# Take 4DEE outside: Using campus and local resources to photograph ecological concepts

Erica S. Tietjen (erica.tietjen@nevadastate.edu)
Senior Lecturer of Biology & Environmental Science
Nevada State University, Henderson NV

***What ecological terms and concepts do you see represented in each of these photos?*** *(Photos by EST and CC)*

**Introduction to Activity:**

In my introductory courses in environmental science and ecology, students participate in activities that take them outdoors to our suburban campus (field) environment (which every campus has, regardless of size, and minimizes the need for travel to remote locations). Students work on a three-part project throughout the 16-week semester (called *"Finding Ecology Where You Look"*) to focus on making observations of ecological phenomena. In Part I of the project, the goal is to photograph their campus observations and to identify examples of ecological concepts (please see "Handout – For Students" for guiding information for learners).

I have concentrated on the 4DEE dimensions and their elements as a way to introduce ecological perspectives, with an emphasis (in bold) on the following elements of each dimension:

I - **Core Ecological Concepts (CEC)** – variable with each photo
II - **Ecology Practices (EP)** - **Natural history** (making observations and connections) and **Communicating and applying ecology**
III - **Human-Environment Interactions (HEI)** – **Human dependence on the environment** (ecosystem services), **Human accelerated environmental change** and **Ethics** (sustainability)
IV - **Cross-Cutting Themes (CCT)** – **Systems** and **Spatial & Temporal** (scales)

Learners take personal ownership of the concepts they have discovered and identified (and often arrive at ideas and themes of natural environment value, complexity and aesthetic qualities). This open-ended assignment provides latitude to make personal connections that are intellectually enriching and experientially valuable.

**Possible Assignment Extensions:**

- Can use the project to generate a **"living concept bank"** as a class through a shared Google doc
  - Start with textbook/text, lecture notes, class discussion to build the concept list (see concept starter on next page)
- Project can extend beyond concepts to be an **expressive or creative work**:
  - Photojournalism portfolio, video journal, or aural impressions (for vision-impaired)
  - Campus ecology/natural history guide

# Ecology Concept Starter

(adapted from Reiners *et al*. 2017)

**Evolutionary Ecology**

adaptation
allopatry
character displacement
cline
coevolution
coexistance
ecotype
evolution
evolutionary convergence
extinction
fitness
founder effect
gene
genetic drift
gene flow
genotype
kin selection
mutation
phenotype
recombination
natural selection
species
speciation

**Interspecific Interactions**

allelopathy
carnivore/carnivory
commensalism
competition
competitive excluision
mutualism
parasitism
pathogen
predator/predation

**Organismal Ecology**

adaptation
acclimation
allocation
autotroph
carnivore
consumers
decomposers/decomposition
dispersal
detritivore/detritivory
fedundity
habitat
herbivores/herbivory
heterotroph
invasive species
kin selection
mimicry
niche
nutrient
omnivore
optimization (foraging)
organism
parasite
pathogen
phenotype
photosynthesis
population
predator
respiration
r/K-selection
sociality
species
species types (generalist, etc.)
life history
life form

**Population Ecology**

age class structure
altruism
carrying capacity
character displacement
cohort
competition
density-dependent
density-independent
dispersal
distribution pattern
doubling time
emigration/immigration
exponential increase
extinction
fecundity
habitat
self-thinning rule
survivorship
territoriality

**Community Structure**

climax community
community
ecosystem engineer
guild
keystone species
niche (realized, fundamental)
plant assemblage
species abundance patterns
species evenness
species richness

**Community Dynamics**

bottom-up control
disturbance
faciliation
food chains
food webs
intermediate disturbance hypothesis
keystone species
invasive species
succession
top-down control

**ENV/BIOL 220 - ECOLOGY TERMS and CONCEPTS**

**Notes/Additional Terms:**

**Ecosystem Structure**

biomass
biosphere
detritus
ecosystem
Liebig's Law of the Minimum
trophic level
trophic pyramids

**Ecosystem Energetics**

1st Law of Thermodynamics
2nd Law of Thermodynamics
energy flow
net primary production
primary productivity
respiration
secondary productivity

**Ecosystem Biogeochemistry**

bioaccumulation
biomagnification
nutrient
nutrient flux/cycles
stoichiometry

**Landscape Ecology**

corridors
ecotone
edge effect
environmental gradient
fragmentation
landscape
metapopulation
zonation

**Biogeography**

allopatry
barriers (migratory)
biome
geographical range
species area relations (curves)
sympatry

**Scale**

emergent properties
equilibrium
homeostasis
pattern and process
resilience
scales (small, local, regional)
stability
stochasticity

**Source:**

Reiners, W. A., Lockwood, J. A., Reiners, D. S., & Prager, S. D. 2017. 100 years of ecology: what are our concepts and are they useful? *Ecological Monographs*, *87*(2):260-277.