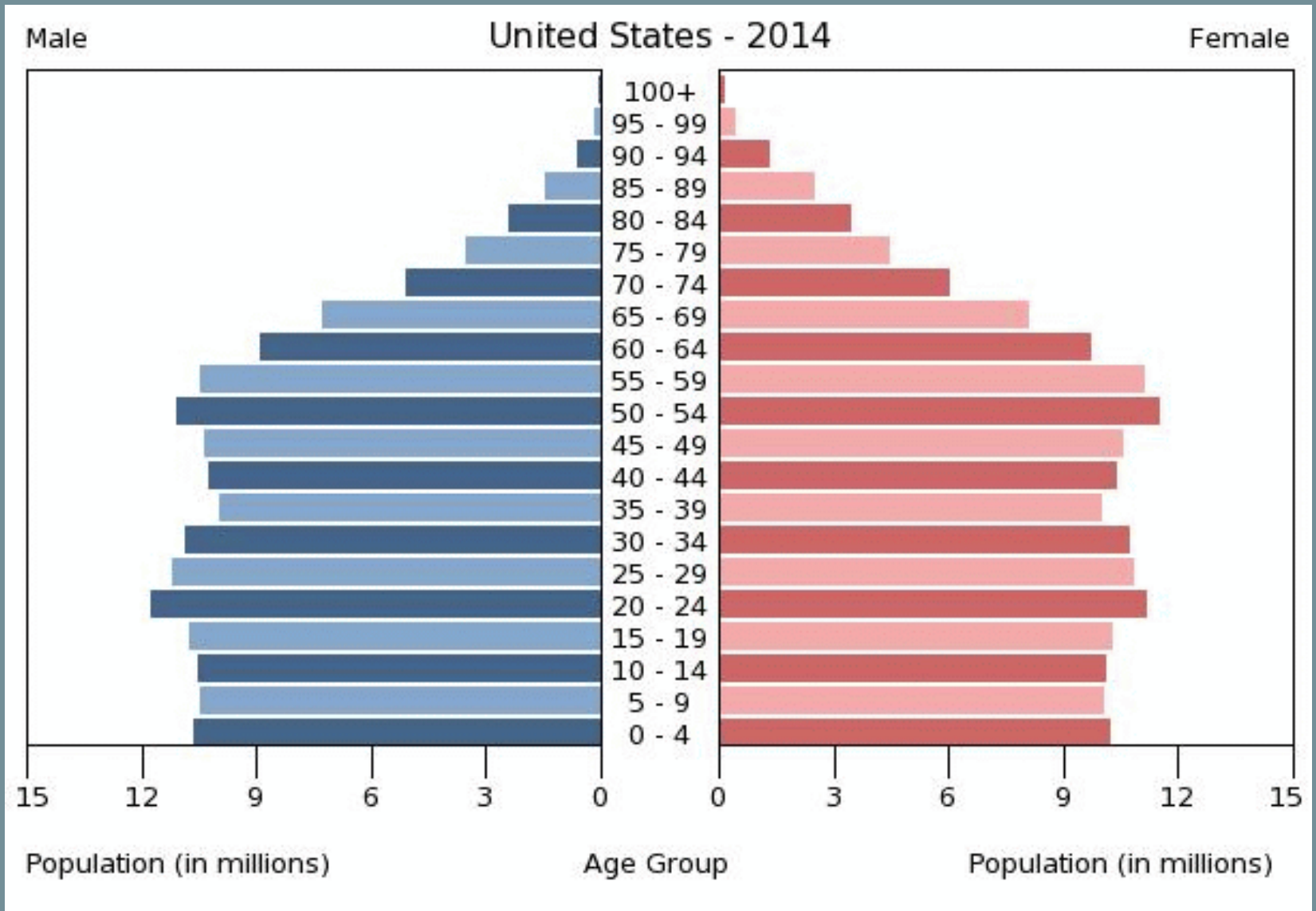
SEX RATIO

IN MONOGAMOUS SPECIES THE OPTIMAL RATIO FOR A POPULATION IS 1:1



HOWEVER, MOST SPECIES ARE NOT MONOGAMOUS

AGE STRUCTURE



POPULATION GROWTH EQUATION

THE OVERALL GROWTH OF A
POPULATION IS SUMMARIZED BY THE
FOLLOWING EQUATION:

$$\text{Growth rate} = \left(\begin{array}{c} \text{Birth rate} \\ + \\ \text{Immigration} \\ \text{rate} \end{array} \right) - \left(\begin{array}{c} \text{Death rate} \\ + \\ \text{Emigration} \\ \text{rate} \end{array} \right)$$

BIOTIC POTENTIAL

✦ BIOTIC POTENTIAL IS THE ABILITY OF AN ORGANISM TO PRODUCE OFFSPRING; OR THE POTENTIAL FOR LIFE, THE DRIVE TO REPRODUCE



BIOTIC POTENTIAL OF THE COMMON HOUSE FLY

- ✦ LET'S TAKE A LOOK AT THE COMMON HOUSE FLY.
- ✦ EACH FEMALE FLY CAN LAY 120 EGGS IN A GENERATION (HALF OF THOSE EGGS WILL BE FEMALE)
- ✦ IT TAKES 56 DAYS FOR THE EGGS TO GROW INTO MATURE, REPRODUCTIVE ADULTS
- ✦ SO IN ONE YEAR, THERE ARE ABOUT 7 GENERATIONS OF FLIES BEING BORN AND REPRODUCING!



HOUSE FLY EXAMPLE CONTINUED

✦ WHEN YOU CALCULATE AND ADD IT ALL UP...

✦ THAT ONE FEMALE HOUSE FLY WOULD BE THE PARENT OF 56 TRILLION OFFSPRING IN 1 YEAR!!!



✦ IF THIS RATE OF REPRODUCTION (BIOTIC POTENTIAL) CONTINUED UNRESTRICTED FOR 10 YEARS, THE EARTH WOULD BE COVERED IN SEVERAL METERS OF HOUSE FLY BODIES.

POPULATION GROWTH GRAPHS

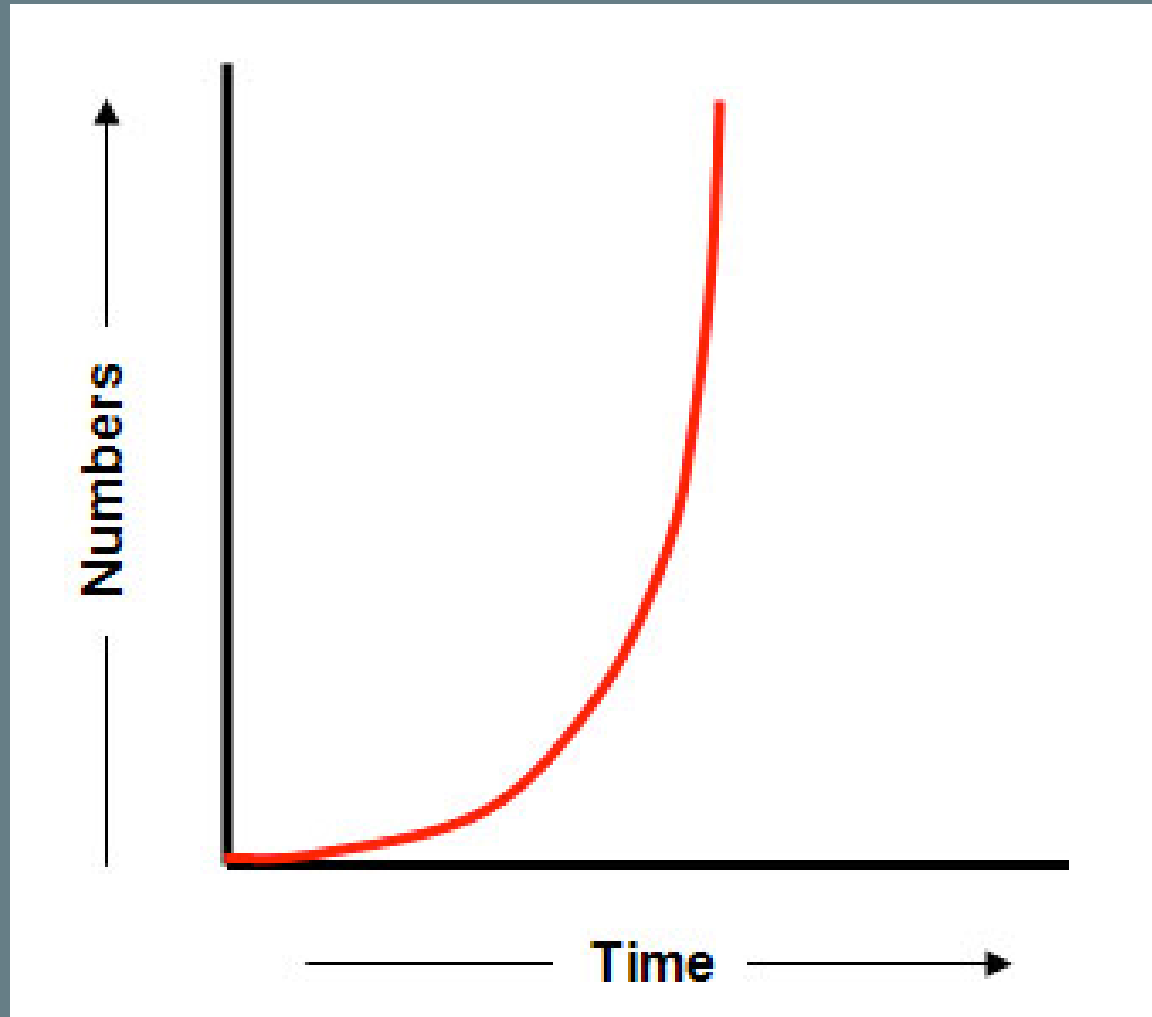
- ✦ WE WILL BE LOOKING AT A FEW GRAPHS OVER THE NEXT SEVERAL SLIDES.
- ✦ YOU NEED TO UNDERSTAND THESE GRAPHS, BE FAMILIAR WITH THEM (ABLE TO RE-CREATE THEM ON YOUR OWN), AND KNOW/UNDERSTAND ALL THE COMPONENTS THAT GO INTO EACH OF THE GRAPHS.

POPULATION GROWTH GRAPHS: THE “J” CURVE

J-CURVE

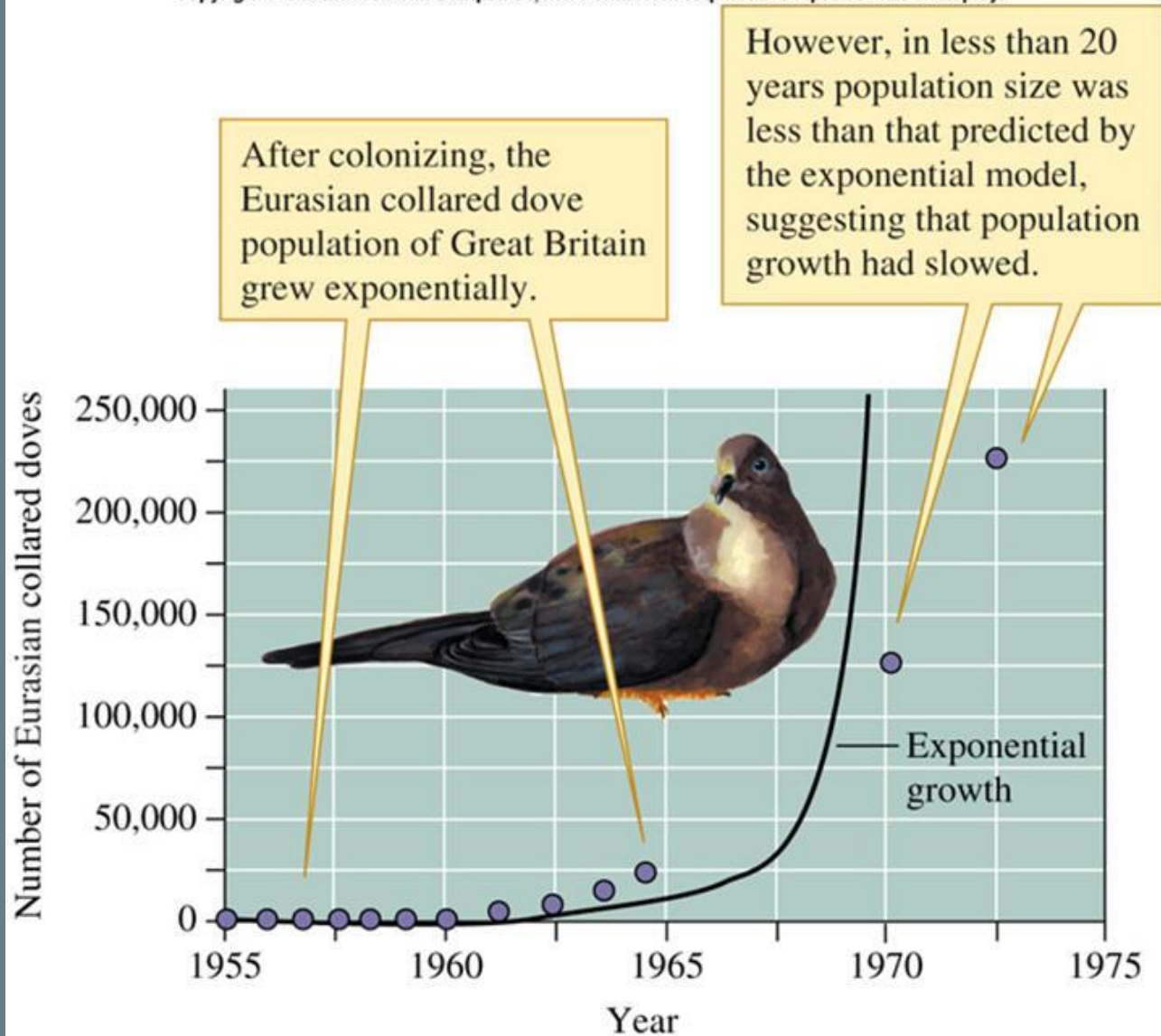
- ✦ THIS UNRESTRICTED GROWTH IN OUR FLY EXAMPLE IS EXPONENTIAL.
- ✦ EVERY ORGANISM HAS THE POTENTIAL FOR EXPONENTIAL GROWTH, IF LEFT UNRESTRICTED
- ✦ IF WE WERE TO GRAPH THIS TYPE OF GROWTH, YOU WOULD HAVE A GRAPH WITH A CURVE THAT LOOKS LIKE THE LETTER “J”

BASIC J-CURVE GRAPH



EURASIAN COLLARED DOVE

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EVIDENCE OF EXPONENTIAL GROWTH

- ✦ HERE IN THE DESERT
- ✦ CONSIDER A GATED COUNTRY CLUB. THE WALLED BARRIER KEEPS OUT LARGE PREDATORS (EG. COYOTE)
- ✦ WITHOUT COYOTES (A RESTRICTION FOR THE BIOTIC POTENTIAL OF RABBITS) - RABBITS' POP. GROWTH TENDS TOWARD EXPONENTIAL GROWTH.
- ✦ BEFORE LONG, PEOPLE ARE COMPLAINING ABOUT TOO MANY RABBITS EATING THEIR GARDENS.

