

Chesapeake Bay Program's Scientific and Technical Advisory Committee Evaluating an Improved Systems Approach to Crediting: Consideration of Wetland Ecosystem Services March 23, 2022

Co-benefits: Amphibians and Wetlands

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Co-benefits: Wetlands and Amphibians

Ecosystem services of wetlands



Second Second Amphibian and habitats

Search Managing wetlands for amphibians







Ecosystem services of wetlands ----> Provide habitat for amphibians

- 1. Improve water quality
 - a. sediment trapping,
 - b. nutrient removal
 - c. chemical detoxification.
- 2. Enhance ecosystem productivity
 - a. aerobic and anaerobic conditions
 - b. primary producers on up the food chain
 - c. energy transfer between terrestrial and aquatic

If you effectively manage the habitat, you can manage <u>a whole suite of species</u>



Search Amphibian and habitats

For some systems, amphibians can be indicator species of ecosystem health

Multiple developmental stages and life histories; ectothermic; food chain role

Require both terrestrial and aquatic habitats: multiple habitat requirement +resource needs

Aquatic

Vernal pools

Permanent wetlands

Wet meadows bogs, fens

Small streams spring seeps

Rivers

Estuarine + coastal wetlands

Terrestrial

Hardwood forests

Spruce + fir forests

Xeric upland + pine forests

Grasslands + old fields

Rock outcrops + talus

Caves + karst

Human

Agricultural lands

Urban + residential



Chesapeake Bay Frogs & Toads – all regions

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Chesapeake Bay Salamanders – all regions

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Vernal pools





Hardwood, upland forests







Water source: precipitation, snowmelt, flooding

Spring

Mating, fertilization, egg development , hatching, larvae

Fall-Winter Nesting and overwintering in dried substrate Post metamorphosis: migration to nearby terrestrial habitat

Generous leaf litter base Downed and decomposing logs

Variable canopy patches for temp

Fossorial growth to adults Overwintering Refugia Mesic rich soil Multiple levels of foraging

Biomass and energy transfer aquatic to terrestrial



Approaches for managing wetlands for amphibians

Wood turtle and Spotted salamanders,

early seasonal breeders

depend on vernal pools for mating, fertilization, and egg mass.,

aquatic larval/tadpoles depend on vernal pool food resources

must migrate to terrestrial post metamorphosis – before the wetland dries out.

Predictions based on climate change data and models increased variability in seasonal precipitation increased intensity and earlier warming trends, drought

Findings: wood frog breeding + successful metamorphosis varied by year positively related to pond's typical hydroperiod length and annual precipitation.

	Journal of Applied Ecology	1913 C 2003 British Ecological Society — custoring services —
Journal of Applied 1	cology 2013 d	oi: 10.1111/1365-2664.12121
vernal po	ng breeding and metamorph occup ool management effects for wood f hical model	•

Adam W. Green^{1*}, Mevin B. Hooten^{2,1,3}, Evan H. Campbell Grant⁴ and Larissa L. Bailey¹

Research: Insert impervious lining to short pools to slow drying long enough to cover metamorphosis

but not so long as to be come permanent wetland.

Findings: small sample size however, data indicate this could be a management tool at some time with climate.



Relationship of wetlands as habitat provisions for amphibians

- Landscape scale planning seasonal activities (e.g., connectivity)
- Hydroperiods for natural wet-dry cycles of wetland (e.g., survive / thrive)
- Native vegetation for safer connectivity of wildlife (e.g., minimize soil compaction)
 migrations to upland, forests or other wetlands
- Natural undulations, snags+ downed logs minimize bank erosion
- Size + vegetation of wetland or stream buffers:
 - Water filtration: minimize siltation, erosion, pollutants nutrient flow
 - Refugia: shelter from prey, foraging + basking areas
- Patch numbers, size, distribution, and between wetland distance
- Diverse vegetation = diverse wildlife = biodiversity as a sign of resiliency



Search Unintended consequences

For data recoding, monitoring, restoration of wetlands, need to be mindful of the damage to wildlife.

- 1. May be creating an attractive nuisance
- 2. Subsidizing predators
- 3. Silt fences to prevent erosion, separate the organisms from dangers of construction.



4. Biosecurity: introducing disease
 Minimize spreading disease from one wetland to another
 Disinfect your equipment, heavy machinery
 Prioritize your movements



Amphibians and Wetlands: Advantages to acting proactively

Indicator species of the health of the ecosystem

Eutrophication links to parasite. (Johnson and Chase, 2004. Ecol. Lett. Vol 7)

Pesticides used in agriculture in tadpoles (Frietas et al., 2022, Envir. Pollut. Vol 299)

Sensitivity to nitrogenous fertilizers (Van Meter et. al., 2022, ETC Vol 41)

Response to specific conductivity, metals, produced wastewater (current studies)

Stress induced immunomodulation (Rollins-Smith 2017. Devel. Comp. Immu., vol 66.)

Climate change for wildlife – consider which organism and role

If you effectively manage the habitat, you manage a whole suite of species