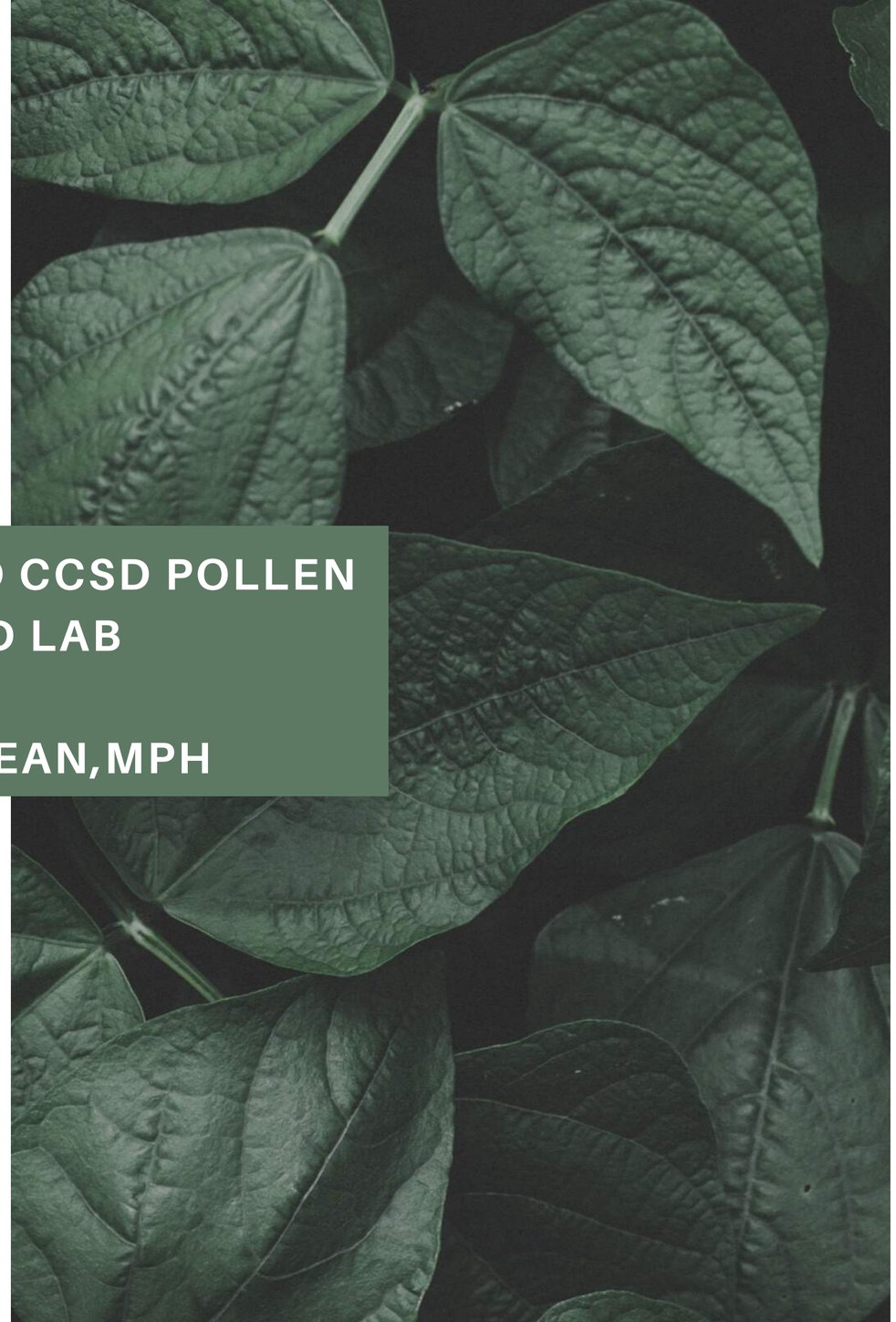


UNLV AND CCSD POLLEN AND MOLD LAB

JOSEPH JEAN,MPH

# Pollen Introduction and Urban Green Spaces: Environmental and Health Impacts

# What is Pollen?

## OVERVIEW

A mass of microspores in a seed plant appearing usually as a fine dust that is transported by various means

## CHARACTERISTICS

- Large in quantity
- Small in size
- Diverse in shape and make-up

## VARIATION IN POLLINATION MODE (TRANSPORTATION)

- Anemophilous – spread by the wind
- Entomophilous – spread by insects
- Amphiphilous – spread by wind & insects

# Health Impacts

## ALLERGENIC SOURCES

- Trees, grass, and shrubs utilized in UGS can act as sources of pollen
  - NAB Pollen Monitoring sites; 84 in the US (AAAI, 2020)
    - Surveillance of pollen seasons
    - Mulberry and Ragweed highly Allergenic

## SEASONAL ALLERGIC RHINITIS

- 50 million Americans effected (National Geographic, 2018).
  - Short Term - sneezing, inflammation, congestion (Skoner, 2001).
  - Long term - Hyperresponsivness to other triggers (Skoner, 2001).
    - Triggers - smoke, noxious odors, temperatures, or exercise
    - Outside of Seaonal Pollination
- Impacts quality of life (Laforest et al., 2001)

## ALLERGIC ASTHMA

- Seasonal allergic rhinitis can lead to increased chances of developing Asthma (Mayo Clinic, 2018).

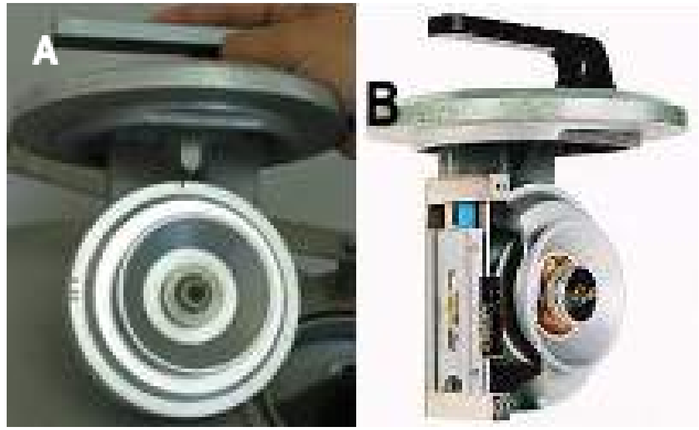
# THE UNLV AND CCSD POLLEN AND MOLD MONITORING PROGRAM

- Program Purpose
  - Prevention
    - Pollen Forecasting
- Intervention
  - Avoid/reduce exposure
  - Allergy medicine
- Education

# AIR SAMPLERS

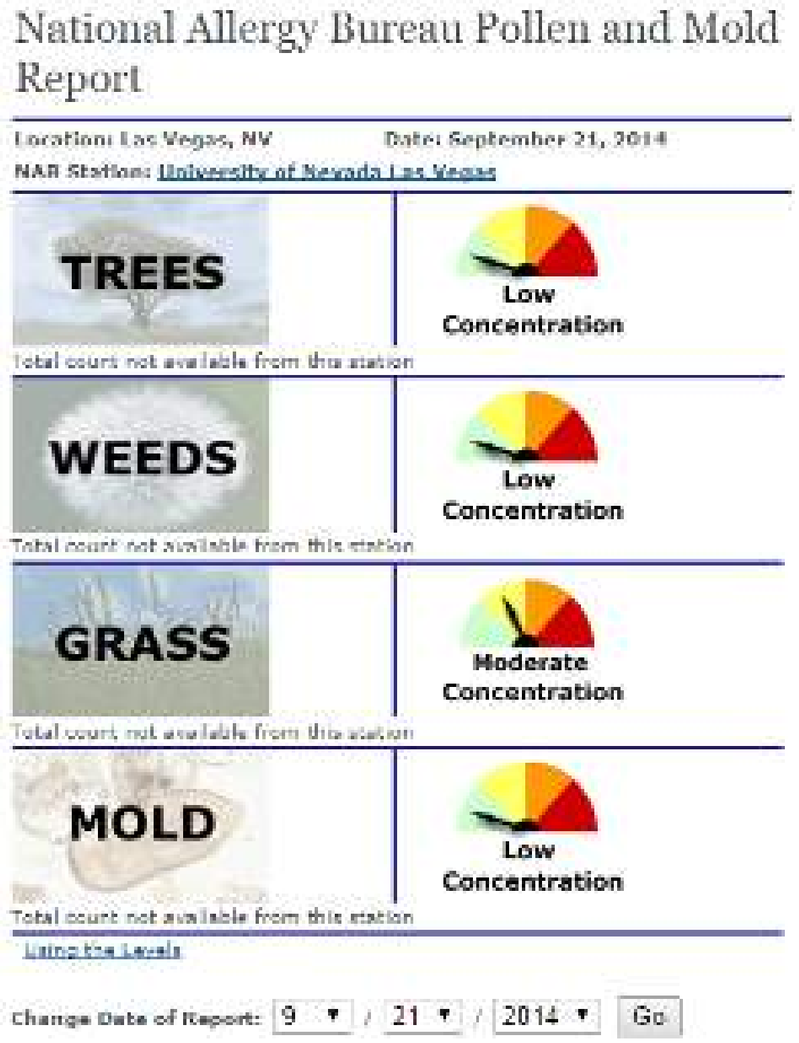
- Burkard recording volumetric spore trap
  - Impaction sampler
  - Efficient for pollen and smaller spores (mold)

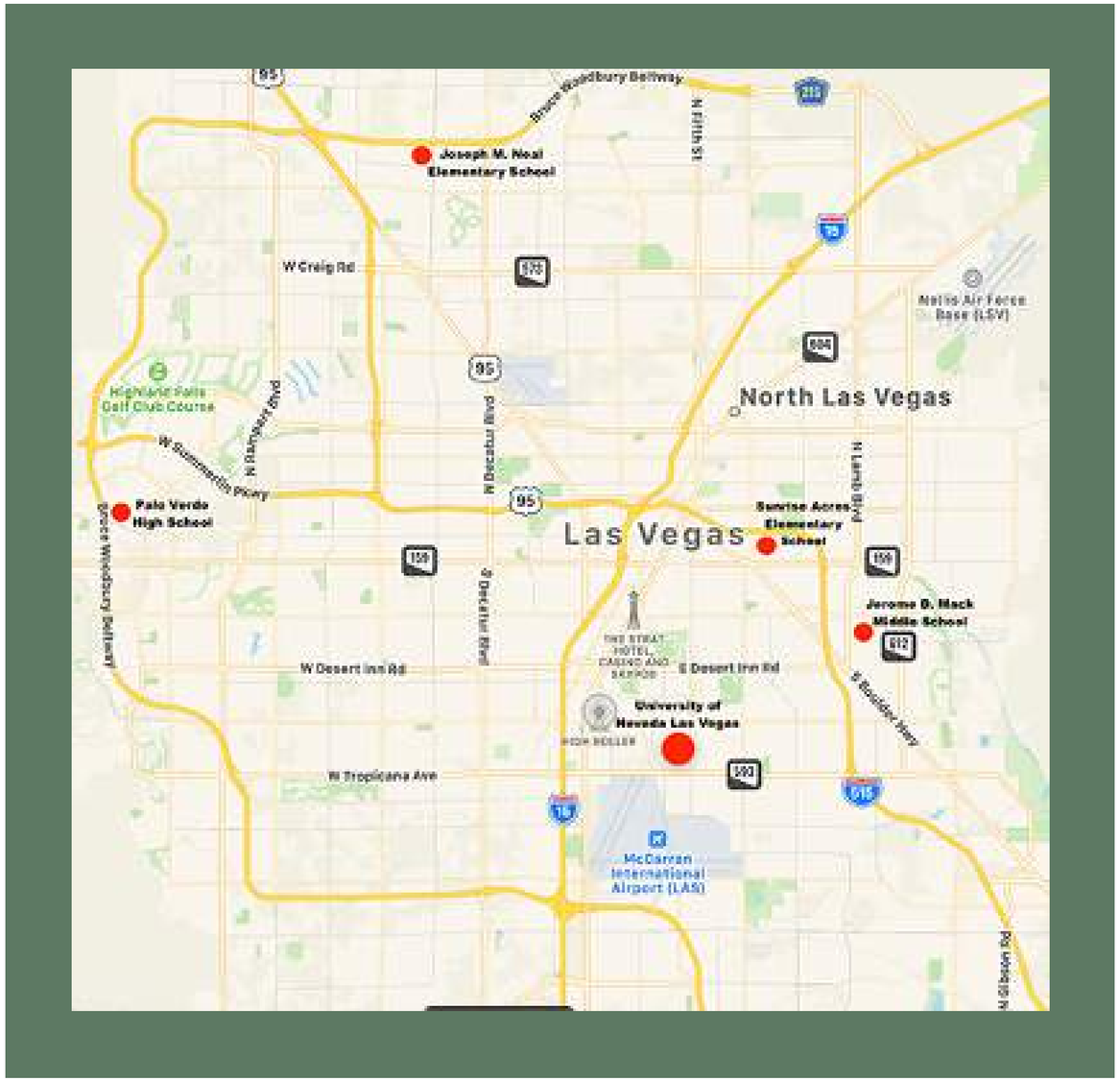
- Key features
  - Wind-oriented
  - Sealed chamber with one orifice
  - Air flow rate: 10L/min
  - 7-day or 24-hour sampling head
  - Clock revolved drum (A) or slide carriage (B) at 2 mm/hour

# NATIONAL ALLERGY BUREAU

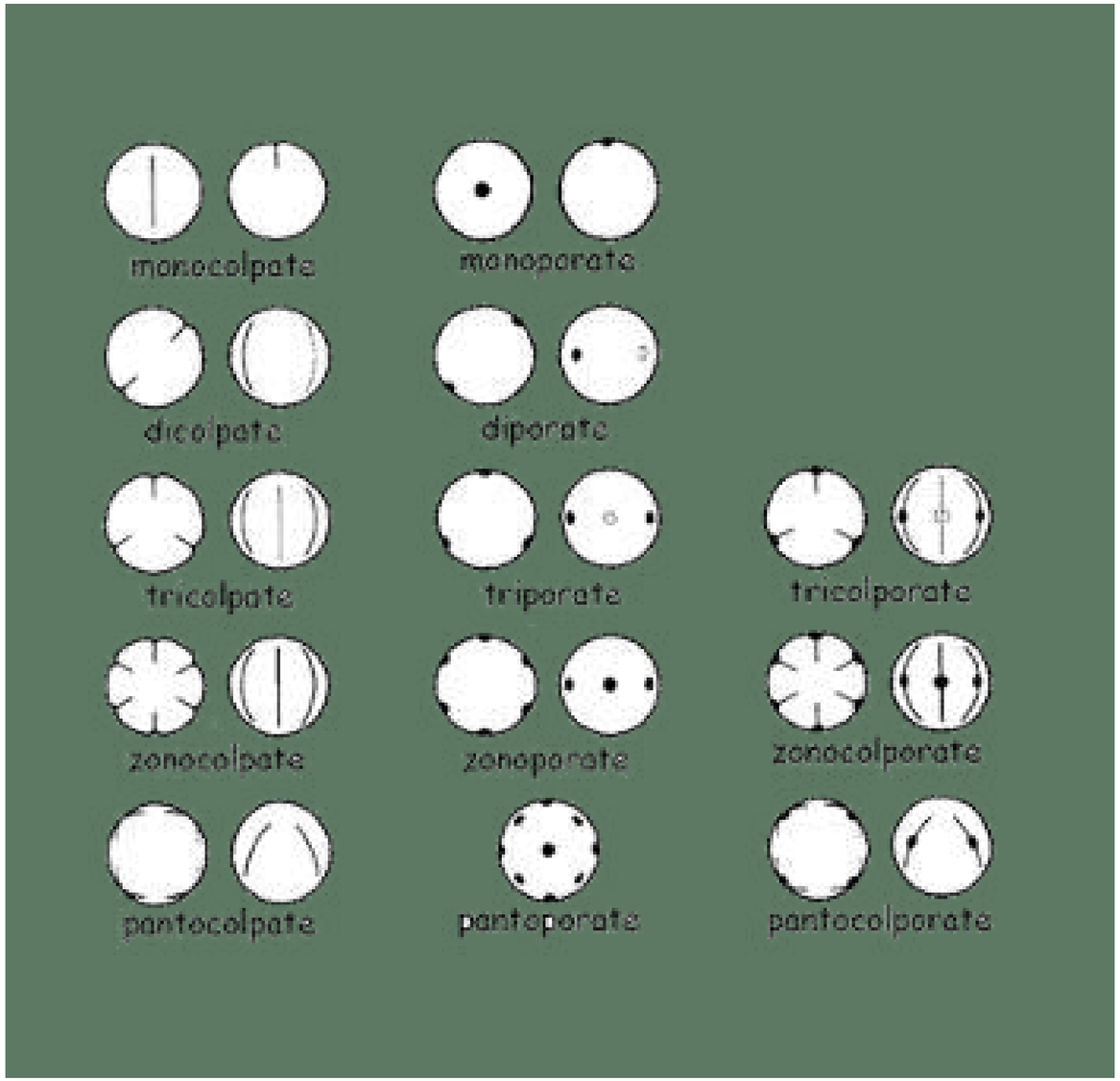
- Pollen
  - Categories: Tree, weed, grass
    - Various families and species
- Pollen of interest
  - Allergenic
  - Wind-borne
  - Large quantities
  - Widely distributed and in close proximaty to human populations






# CCSD Sampler Sites

- Currently we have 4 Clark County School District sites. These school samples are collected weekly, 365 days a year.
  - Jerome D. Mack Middle School
  - Sunrise Acres Elementary School
  - Joseph M. Neal Elementary School
  - Palo Verde High School



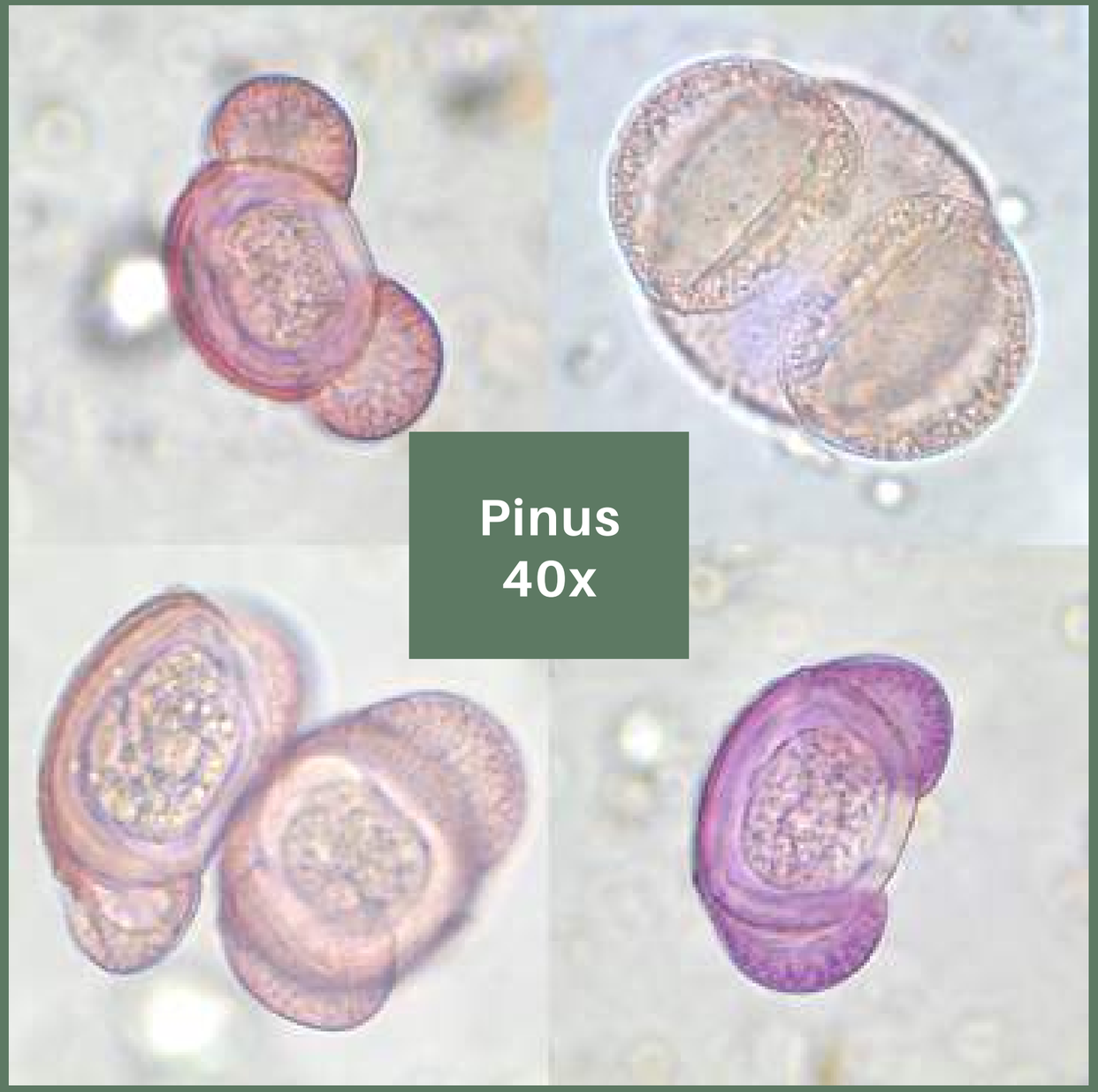

# Pollen Characteristics

- Size (in μm)
- Shape
  - eg. circular, triangular, oval
- Apertures (thin or missing part of the surface)
  - Colpus (colpate)
  - Pore (porate)
  - Both (colporate)
- Ornamentation
  - eg. air-bladder, spikes, warty

# FIVE COMMON POLLEN IN THE LAS VEGAS VALLEY

# Tree - Pinus

- Common name
  - Pine
- Pollination period
  - Spring
- Size
  - 50-150 µm
- Shape
  - Bisaccate
  - "Mickey Mouse" head


Pinus
40x

# Tree - Morus

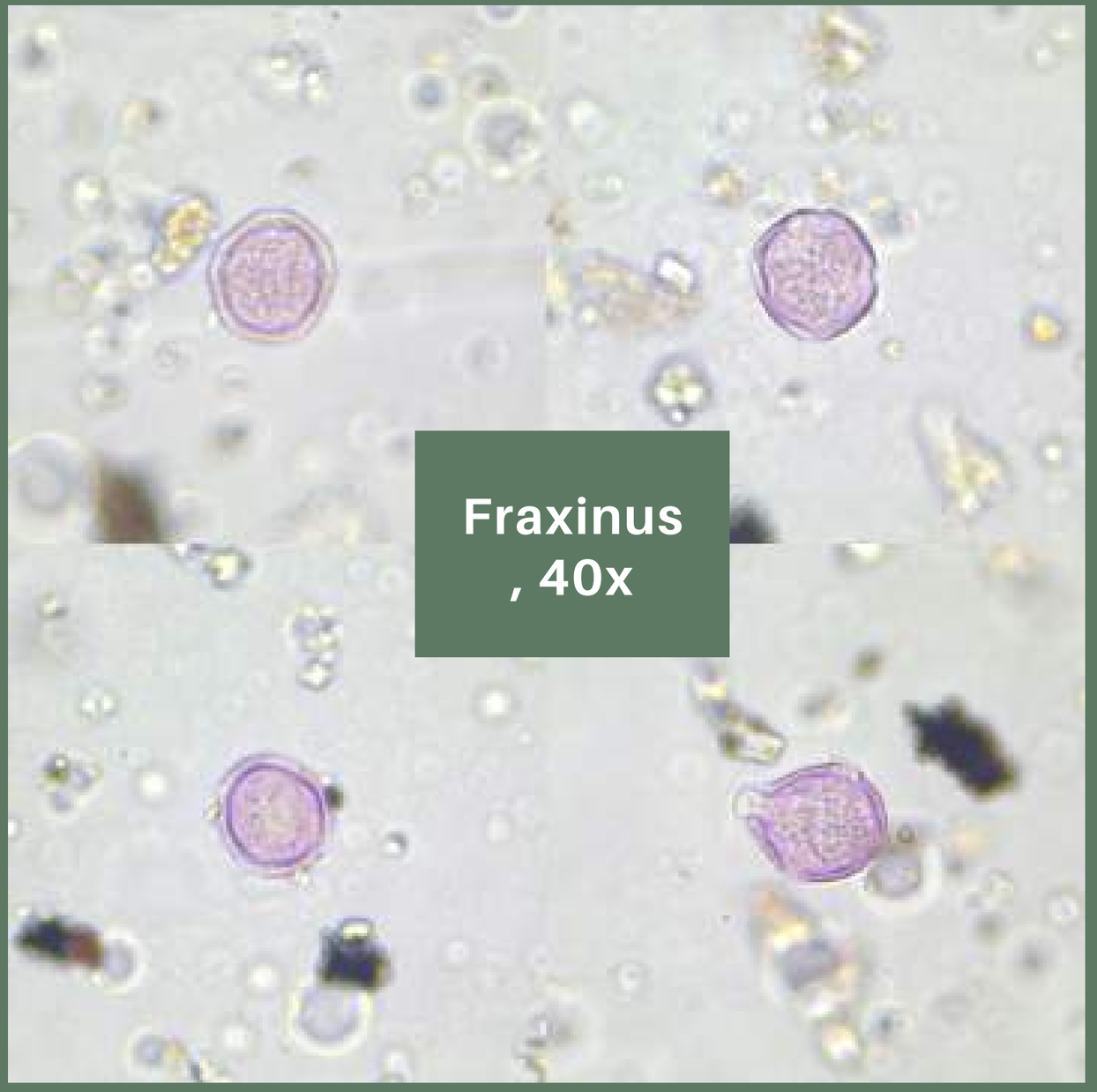
- Common name
  - Mulberry
- Pollination period
  - Spring
- Size
  - 14-22µm
- Shape
  - Cirucular
  - Diporate


Morus,
40x



# Tree - Fraxinus

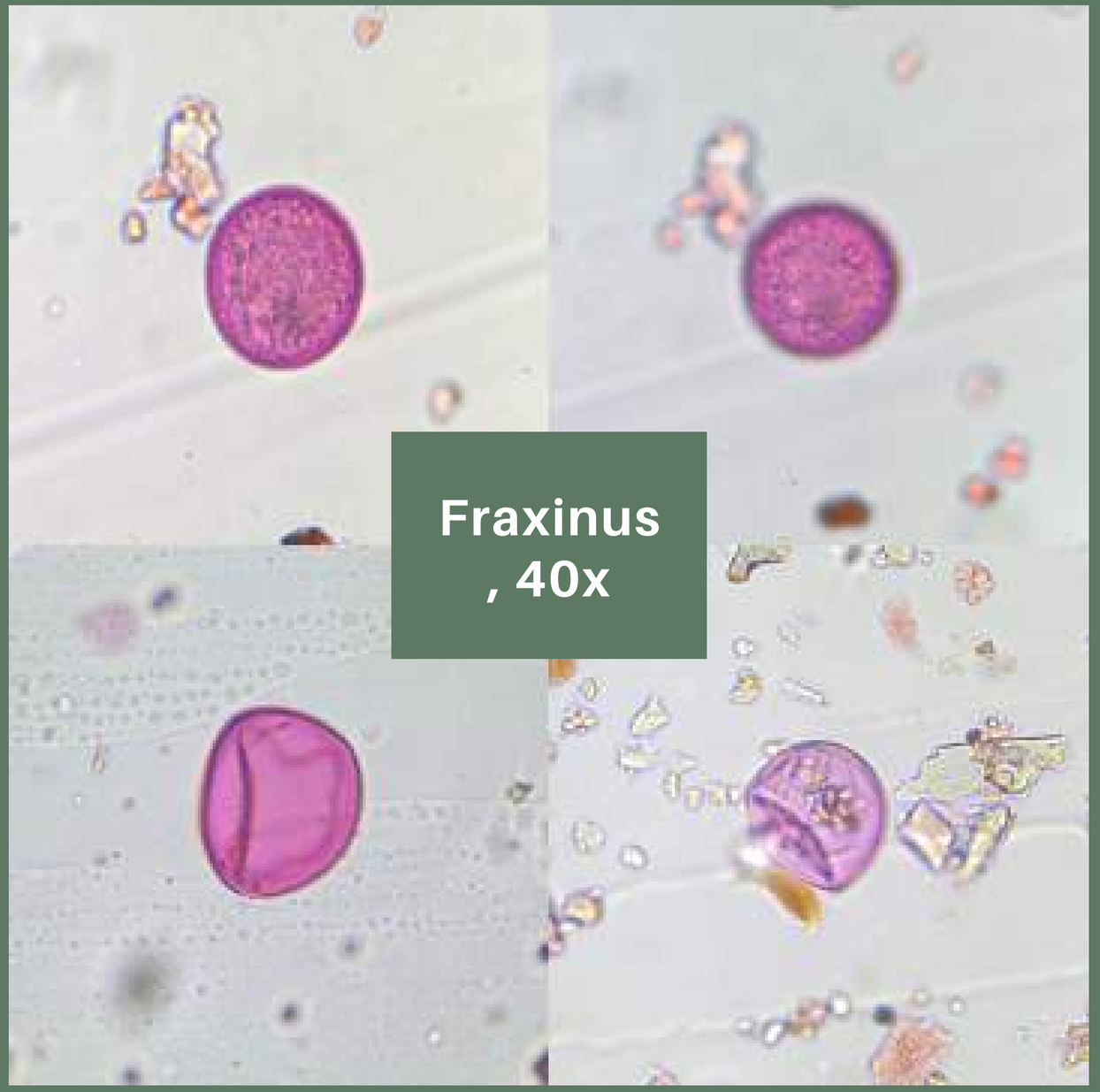
- **Common name**
  - **Ash**
- **Pollination period**
  - **Spring**
- **Size**
  - **19-33 µm**
- **Shape**
  - **Square**
  - **Tetracolpate, occasionally pentacolpate (pentagon)**



Fraxinus
, 40x

# Grass - Graminae/Poaceae

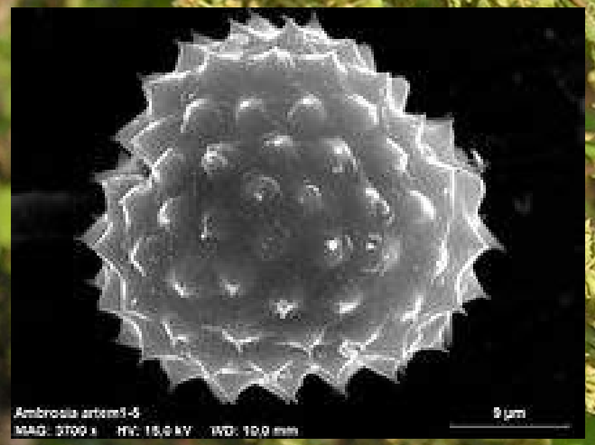
- **Common name**
  - **Grass**
- **Pollination period**
  - **Spring to Summer**
- **Size**
  - **30-66 µm**
- **Shape**
  - **Spheroidal**
  - **Monoporate**

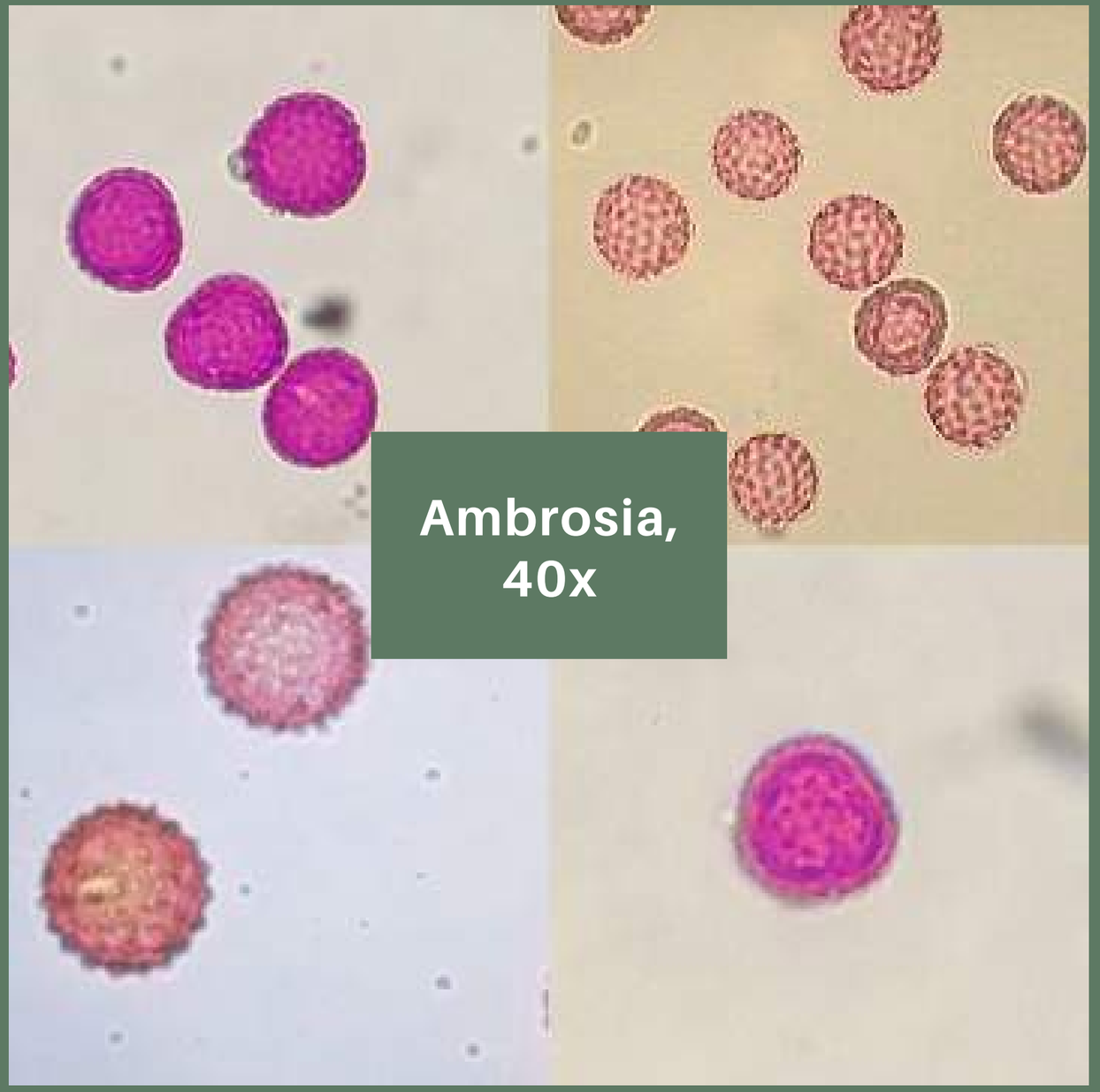


Fraxinus
, 40x

# Weed - Ambrosia

- Common name
  - Ragweed
- Pollination period
  - Mid Summer to Fall
- Size
  - 15-28 µm
- Shape
  - Tricolporate
  - Prolate to spheroidal
  - Low spine composite





Ambrosia, 40x

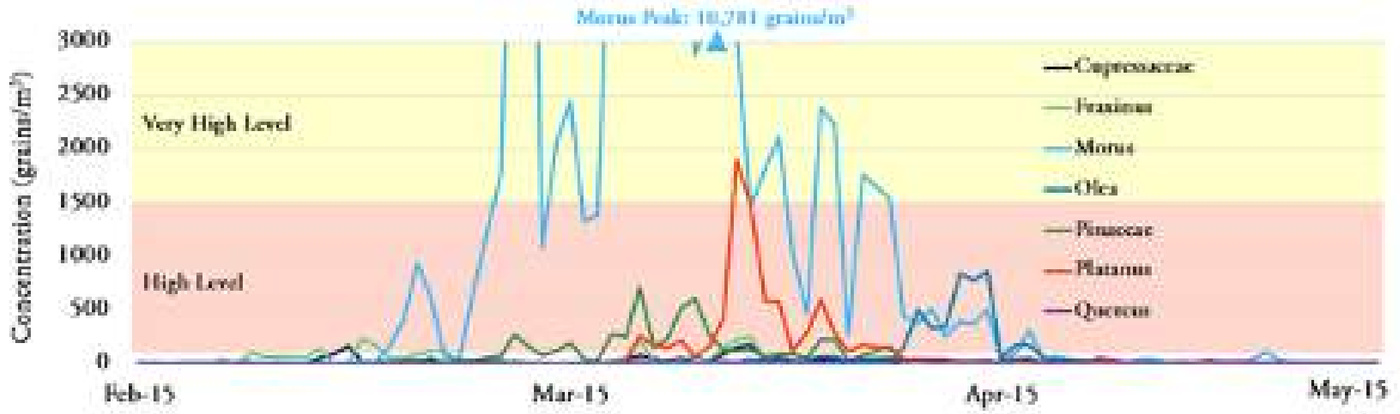
## Spring

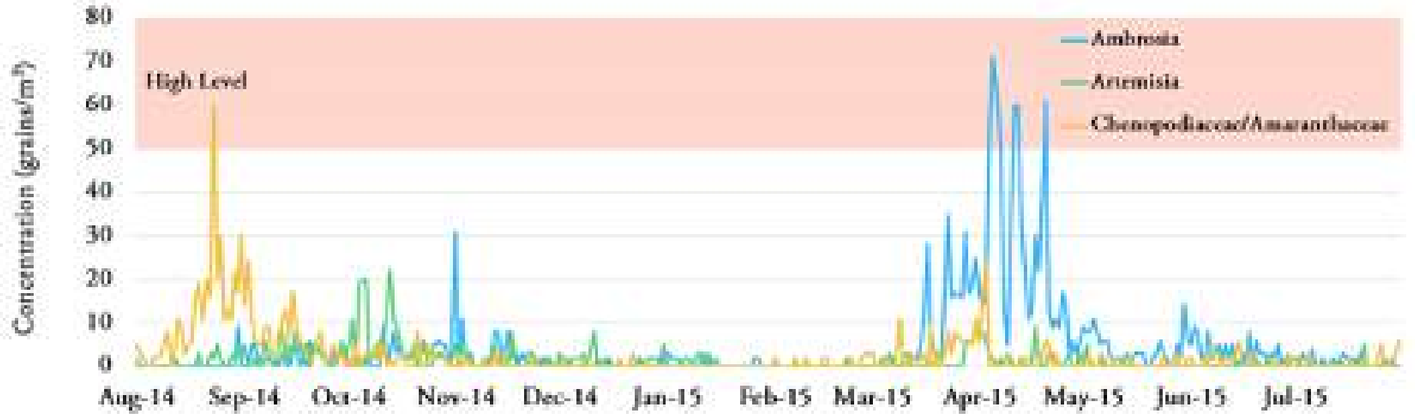
Trees pollinate heavily in Spring.

## Spring and Fall

Weeds pollinate heavily in Spring and Fall.

# POLLEN SEASONS IN LAS VEGAS



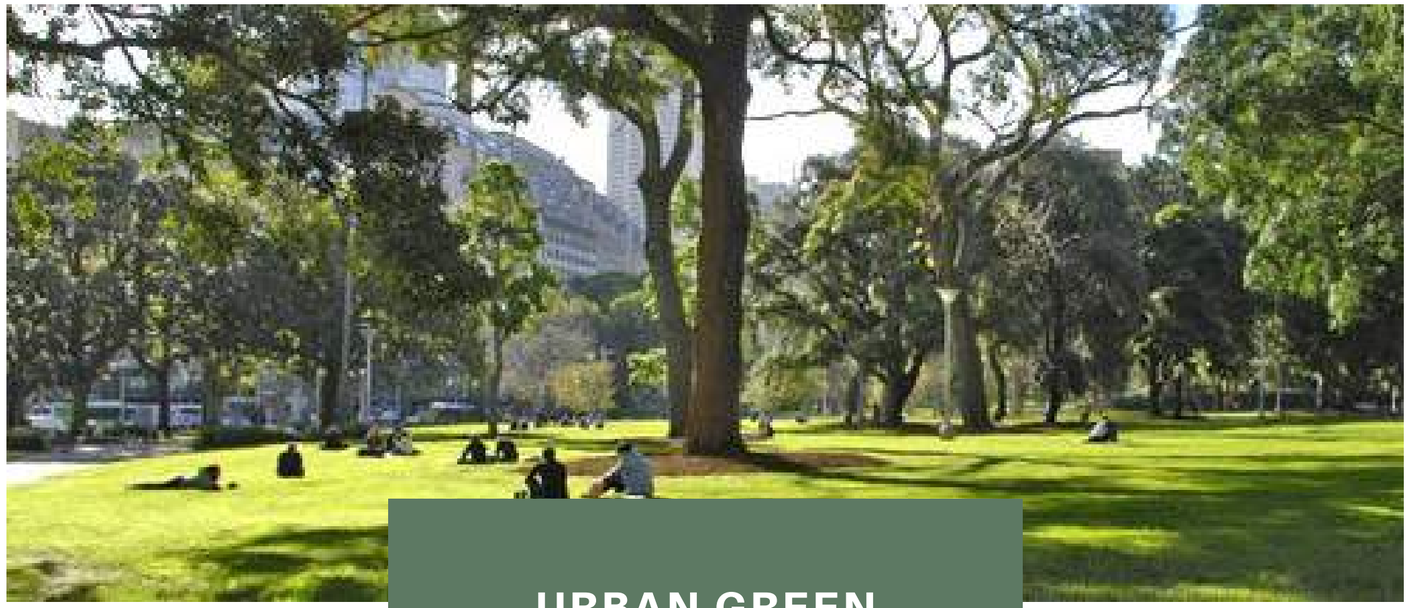
# WHERE DOES POLLEN COME FROM IN LAS VEGAS?

## Community Spaces

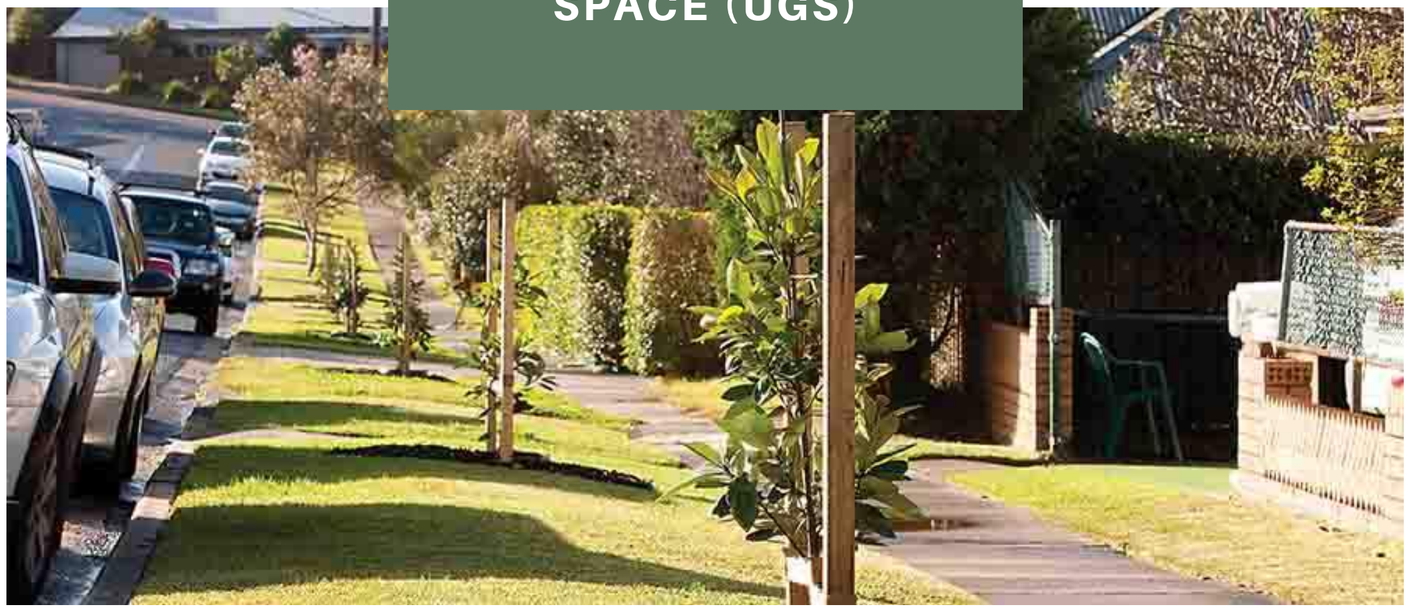
Parks, School yards, Gardens, Palazas, Cemeteries (EPA, 2017)

## City Design Features

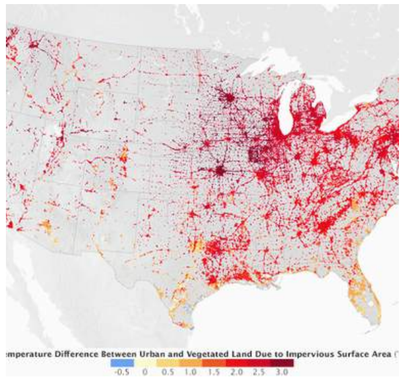
Road lane barriers, pedestrian walkways, decorative vegitation (Price, 2017)



**URBAN GREEN SPACE (UGS)**



# UGS BENEFITS




## MITIGATING URBAN HEAT ISLAND EFFECT

Vegetation offers more shade and performs evapotransportation. Overall reducing air temperatures of urban settings.

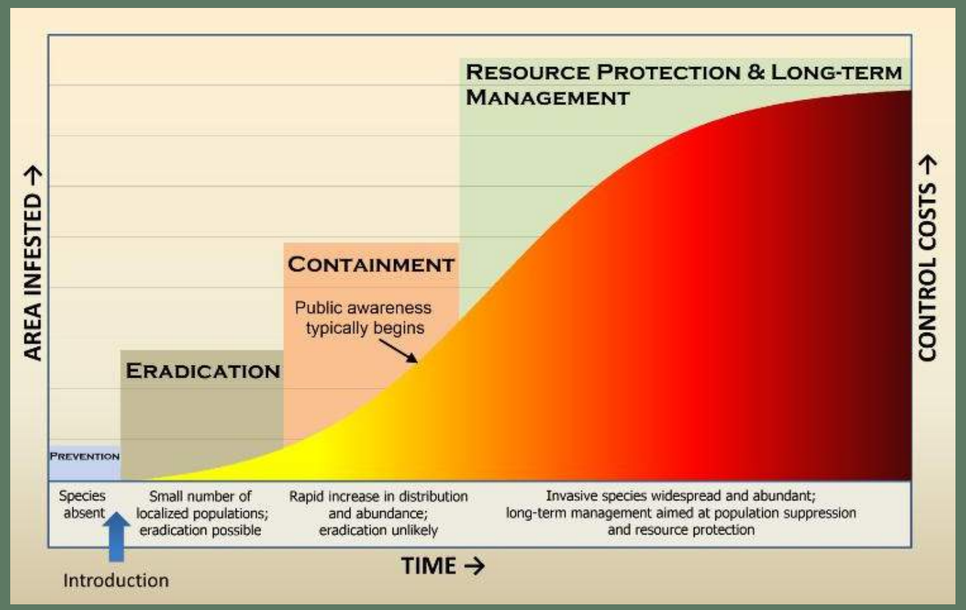
## SOCIAL/ECONOMIC IMPROVEMENTS

Increases land value and brings communities together

## HEALTH

Improves mental and physical health

EPA , 2020




# Environmental impacts

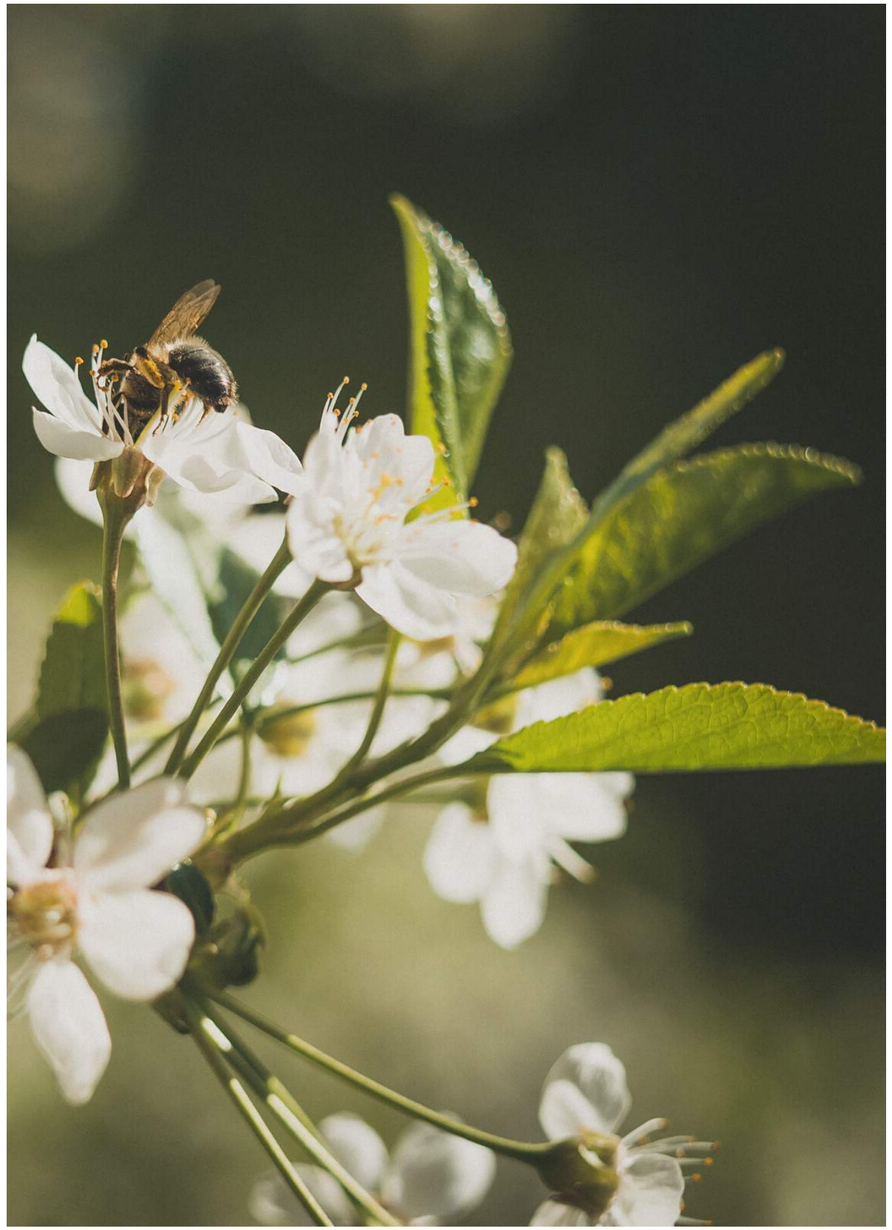
## Facilitation of Invasive Species

- Newlands Forest Conservancy area, South Africa (Alston and Richardson, 2006).
  - Area under threat from near by plants utilized in pedestrian walkways/trails
- Urban garden vegetation spreading in Mediterranean regions (Marco et al., 2010).
  - 407 non-native species originating from gardens, identified in area of study; Identified ecological and biological characteristics favoring spread
- Atlanta, Washington D.C., and Dallas found facilitate invasive species in their UGS designs (Hui et al., 2010)

# ENVIORNMENTAL IMPACTS

## Bees and Ecosystems

- Bees efficiency affected by urban green spaces in San Francisco Bay Area (Leong et al., 2014)
  - UGS offered more exotic plants for pollination
  - Created more favorable enviornment for bees
  - Lowered pollination services of surrounding natural environment



# Solutions to Improve UGS

## COMPREHENSIVE ECOLOGICAL/BIOLOGICAL STUDIES

Identifies factors and characteristics of invasive species

## TRACKING POLLEN IN COMMUNITIES

Provides accurate tracking identification of allergenic pollen present in communities

## COMPREHENSIVE SMART UGS IMPLEMENTATION AND MANAGEMENT

Las Vegas and xeriscaping

## Definition

Xeriscaping is the process of landscaping, or gardening, that reduces or eliminates the need for irrigation.

**XERISCAPING**

# QUESTIONS?

# REFERENCES


American Academy of Allergy, Asthma, and Immunology. (2020). National Allergy Bureau Pollen Counts. Retrieved from https://www.aaaai.org/global/nab-pollen-counts?ipb=1&desktop=1

Environmental Protection Agency. (2017, April 10). What is Open Space/Green Space? | Urban Environmental Program in New England. Retrieved from https://www3.epa.gov/region1/eco/uep/openspace.html

Environmental Protection Agency. (2020, January 23). Heat Island Effect. Retrieved from https://www.epa.gov/heat-islands

Hui, Cang & Richardson, David & Visser, Vernon. (2017). Ranking of invasive spread through urban green areas in the world's 100 most populous cities. Biological Invasions. 1-13. 10.1007/s10530-017-1584-0.

Laforest, L., Bousquet, J., Pietri, G., Kocevai, V., Yin, D., Pacheco, Y., van Ganse, E Laforest, L. (2005, March). Quality of Life during Pollen Season in Patients with Seasonal Allergic Rhinitis with or without Asthma. International Archives of Allergy and Immunology, 136(3), 281-286. https://doi.org/10.1159/000083955

Leong, M., Kremen, C., Roderick, G., & Vamosi, S. (2014). Pollinator Interactions with Yellow Starthistle ( Centaurea solstitialis ) across Urban, Agricultural, and Natural Landscapes. PLoS ONE, 9(1), E86357. https://doi.org/10.1371/journal.pone.0086357

Marco, A., Lavergne, S., Dutoit, T., & Bertaudiere-Montes, V. (2010). From the backyard to the backcountry: How ecological and biological traits explain the escape of garden plants into Mediterranean old fields. Biological Invasions, 12(4), 761-779. https://doi-org.ezproxy.library.unlv.edu/10.1007/s10530-009-9479-3

Mayo Clinic. (2018, November 06). Allergies and asthma: They often occur together. Retrieved from https://www.mayoclinic.org/diseases-conditions/asthma/in-depth/allergies-and-asthma/art-20047458

National Geographic. (2018, November 2019). Ragweed is on the Move. Retrieved from https://blog.nationalgeographic.org/2018/11/19/ragweed-is-on-the-move/

Price, A. (2017, May 22). Why greenspace is different from a park. Retrieved from https://www.strongtowns.org/journal/2017/5/22/what-makes-a-park-great-lets-explore-van-vorst-park

Skoner, D.P. (2001, July). Allergic rhinitis: definition, epidemiology, pathophysiology, detection, and diagnosis. The Journal of allergy and clinical immunology., 108(1), S2-S8. https://doi.org/10.1067/mai.

World Health Organization. (2012). Urban Green Spaces. Retrieved from https://www.who.int/sustainable-development/cities/health-risks/urban-green-space/en/