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# If You Build It, They Will Come: Herpetofaunal Colonization of Constructed Wetlands and Adjacent Terrestrial Habitat in the Cache River Drainage of Southern Illinois

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## ABSTRACT

Agricultural lands within the Cache River drainage of southern Illinois are being acquired by both public and private conservation organizations and restored to native terrestrial and wetland natural community types. These efforts proceed under the untested assumption that constructed wetlands and adjacent reforested terrestrial habitat provide a suitable environment for local fauna. I examined this assumption for amphibians and reptiles at three newly constructed wetlands and adjacent terrestrial habitat in Johnson County, Illinois. A total of 35 species of amphibians and reptiles was observed, ranging from 22 to 28 per year. Frogs comprised 31.5% of the species observed, followed by snakes (26%), turtles (20%), salamanders (17%), and lizards (5.5%). Previously unrecorded species were observed each year, suggesting continued colonization by new species. Although most species observed are common in southern Illinois, four species of conservation concern were also encountered. When source populations occur nearby, constructed wetlands and associated terrestrial habitat are rapidly colonized by amphibians and reptiles. Constructed wetlands and adjacent reforested terrestrial habitat provide a habitable environment for amphibians and reptiles and have the potential to expand existing herpetofaunal populations, including those of species of conservation concern.

## INTRODUCTION

Through the efforts of a diverse assemblage of conservation partners, agricultural lands within the Cache River drainage of southern Illinois are being acquired to link existing conservation lands and reduce sediment input into the Cache River. Former agricultural land is being reforested with native bottomland hardwood trees (principally *Quercus palustris,* but also *Q. bicolor*, *Q. lyrata*, *Q. macrocarpa*, *Q. michauxii*, *Q. pagodaefolia*, *Q. phellos*, *Q. shumardii*, and *Carya illinoensis*) and wetlands are being constructed to reduce effects of floods. Constructed wetlands and reforested terrestrial habitat are assumed to provide suitable habitat for local fauna (Kruse and Groninger 2003, Palmer et al. 1997). I examined this assumption by studying amphibian and reptile colonization of three newly-constructed wetlands and adjacent early-successional terrestrial habitat at

Grassy Slough Preserve (GSP), a Nature Conservancy property in Johnson County, Illinois. In addition to documenting immediate herpetological colonization of newly-created habitat, I assessed suitability of newly-created wetlands as amphibian reproductive habitat by sampling for larvae and metamorphs. I used repeatable, quantitative methods to collect baseline data with which to make future herpetofaunal community comparisons possible.

## STUDY AREA

The study area is an approximately 1123 ha former vegetable farm along the Cache River, Johnson County, Illinois. In 1999, The Nature Conservancy (TNC) purchased the land and designated it Grassy Slough Preserve. In 1999-2000, TNC constructed 15 Wetland Reserve Program wetlands designed by the Natural Resources Conservation Service, and planted former cropland to hardwood tree seedlings. The preserve is bisected by the Forman Floodway, a channelized portion of the Cache River, and is bordered by the Cache River State Natural Area (CRSNA), cropland, and the town of Belknap (Figure 1).

Following cessation of crop production, pioneering herbaceous vegetation, especially *Hordeum pusillum*, *Setaria* sp., *Erigeron canadensis*, *Erigeron* sp., and *Solidago* spp. colonized the former cropland. Planted hardwood tree seedlings are visually inconspicuous in this herbaceous-dominated "oldfield" habitat. In addition to extensive oldfield habitat, bottomland forest, comprised of *Acer saccharinum, Acer negundo*, *Acer rubrum*, *Fraxinus pennsylvanica*, *Platanus occidentalis*, *Celtis laevigata*, *Betula nigra*, *Quercus palustris*, *Ulmus Americana,* and *Liquidambar styraciflua* occurs in narrow riparian corridors along the Cache River and a former channel of the river, as well as adjacent to the southwest and northeast borders of GSP. Upland forest, dominated by *Quercus* spp. and *Carya* spp, occurs on hills on GSP and CRSNA. Aquatic habitats, in addition to the constructed wetlands, include roadside and drainage ditches, irrigation ponds, sewage lagoons, and the present and former channels (including an oxbow) of the Cache River (Figure 1).

Prior to the present study, I surveyed the herpetofauna of GSP and CRSNA from 23 February through 30 June 2000 (Palis 2000). The objective of the 2000 survey was to determine the composition of the herpetofauna of GSP at the initiation of restoration efforts and to determine the suite of potential colonist species inhabiting adjacent CRSNA. Wetland Reserve Program wetlands (including those studied from 2001-2004) were just completed or being constructed at the time of the 2000 survey; therefore they were not included in the 2000 survey. The 2000 survey documented 48 species of amphibian and reptiles on CRNSA, all but one also occurred on GSP.

I focused my 2001-2004 survey efforts on three constructed wetlands (1, 4, and 11; Figure 1) and adjacent terrestrial habitat. Wetland 1 (17.5 ha) and Wetland 11 (7.75 ha) were constructed in spring 2000, whereas Wetland 4 (8.0 ha) was constructed in fall 1999. Each wetland was created by impounding water behind an earthen dam constructed at the low end of a shallow, gently-sloping valley. Although the maximum depth of each wetland is approximately 1.5 m, water depth is generally is $\leq$0.5 m. All three wetlands are permanent, and water levels and area inundated fluctuate with variations in precipitation.

During the study, all three wetlands were principally vegetated with algae, *Jussiaea repens*, and *Xanthium commune*.

Wetland 1 is within 150 m of Wetland 3, an oxbow in a former channel of the Cache River. During the 2000 survey, I observed 21 herpetofaunal species in Wetland 3 (before it was impounded in late spring 2000). Wetland 4 is within 800 m of forested wetlands and uplands on CRSNA where I encountered 10 herpetofaunal species in 2000. Wetland 11 is within 800 m of bottomland forest where, in 2000, I documented 9 herpetofaunal species.

## METHODS

I conducted three herpetofaunal surveys per year, once each in April, May, and June. I varied the order of visitation to the wetlands when employing all survey methods to avoid potential bias associated with time of day.

### Drift Fence Sampling

I constructed 21, 10-m long x 0.75 m-high drift fences from 0.9 m-wide x 30 m-long rolls of black silt-fence. I placed seven drift fences near each wetland, three in a y-shaped array in the adjacent terrestrial habitat, and four parallel to, and 8-12 m from, the shoreline of each wetland (two on the north side and two on the south side of each wetland; Figure 1). Fences in y-shaped arrays were 120º apart and radiated outward beginning 10 m from a central point. Each fence was supported by wood stakes, and the bottom of each fence was buried approximately 0.15 m in the ground to prevent animals from burrowing beneath. Due to excessive weathering, I replaced several drift fences each year. Prior to construction of drift fences, and at the beginning of each year, I cleared vegetation with a mechanical weed-eater or by hand up to 0.25 m away from each side of every fence.

I placed single-ended, cylindrical, aluminum window-screen funnel traps on both sides of each end of every fence (4 traps per fence). Funnel traps were 80 cm long x 20 cm wide and had an interior funnel opening 5 cm in diameter. The funnel of each trap faced toward the center of the fence. Each trap was molded to fit tight against the fence and ground, and was held in place by a 41-cm square tempered masonite shade board. Shade boards were leaned across each trap at an approximately 45 degree angle, from the ground to the fence. The shade board was held in place by a wood stake at the bottom and by the fence at the top. Each trap contained a moistened 7.5-cm x 12.5-cm cellulose sponge.

With the exception of May 2002, I trapped along drift fences for ten consecutive days per sample month. I split the May 2002 trapping period into two, 5-day periods (separated by 13 days) due to flooding that inundated nearshore traps. I inspected traps each day. I identified captures to species, and then marked cohorts by clipping a different toe on a hind foot (salamanders, frogs, and lizards), clipping a different ventral scute (snakes), or filing a different notch into a marginal scute of the carapace (turtles) each year. Scissors were dipped in alcohol between each use. I released all captures ≥1 m away on the opposite side of the fence or off to the side of the fence. I closed traps between survey periods by everting and closing the funnels.

**Coverboard Sampling**

I placed an array of 20 coverboards (0.6-m x 1.2-m x 0.6-cm thick chipboard) in the terrestrial habitat within 250 m each wetland (Figure 1). I arranged 10 boards, 10 m apart, in two parallel rows, 10 m apart. Due to excessive weathering, I replaced half of the boards at each wetland in 2004, alternating new boards with old boards. I checked boards irregularly in 2001 (220 board checks in April, 300 in May, and 180 in June; 700 board checks total), and six alternating days each in April, May, and June 2002-2004 (360 board checks per month per year; 1080 board checks total per year). At each check, I lifted one end of every board and captured, marked (as at drift fences), and released all amphibians and reptiles.

**Turtle Trapping**

I trapped turtles from 2002-2004 with baited, 2.54-cm mesh, 76.2-cm diameter, single-throated nylon hoop nets. I placed one net in relatively deep water parallel to, and near, the dam of each wetland. The top of each net extended above the water. I baited each net with a partially open can of sardines packed in oil which I suspended near the rear of each net. I trapped for 7 days in May 2002 (21 trap-days) and for 3 consecutive days in May 2003 and 2004 (9 trap-days per year). I checked nets each day they were open. I marked and released turtles, and released other, non-target animals near the net.

**Visual Encounter Surveys**

I conducted three diurnal wetland visual encounter surveys (WVES) per year by slowly wading through shallow, nearshore water and walking along the edge of each wetland, periodically scanning the substrate or water's surface with binoculars (10 x 40), dipnetting (4-mm mesh, 41-cm wide dipnet), and watching and listening for movement in the water and along the shore. I tallied the number of individuals of each species I encountered and recorded survey time. I surveyed each wetland a maximum of 2 hours per month. When positive identification was not possible (e.g., small *Pseudacris* larvae or briefly observed snakes or turtles), I recorded the lowest identifiable taxon.

I conducted three diurnal terrestrial visual encounter surveys (TVES) per year along predetermined linear transects near each wetland (see Figure 1). Transect length varied from 500 m near Wetland 4 to 800 m near Wetlands 1 and 11. I surveyed transects by slowly walking through the herbaceous vegetation, visually scanning and listening for movement, as well as turning cover (e.g., matted dead grass) with a long-handled potato rake. In terms of visibility, each transect was approximately 5 m wide. In June, however, visibility was often less than 5 m due to dense vegetative growth. I tallied the number of individuals of each species I encountered and recorded survey time.

**Anuran Vocalization Surveys**

I conducted four nocturnal anuran vocalization surveys per year to account for differences in anuran calling phenology (2001-2003: twice in April and once each in May and June; 2004: once each in late March, April, May and June). I listened for 10-15 minutes at each site, identified the species calling, and scored the chorus of each species as follows: 1 = one or more individuals calling, but no overlap; 2 = overlapping calls; and 3 = chorus, calls overlapping and continuous.

**Incidental Encounters**
From 2002-2004, I recorded species I encountered peripheral to other survey activities. In addition to recording direct observations of animals, I noted calling anurans.

## RESULTS

I observed a total of 21,148 individuals of 35 species of amphibians and reptiles -- all survey methods combined -- at, or near, all three wetlands combined from 2001-2004 (Tables 1 & 2). Because recapture rates of marked individuals was extremely low (1.6%), I included them in the total number of individuals observed. I observed 22 species in 2001, 26 in 2002, 25 in 2003, and 28 in 2004 (Table 1). I observed previously unrecorded species each year: six in 2002 (*Rana areolata*, *Chelydra serpentina*, *Agkistrodon piscivorus*, *Farancia abacura*, *Lampropeltis getula*, *Nerodia rhombifer*), two in 2003 (*Pseudemys concinna*, *Elaphe obsoleta*), and five in 2004 (*Siren intermedia*, *Kinosternon subrubrum*, *Sternotherus odoratus*, *Terrapene carolina*, *Eumeces fasciatus*). I observed 30 species and over 5,000 individuals at, or near, Wetland 1, including five species not observed elsewhere. I observed 8,000 individuals of 26 species at, or near, Wetland 4, and nearly 7,000 individuals of 24 species at, or near, Wetland 11 (Table 1).

Combined, WVES and drift fence trapping yielded the most species (N = 33; 94.3%) and individuals (N = 20,825; 98.5%) of all sampling methods (Table 2). Only two species were not recorded by these methods (*Eumeces fasciatus* and *Pseudemys concinna*). Six species comprised 89% of the WVES observations: *Acris crepitans*, *Bufo fowleri*, *Hyla chrysoscelis*, *Pseudacris crucifer*, *Pseudacris feriarum*, and *Rana sphenocephala*. Observations were principally of larvae and juveniles. The per-hour herpetofaunal encounter rate during the four-year period was 201.9 at Wetland 1, 304.0 at Wetland 4, and 247.6 at Wetland 11. The annual per-hour herpetofaunal encounter rate at all three wetlands combined was 247.7 in 2001, 250.4 in 2002, 224.9 in 2003, 289.5 in 2004 (253.8 overall).

Three amphibian species comprised nearly 82% of the total catch at all drift fences: *Rana sphenocephala* (44.0%), *Bufo fowleri* (19.6%), and *Acris crepitans* (18.1%). Captures at drift fences were dominated by juvenile amphibians: 96.4% in 2001, 94.5% in 2002, 77.0% in 2003, and 87.1% in 2004. The number of amphibians and reptiles captured at drift fences fluctuated among years (625 in 2001, 2255 in 2002, 451 in 2003, and 1277 in 2004). More herpetofaunal captures were made at Wetland 4 (N = 1782) than at Wetland 1 (N = 1477) or Wetland 11 (N = 1349).

Only 231 individuals of 12 species were encountered during coverboards checks and TVES (Table 2). *Bufo fowleri* (juveniles) and *Coluber constrictor* accounted for 75.6% of the observations during coverboard checks. The capture rate (per 100 coverboards) of individuals observed under coverboards was 0.28 in 2001, 4.44 in 2002, 1.94 in 2003, and 0.65 in 2004 (1.83 overall). Three amphibians (*Acris crepitans*, *Bufo fowleri*, and *Rana sphenocephala*) accounted for 93.5% of observations during TVES. The per-hour TVES herpetofaunal encounter rate during the four-year period was 5.71 near Wetland 1, 6.03 near Wetland 4, and 11.7 at Wetland 11. The annual per-hour encounter rate near all three wetlands combined was 6.13 in 2001, 14.9 in 2002, 9.3 in 2003, and 1.43 in 2004 (7.85 overall).

I captured 89 individuals of three turtle species, as well as one snake, in hoop nets during the four-year period (Table 2). The number of turtles and the turtle catch rate (number of turtles per trap-day) increased each year, from 16/0.7 in 2002, to 30/3.3 in 2003, and 43/4.7 in 2004. *Trachemys scripta* dominated the turtle catch (87.6%).

The number of anuran species documented by vocalization surveys at all three wetlands combined was 8 in 2001, 11 in 2002, 10 in 2003 and 10 in 2004. The three species added in 2002 include *Rana areolata*, *Rana catesbeiana*, and *Rana clamitans*. I did not hear *Rana areolata* in 2003 or *Rana clamitans* in 2004. The number of species with enough males to chorus increased from two in 2001 (*Acris crepitans*, *Hyla cinerea*) to five in 2002 (*Acris crepitans*, *Hyla chrysoscelis*, *Hyla cinerea*, *Pseudacris crucifer*, *Rana sphenocephala*), fell to four in 2003 (*Acris crepitans*, *Bufo fowleri*, *Hyla chrysoscelis*, *Hyla cinerea*), and rose to seven in 2004 (*Acris crepitans*, *Bufo americanus*, *Hyla chrysoscelis*, *Hyla cinerea*, *Pseudacris crucifer*, *Pseudacris feriarum*, *Rana sphenocephala*). Four species (*Acris crepitans*, *Bufo fowleri*, *Hyla chrysoscelis*, *Hyla cinerea*) chorused in at least one year in all three wetlands. Three species (*Rana areolata, Rana catesbeiana*, *Rana clamitans*) never chorused.

I observed a total of 15-20 herpetofaunal species per year incidental to other activities from 2002-2004 (Table 2). Two species, *Pseudemys concinna* and *Eumeces fasciatus*, were not encountered by any other survey method.

## DISCUSSION

Twenty-two species of amphibians and reptiles colonized the wetlands and adjacent early-successional terrestrial habitat within one year of wetland construction. Rapid colonization of GSP wetlands is consistent with observations of amphibian colonization elsewhere (Lehtinen and Galatowitsch 2001, Pechmann et al. 2001). Rapid colonization by amphibians may be the result of chance encounters of adults moving towards historic breeding sites and/or maturing juveniles dispersing from their natal wetlands. Reptile colonization may be the result of foraging behavior or terrestrial wandering. Many snakes have large home ranges (Maccartney et al. 1988) and turtles wander overland in search of nesting sites or mates (Obbard and Brooks 1980, Morreale et al. 1984). Eighteen herpetofaunal species were documented at, or near, all three wetlands suggesting they are especially adept at colonizing new habitat.

The cumulative total number of herpetofaunal species colonizing the new habitat continued to rise during the study, from 22 in 2001 to 35 in 2004. All species documented during this survey were, except for *Farancia abacura* and *Pseudemys concinna*, previously observed on GSP prior to wetland construction (Palis 2000). Given that pre-wetland construction surveys of GSP and adjacent CRSNA yielded a total of 48 herpetofaunal species, the number of species colonizing the wetlands and adjacent terrestrial habitat will likely increase as habitat conditions become more favorable for a greater variety of species.

My observation of large numbers of larval and juvenile amphibians suggests that the newly-created wetlands provide quality larval habitat. Canopy-free wetlands are highly productive systems (Moore 1970). Unimpeded input of solar radiation results in elevated water temperatures and abundant periphyton (Feminella et al. 1989, Petranka et al. 2003). Anuran larvae grow and develop quickly at warm water temperatures (Newman 1998, Skelly et al. 2002) and periphyton is a significant food of larval anurans (Dickman 1968, Seale 1980). Larval amphibians are also likely to benefit from the lack of established populations of predators and competitors in newly constructed wetlands (Hecnar and M'Closkey 1997, Smith 1983). The temporal increase in the number of anuran species abundant enough to chorus suggests that the wetlands and adjacent early-successional terrestrial habitat may be suitable for maturation of juvenile anurans.

I observed four Illinois species of conservation concern (Illinois Department of Natural Resources 2005) on GSP: *Rana areolata*, *Pseudemys concinna*, *Nerodia erythrogaster neglecta* and *Thamnophis sauritus*. *Rana areolata* successfully reproduced (produced metamorphs) in two of the newly created wetlands in two years. Both snake species appeared to be relatively common and widespread on GSP. With 42 and 22 individuals, respectively, *Thamnophis sauritus* and *Nerodia erythrogaster neglecta* were the third and fourth most commonly captured snakes at drift fences. Moreover, *Nerodia erythrogaster neglecta* was the most commonly observed snake during wetland visual encounter surveys (68.7% of all snakes observed at all three wetlands). With only one individual fortuitously encountered, *Pseudemys concinna* is likely a rare or transient occupant of GSP.

## SUMMARY

Newly-constructed wetlands and adjacent early-successional terrestrial habitat are rapidly colonized by herpetofauna when source populations occur nearby. Newly-constructed wetlands and associated terrestrial habitat in the Cache River drainage of southern Illinois can provide suitable habitat for amphibians and reptiles, and have the potential to expand populations of the indigenous herpetofauna, including those of species of conservation concern. Terrestrial habitat conditions at GSP are expected to change over time from herbaceous-dominated oldfield to closed-canopy forest. As the canopy closes, forest-dwelling amphibian and reptile species will likely colonize GSP whereas herpetofaunal species associated with early successional, open-canopied habitats will likely decline in abundance (Fitch 2006, Skelly et al. 1999).

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Table 1. Number of amphibians and reptiles observed at/near wetlands 1, 4, and 11 from 2001-2004, all sampling methods combined.

| SPECIES | WETLAND 1 | WETLAND 4 | WETLAND 11 | TOTAL |
|---|---|---|---|---|
| SALAMANDERS | | | | |
| *Ambystoma opacum* (marbled salamander) | 0 | 0 | 2 | 2 |
| *Ambystoma talpoideum* (mole salamander) | 5 | 12 | 0 | 17 |
| *Ambystoma texanum* (smallmouth salamander) | 93 | 58 | 33 | 184 |
| *Ambystoma tigrinum* (tiger salamander) | 6 | 2 | 0 | 8 |
| *Notophthalmus viridescens* (eastern newt) | 15 | 11 | 4 | 30 |
| *Siren intermedia* (lesser siren) | 0 | 5 | 0 | 5 |
| TOTAL | 119 | 88 | 39 | 246 |
| ANURANS | | | | |
| *Acris crepitans* (cricket frog) | 2607 | 2017 | 3183 | 7807 |
| *Bufo americanus* (American toad) | 107 | 0 | 0 | 107 |
| *Bufo fowleri* (Fowler's toad) | 322 | 1485 | 787 | 2594 |
| *Bufo* sp. (unidentified) | 50 | 100 | 300 | 450 |
| *Hyla chrysoscelis* (gray treefrog) | 199 | 930 | 250 | 1379 |
| *Hyla cinerea* (green treefrog) | 190 | 24 | 4 | 218 |
| *Pseudacris crucifer* (spring peeper) | 28 | 238 | 13 | 279 |
| *Pseudacris feriarum* (upland chorus frog) | 12 | 241 | 27 | 280 |
| *Pseudacris* sp. (unidentified) | 110 | 515 | 115 | 740 |
| *Rana areolata* (crawfish frog) | 2 | 10 | 0 | 12 |
| *Rana catesbeiana* (bullfrog) | 30 | 15 | 480 | 525 |
| *Rana clamitans* (green frog) | 2 | call | 3 | 5 |
| *Rana sphenocephala* (southern leopard frog) | 1436 | 2792 | 1618 | 5846 |
| *Rana* sp. (unidentified) | 2 | 7 | 4 | 13 |
| TOTAL | 5097 | 8374 | 6784 | 20255 |
| TURTLES | | | | |
| *Chelydra serpentina* (snapping turtle) | 3 | 4 | 4 | 11 |
| *Chrysemys picta* (painted turtle) | 8 | 1 | 3 | 12 |
| *Kinosternon subrubrum* (eastern mud turtle) | 1 | 0 | 0 | 1 |
| *Pseudemys concinna* (slider) | 1 | 0 | 0 | 1 |
| *Sternotherus odoratus* (stinkpot) | 1 | 0 | 0 | 1 |
| *Terrapene carolina* (eastern box turtle) | 0 | 1 | 0 | 1 |
| *Trachemys scripta* (red-eared slider) | 42 | 80 | 28 | 150 |
| Unidentified Turtle | 10 | 116 | 3 | 129 |
| TOTAL | 66 | 202 | 38 | 306 |
| LIZARDS | | | | |
| *Eumeces fasciatus* (five-lined skink) | 1 | 0 | 0 | 1 |
| Scincella *lateralis* (ground skink) | 1 | 0 | 1 | 2 |
| TOTAL | 2 | 0 | 1 | 3 |

Table 1, continued.

| SPECIES | WETLAND 1 | WETLAND 4 | WETLAND 11 | TOTAL |
|---|---|---|---|---|
| SNAKES | | | | |
| *Agkistrodon piscivorus* (cottonmouth) | 4 | 1 | 0 | 5 |
| *Coluber constrictor* (racer) | 31 | 20 | 31 | 82 |
| *Elaphe obsoleta* (rat snake) | 1 | 0 | 1 | 2 |
| *Farancia abacura* (mud snake) | 0 | 0 | 1 | 1 |
| *Lampropeltis getula* (common kingsnake) | 0 | 9 | 5 | 14 |
| *Nerodia erythrogaste*r (plainbelly water snake) | 31 | 11 | 4 | 46 |
| *Nerodia rhombifer* (diamondback water snake) | 7 | 0 | 1 | 8 |
| *Thamnophis sauritus* (eastern ribbon snake) | 26 | 9 | 8 | 43 |
| *Thamnophis sirtalis* (eastern garter snake) | 26 | 49 | 57 | 132 |
| *Thamnophis* sp. (unidentified) | 1 | 0 | 0 | 1 |
| Unidentified Snake | 2 | 2 | 0 | 4 |
| TOTAL | 129 | 101 | 108 | 338 |
| | | | | |
| TOTAL INDIVIDUALS | 5413 | 8765 | 6970 | 21148 |
| TOTAL SPECIES | 30 | 26 | 24 | 35 |
| SPECIES UNIQUE TO WETLAND | 5 | 2 | 2 | |

Table 2. Number of amphibians and reptiles observed at/near wetlands 1, 4, and 11 from 2001-2004, by sampling method. Dfence = drift fence, Cboard = coverboard, Hopnet = hoop net, WetVES = wetland visual encounter survey, TerVET = terrestrial visual encounter survey, Fvocal – frog vocalization survey, and Indntl = incidental observation. An "x" denotes a non-numeric observation.

| SPECIES | Dfence | Cboard | HopNet | WetVES | TerVES | Fvocal | Indntl |
|---|---|---|---|---|---|---|---|
| SALAMANDERS | | | | | | | |
| *Ambystoma opacum* | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Ambystoma talpoideum* | 3 | 0 | 0 | 14 | 0 | 0 | 0 |
| *Ambystoma texanum* | 90 | 2 | 0 | 91 | 1 | 0 | x |
| *Ambystoma tigrinum* | 7 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Notophthalmus viridescens* | 1 | 0 | 0 | 29 | 0 | 0 | 0 |
| *Siren intermedia* | 0 | 0 | 0 | 5 | 0 | 0 | 0 |
| TOTAL | 102 | 2 | 0 | 141 | 1 | 0 | N/A |
| ANURANS | | | | | | | |
| *Acris crepitans* | 834 | 0 | 0 | 6940 | 33 | x | x |
| *Bufo americanus* | 0 | 0 | 0 | 107 | 0 | x | x |
| *Bufo fowleri* | 906 | 42 | 0 | 1552 | 94 | x | x |
| *Bufo* sp. (unidentified) | 0 | 0 | 0 | 450 | 0 | 0 | 0 |
| *Hyla chrysoscelis* | 250 | 0 | 0 | 1128 | 1 | x | x |
| *Hyla cinerea* | 2 | 0 | 0 | 216 | 0 | x | x |
| *Pseudacris crucifer* | 69 | 0 | 0 | 210 | 0 | x | x |
| *Pseudacris feriarum* | 95 | 0 | 0 | 184 | 1 | x | x |
| *Pseudacris* sp. (unidentified) | 5 | 0 | 0 | 735 | 0 | 0 | 0 |
| R*ana areolata* | 11 | 0 | 0 | 1 | 0 | x | 0 |
| *Rana catesbeiana* | 14 | 0 | 0 | 511 | 0 | x | x |
| *Rana clamitans* | 2 | 0 | 0 | 3 | 0 | x | x |
| *Rana sphenocephala* | 2029 | 2 | 0 | 3799 | 16 | x | x |
| *Rana* sp. (unidentified) | 1 | 0 | 0 | 12 | 0 | 0 | 0 |
| TOTAL | 4218 | 44 | 0 | 15848 | 145 | N/A | N/A |
| TURTLES | | | | | | | |
| *Chelydra serpentina* | 1 | 0 | 7 | 3 | 0 | 0 | x |
| *Chrysemys picta* | 2 | 0 | 4 | 6 | 0 | 0 | x |
| *Kinosternon subrubrum* | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Pseudemys concinna* | 0 | 0 | 0 | 0 | 0 | 0 | x |
| *Sternotherus odoratus* | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Terrapene carolina* | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Trachemys scripta* | 15 | 1 | 78 | 56 | 0 | 0 | x |
| Unidentified Turtle | 0 | 0 | 0 | 129 | 0 | 0 | x |
| TOTAL | 19 | 1 | 89 | 196 | 0 | 0 | N/A |
| LIZARDS | | | | | | | |
| *Eumeces fasciatus* | 0 | 0 | 0 | 0 | 0 | 0 | x |
| *Scincella lateralis* | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 2 | 0 | 0 | 0 | 0 | 0 | N/A |

Table 2, continued.

| SPECIES | Dfence | Cboard | HopNet | WetVES | TerVES | Fvocal | Indntl |
|---|---|---|---|---|---|---|---|
| SNAKES | | | | | | | |
| *Agkistrodon piscivorus* | 5 | 0 | 0 | 0 | 0 | 0 | x |
| *Coluber constrictor* | 63 | 17 | 0 | 0 | 2 | 0 | x |
| *Elaphe obsoleta* | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| *Farancia abacura* | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Lampropeltis getula* | 5 | 7 | 0 | 0 | 2 | 0 | x |
| *Nerodia erythrogaster* | 22 | 0 | 1 | 22 | 1 | 0 | x |
| *Nerodia rhombifer* | 5 | 0 | 0 | 3 | 0 | 0 | x |
| T*hamnophis sauritus* | 42 | 0 | 0 | 1 | 0 | 0 | x |
| *Thamnophis sirtalis* | 123 | 6 | 0 | 1 | 2 | 0 | x |
| *Thamnophis* sp. (unidentified) | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Unidentified Snake | 0 | 0 | 0 | 4 | 0 | 0 | 0 |
| TOTAL | 267 | 31 | 1 | 32 | 7 | 0 | N/A |
| TOTAL INDIVIDUALS | 4608 | 78 | 90 | 16217 | 153 | N/A | N/A |
| TOTAL SPECIES | 29 | 8 | 4 | 26 | 10 | 11 | 23 |
| SPECIES UNIQUE TO SAMPLING METHOD | 1 | 0 | 0 | 3 | 0 | 0 | 2 |

Figure 1. Location of wetlands 1, 4, and 11, as well as drift fences, coverboard arrays, and terrestrial VES transects.

# Grassy Slough Preserve