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
- Amphibian and habitats
- Managing wetlands for amphibians
- Unintended consequences
- Co-benefits: amphibians + wetlands

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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 a whole suite of species

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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

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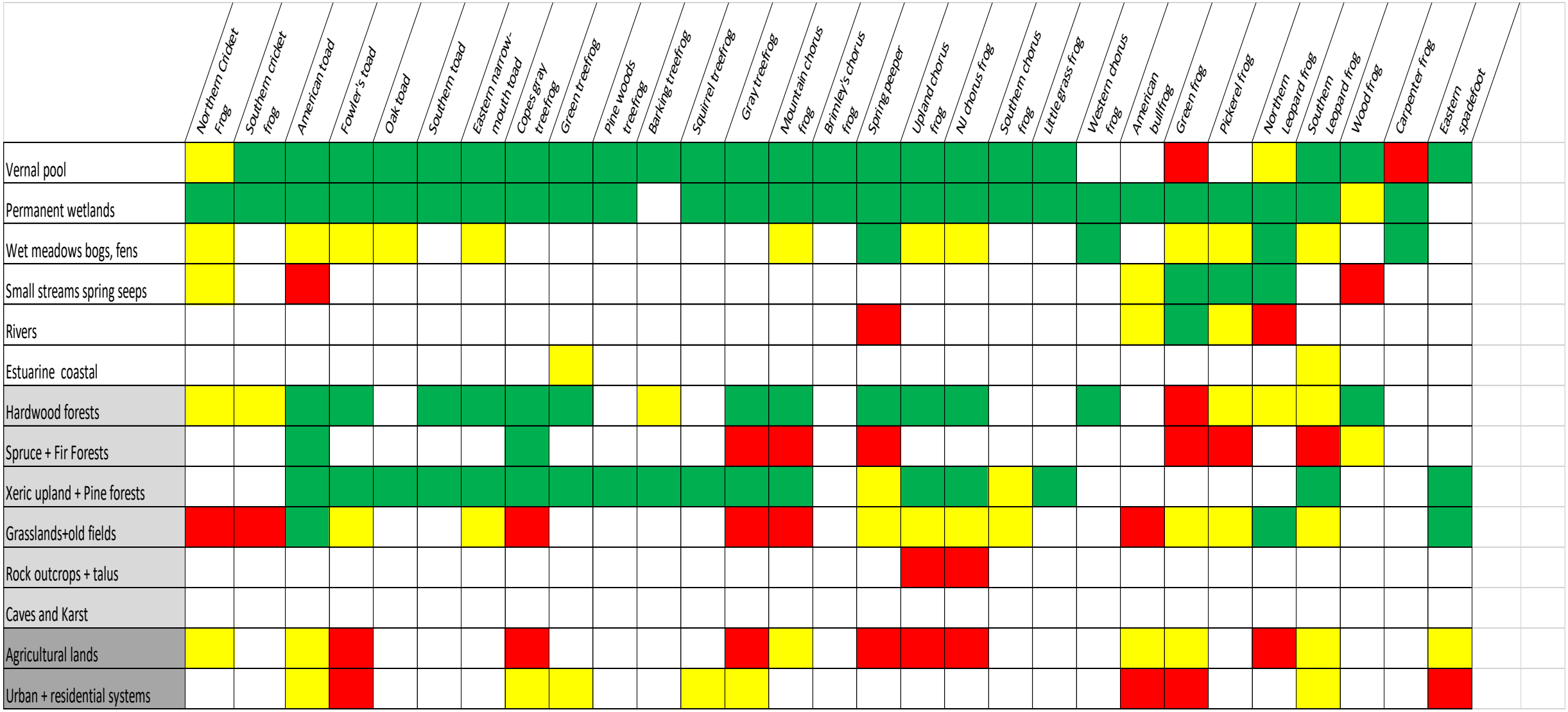
Chesapeake Bay Frogs & Toads – all regions



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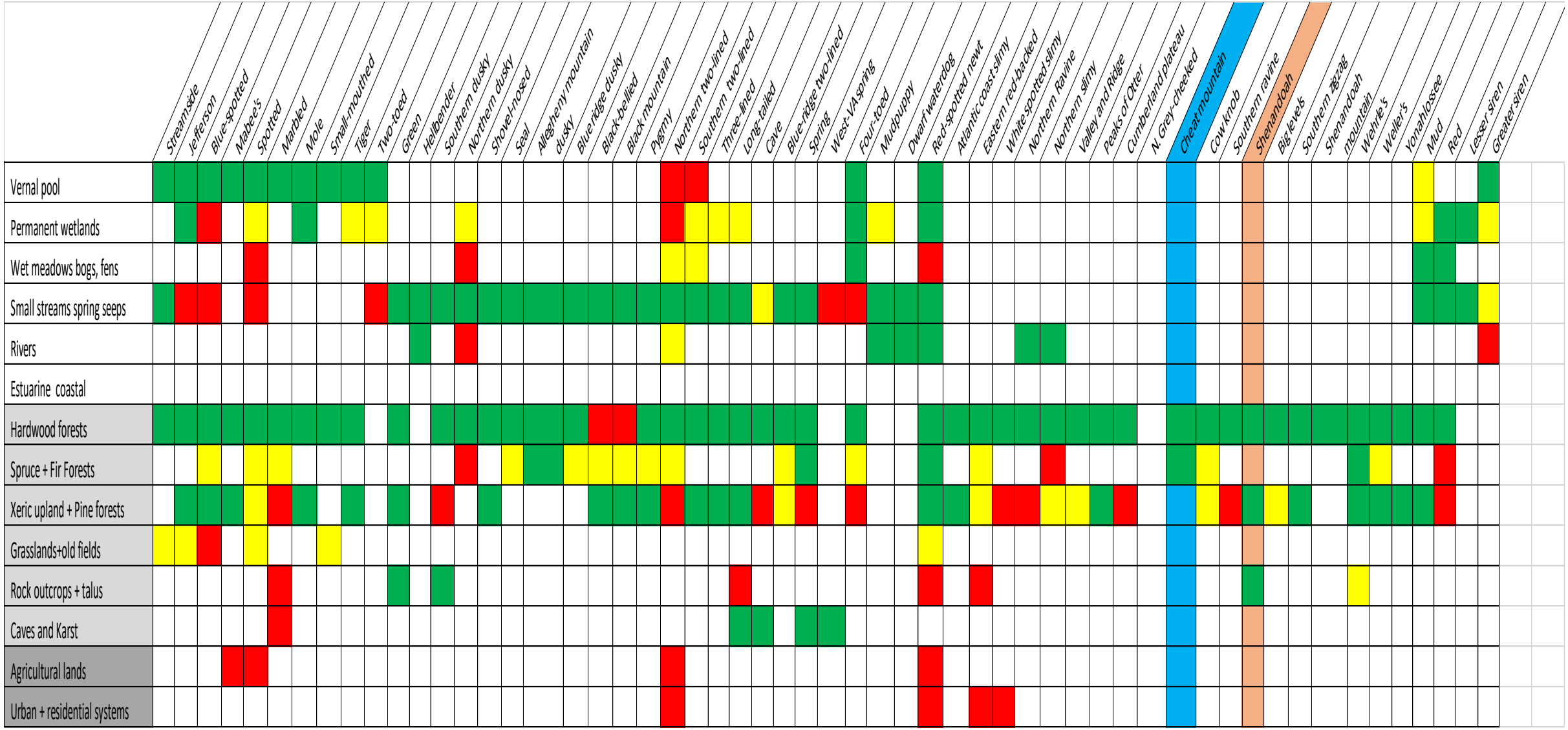
Chesapeake Bay Salamanders – all regions



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Vernal pools

Water source:
precipitation, snowmelt, flooding

Spring
Mating, fertilization, egg development , hatching, larvae

Fall-Winter
Nesting and overwintering in dried substrate

Hardwood, upland forests

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.,

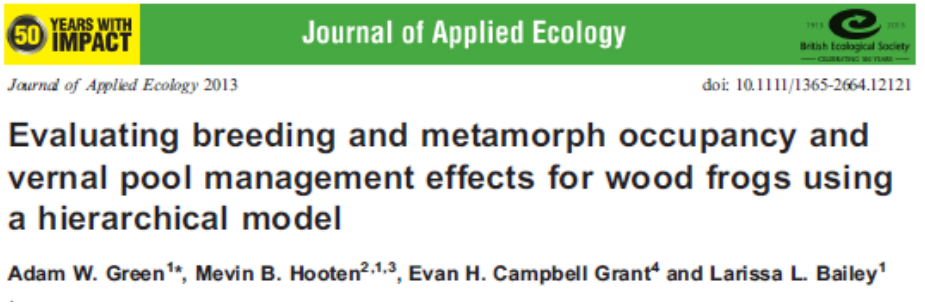
aquatic larval/tadpoles depend on vernal pool food resources

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.

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.

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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

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

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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