Phenology helps with decision making

WHAT KINDS OF DECISIONS?
- Landscape plant maintenance
- Integrated Pest Management (IPM)
- Desert landscape plants
- Home & landscape water use
- Plant propagation
- Vegetable and fruit trees
- Nature’s Notebook in YOUR garden

Decision making

WHAT? - Integrated Pest Management (IPM)
- IPM=long-term prevention using multiple techniques (biological & chemical)
- Recordkeeping, field monitoring, forecasting = BMP
- Pesticides work best on unstressed foliage
- Apply pre-emergence pesticides before eggs hatch

Phenology Application
- Squash beetles – nymph and adult suck sap from squash leaves and stems and inject toxin
- Collect egg masses, squash
- Cover plants until it begins to bloom so reduce the number of nymphs present. Remove before pollination
Decision making

**Phenology Application**
- Biological control for predator or prey (lacewings eat larvae of aphids, thrips, mites), parasitic wasps eat caterpillar eggs (tomato fruit worm)
- Adjust planting dates to avoid pests
- Squash vine borer lays eggs when chickory is in bloom
- Phenological events indicate pest activity
- Plants/insects respond to GDD

**Climatic Implications**
- Entomologist predict more generations of pest insects in warming climate conditions – not cold enough to eliminate

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Decision making

- Growing-degree days (GDD) are used to measure when to manage the moths
- Start accumulating once they are showing up in pheromone traps
- 175DD (base = 45) after first sustained catch is time for spraying

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GDD = \frac{T_{\text{max}} + T_{\text{min}}}{2} - T_{\text{base}}.
\]
**Decision making**

**WHAT? - Landscape plant maintenance**
- Proper plants for climatic zone = functional
- Healthy and balanced (ecosystem) garden limits stress and incidence of pest damage
- Bloom times – garden constantly in bloom?
- Weeds (a plant growing out of place) and noxious & invasives may result in economic consequence

**Phenology Application**
- Knowing species cycles improves accuracy of pruning and care – showy, larger flowers
- Ensure pruning at proper time of year to limit new growth’s exposure to hot sun, frost
- Weeds – manage during colder months limits spread
- Prune when young and dormant - more fruit

**Decision making**

**Climatic Implications**
- An increasing temperature may cause undesirable species to expand to new locations – e.g. higher altitudes (bufflegrass)
- Weeds respond more quickly than cash crops to increasing CO\(_2\) in the environment and can easily adapt to climatic changes – light, water, nutrients, CO\(_2\)
- Warmer temperatures prevent plants from becoming dormant
- Warmer temps and more water - plants more susceptible to disease, increased range
- An increased amount of CO\(_2\) increases canopy cover and limits undergrowth
Decision making

**WHAT? - Home & landscape water use**
- Understand local/regional wet and dry seasons for management
- Plants require a certain amount of water depending upon species
- Monitor species on water conservation plans vs. naturally occurring vs. irrigation
- Understand the implications of drought

**Phenology Application**
- Track water use and seasonal rain in your garden
- Note environmental patterns and changes
- Note leafing and flowering patterns related to irrigation

Decision making

**Climatic Implications**
- Drought has serious implications for plants, even in the desert
- Native species can better withstand drought
- Changes in drought patterns implicate plant survival
- Evapotranspiration rates will vary
Decision making

**WHAT? - Desert landscape plants**
- Planting/transplanting times important – warmer temps promote active root growth and plant establishment
- Winter nighttime temps should be above 40°F – cold hardiness, sunburn
- Select plants for extremes
- Irrigation plan based on regional rainfall

**Phenology Application**
- Temp driven phenophases in Tucson
- Track plant activity with rainfall and weather
- Pollinator garden and wildlife – what blooms when to attract what you desire?
- Track bloom times to design complimentary garden

Decision making

**Climatic Implications**
- Warmer or cooler temperatures and more or less moisture will change the climatic zone of the desert in Tucson
Decision making

WHAT? - *Plant propagation*
- To generate or multiply sexually (pollination > germination) or asexually (cultivars closely resembling parent plant)
- Sexual – wind, pollinator
- Asexual – cutting, layering, division, budding and grafting (Cal. MG Handbook p 94)

Phenology Application
- Longest purposeful phenology project – monitoring clones to attribute differences in phenophase appearance to environmental conditions, not individual
- Better understand plants response to changing climate

Phenology Applications...

For Germination:
- Soil temperature - range
- Water
- Oxygen
- OR growth inhibition

Climatic Implications
- Temp and light vary, germination will vary
- Soil does not heat up as quickly, germination time changed, delayed, or canceled
Working examples

Phenology can guide planning:
Tracking leaf fall to improve water quality