Honing your B(ad) S(cience) detector

Seminar roadmap

- Sources of information
- Evaluating information
- Assessment examples: products, practices, and phenomena
- Good and not-so-good science

Sources of information

- Scientific – peer reviewed, academic audience
- Gray – not peer reviewed, professional audience
- Popular – not peer reviewed, general audience

Assessment of products and practices

- No supporting science (no research; inconsistent or negative results; poor quality research or reporting)
- Misapplied science (agricultural products and practices applied to nonagricultural settings)
- Overextrapolated science (products and practices with limited efficacy outdoors, and perceived phenomena with no landscape-level evidence)

Evaluating information using the CRAP test

- **C**redibility of the source
  - Author's credentials and qualifications?
  - Publisher?
  - Website urls?
- **R**elevance to managed landscapes
  - Crop production or urban landscapes?
  - Geographic or other constraints on usability?
- **A**ccuracy
  - Science-based?
  - Objective?
  - Current?
  - Well-written?
- **P**urpose
  - Educational or commercial?
  - Political, ideological, cultural, religious, or personal biases?
  - When in doubt, consult with relevant discipline experts

No consistent, reliable supporting science

- Products
  - Balanced fertilizers
  - Compost tea
  - Conditioners
  - Kelp products
  - Organic superiority
  - Vitamin B-1 transplant fertilizer
  - Wound dressings
- Practices
  - Biodynamics
  - Companion planting
  - Fertilizer injections
  - Hot weather watering
  - Hügelkultur
  - Lasagna mulching
  - Leaving rootballs intact
  - Native plant superiority
  - Retrenchment pruning

Because none of these products or practices are supported with sufficient scientific evidence, they should not be used or recommended.

2. Misapplied science

- Products
  - Antitranspirants
  - Epsom salts
  - Gypsum
  - Hydrogels ("water crystals")
  - Phosphate fertilizer
- Practices
  - Amending soil before planting
  - Foliar fertilizers

3. Overextrapolated science

- Products
  - Corn gluten meal (CGM)
  - Harpin
  - Mycorrhizal/probiotic inoculants
- Phenomena
  - Allelopathy and black walnuts
  - Humus formation

Science-based alternatives:

- Avoid automatic applications of pesticides, fertilizers, or any other chemical before thoroughly diagnosing landscape problems
- Test soils before adding any amendments
- Add organic material as "slow food" after planting
- Use coarse woody mulches
  - Control weeds
  - Add nutrients slowly
  - Do not restrict water and gas movement
  - Protect and enhance soil health
  - Support native populations of beneficial microbes
- Rely on science-based evidence for making recommendations

Good and not-so-good science

1. Good quality research but poor reporting

- Often due to researcher bias
- Selective highlighting of results (often with statistical errors) in the abstract or summary
- Downplaying or omitting other results

2. Poor quality research

- Common with authors with no expertise in field
- Conflating correlation with causation
  - A correlation between two variables does not mean that one causes the other
  - Controlled studies can determine causation but not always feasible
  - Correlations can be valuable, but only if examined rigorously and eliminating other possible causes of the observed phenomenon

Look at the body of research. If a paper is at odds with most other papers, it must withstand increased scrutiny.

Dr. Linda Chalker-Scott, WSU Professor and Extension Urban Horticulturist
URL: http://www.theinformedgardener.com (white papers on many of these myths)
Blog: http//www.gardenprofessors.com
Books: http//www.sustainablelandscapesandgardens.com
Facebook page: http://www.facebook.com/TheGardenProfessors
Facebook group: https://www.facebook.com/groups/GardenProfessors/
Publications: https://www.researchgate.net/profile/Linda_Chalker-Scott/publications