Transactions of the Illinois State Academy of Science
(1999), Volume 92, 3 and 4, pp. 277-283

received 1/8/99
accepted 6/2/99

Translocations of Amphibian Species Outside Their Native Range: A Comment on Thurow (1994, 1997)

Robert E. Szafoni
Illinois Department of Natural Resources
Division of Natural Heritage
Charleston, IL 61920

Christopher A. Phillips
Illinois Natural History Survey
Center for Biodiversity
Champaign, IL 61820

Michael Redmer[1]
Department of Zoology
Southern Illinois University at Carbondale
Carbondale, Illinois 62901

[1]Present address:
21 W. 103 Par Lane
Itasca, Illinois 60143

ABSTRACT

We question the rationale and methodology behind two recent amphibian translocations into west-central Illinois. In both cases, species were translocated outside their native ranges and no rigorous criteria for gauging success were utilized. We are concerned that translocations such as these will give the mistaken impression that new populations of amphibians can be easily established, even in marginal habitats, and that any translocation effort will result in successful amphibian conservation.

INTRODUCTION

The current status of amphibian distribution and abundance is generating much concern among herpetologists, conservation biologists, natural resource managers, and the general public (Wyman, 1990; Blaustein et al., 1994). Dramatic declines in local populations, malformations, and extirpations have been reported while impacts of acid rain, ultraviolet radiation, pollution, pesticide use, and habitat loss are the focus of much research. While no one factor has been established as the major cause underlying these declines, interest in identifying and ameliorating these factors and their negative effects on amphibian populations is high.

Concerns over declining amphibian populations are compounded by the fact that most amphibians are poor colonizers of unoccupied habitats (Petranka, et al., 1993), especially where habitat is fragmented by development or agriculture and dispersal corridors are limited or absent. The combination of low vagility and population declines has resulted in renewed interest in translocations of amphibians to suitable habitats. The ability to collect many individuals from a few areas or move egg masses from known breeding sites has contributed to the increase in the popularity of amphibians as translocation subjects. As pointed out by Dodd and Siegel (1991), however, caution should be exercised when considering translocation as a potential conservation measure, especially for endangered or threatened species.

Thurow (1994,1997) described efforts to translocate two species of amphibians into west-central Illinois. While these studies contribute some basic biological information for the species involved (the wood frog, *Rana sylvatica* and the two-lined salamander, *Eurycea cirrigera*), we question several aspects of the rationale for these translocations, the interpretation of data, and especially the implications for amphibian conservation.

TRANSLOCATION RATIONALE

Thurow (1994, 1997) suggests that *E. cirrigera* and *R. sylvatica* formerly occurred in west-central Illinois and that anthropogenic causes or recent climate change have caused range contractions. For *E. cirrigera*, the species' current U.S. range is described as "N, S, E, and even W (in Mississippi and Louisiana)" of west-central Illinois as evidence of past existence in this part of the state. However, the current distribution of *E. cirrigera* (Fig. 1a) actually argues against its existence in west-central Illinois. There are no records for northern Illinois or the states of Wisconsin or Michigan. With the exception of the Kankakee and Will county populations, there are no known records of *E. cirrigera* in Illinois outside the Wabash-Ohio river drainage (Smith, 1961; Mierzwa, 1989). A more plausible scenario, suggested by Smith and Minton (1957), is that the range of *E. cirrigera* has been determined by the distribution of the eastern deciduous forest, which has been fairly stable in Illinois since the end of the Hypsithermal Interval, 6,000 years before present (YBP) (Webb and Bryson, 1972).

Thurow (1994) cites *R. sylvatica* records from Peoria and Rock Island counties as evidence that this species historically occurred in west-central Illinois. The Peoria County record, although accepted by Smith (1961), is unverified and both records are subject to question (Redmer, 1998). We believe the current distribution of *Rana sylvatica* was restricted by the development of the Prairie Peninsula (sensu Transeau, 1935) during the Hypsithermal Interval 8,000 - 6,000 YBP (Smith 1957). The historic and, in some cases, current distributions of many species of plants and animals are restricted to or by the Prairie Peninsula. Such distributions can be observed in Illinois plants (Mohlenbrock and Ladd, 1978), amphibian and reptiles (Smith and Minton, 1957; Bock, et al., 1981) and mammals (Hoffmeister, 1989). In particular, this is likely true for species of low vagility or colonizing potential that depend on moist, closed forest communities for their survival such as forest amphibians. The Illinois range map for *R. sylvatica* (Fig. 1b) exemplifies this biogeographic effect. The historic range of *R. sylvatica* almost certainly did not include large portions of the Prairie Peninsula.

While it is possible that *E. cirrigera* and *R. sylvatica* may have occurred in west-central Illinois over geologic time, as did black spruce, red pine, and hemlock (King, 1981), there is no evidence that either species existed in west-central Illinois.

DATA INTERPRETATION

Thurow (1994,1997) suggests more can be learned about habitat restrictions and possible conservation measures from these translocations. However, we see no evidence of any control populations being monitored in existing or, more appropriately, donor habitats. Without past or concurrent information on breeding success within known ranges, the significance of the data and interpretations is weakened.

We also raise questions regarding some of the ". . . useful information (that) has been generated" (Thurow, 1997; 85-86). Specifically:

"(1) Translocations of about 200 individuals appears sufficient to establish a colony in good habitat. The number could be smaller."

We do not believe that Thurow (1997) provides adequate data to demonstrate minimum numbers of translocated individuals to establish viable populations. It appears from the methods that animals were continually released over several years at Thurow's sites as collections at the donor sites permitted. In the 4 sites deemed successful (1,2,4, and 6), 504, 304, 496, and 223 animals were released (mean = 382). Further, because introductions continued to take place after the first sign of reproduction, it is not known whether subsequent reproduction can be attributed to an "established" population or the release of additional individuals. Finally, the minimum number of individuals required to achieve <u>any</u> sign of reproduction cannot be considered to be the minimum founder population size until further and continued reproduction, without additional releases, is documented.

"(2) Under special circumstances, the wet area occupied by a colony can be less than $200m^2$, or even $26m^2$ of stream bottom."

Over the short term, this appears to be true. However, the long term persistence of populations in such small and isolated habitats is questionable at best. Indeed, if *E. cirrigera* may have occurred in west-central Illinois, the small and widely scattered distribution of suitable microhabitats and their distance from the main species range in the eastern United States could explain its extirpation from the area over geologic time. Small, isolated populations are far more prone to extinction than larger populations or those closer to the main range (Noss and Cooperrider, 1994 and references therein).

"(3) Two-lined salamanders can survive in drier west-central Illinois, when more suitable habitat is found or created".

Data from sites 1 and 2, at least, strongly suggest that *E. cirrigera* can persist for some time when placed in a suitable <u>microhabitat</u>. As a region, however, west-central Illinois receives approximately 2.5cm less precipitation than eastern Illinois, where *E. cirrigera* occurs naturally (Fentem, 1996; Neely & Heister, 1987) Thurow's data do suggest that when drought causes seeps and springs to cease flowing, (sites 3& 4), reproduction and/or survival may be severely reduced. Droughts and drought severity appear to be as common in eastern Illinois and west-central Illinois (Neely & Heister, 1987).

"(4) Although the preferred habitat is clear rock-bottomed streams in forested areas, seepage slope films can also be used, particularly if there are seepage pools downstream. "

Many plants and animals may persist and reproduce in marginal habitats but the long term viability of such populations is extremely tenuous (Maurer, 1986). In the case of forest-interior birds in small woodlots, populations are almost exclusively maintained by immigration of individuals born elsewhere (Robinson, et al., 1995). No data are presented that compare salamander population ecology in these seepages and springs with that in its preferred native habitat.

"(5) Pristine sites are not necessary and survival can occur in selectively lumbered redeveloping oak-hickory forest."

If *E. cirrigera* was limited to pristine forest, it would be a rare animal indeed. Within its native Illinois range, only 1552 acres of high quality mesic forest remain (White, 1978) yet *E. cirrigera* is not a rare animal in this area (Smith, 1961; Mierzwa, 1989).

"(6) Devegetation of drainage basins tend to cause xerification and loss and deterioration of surface waters and stream flow regimes, and should be avoided in and around nature preserves for semiaquatic animals like the two-lined salamander."

We do not argue the potential truth of this statement. However, we can find no data in Thurow (1997) that tests or supports this assertion. Further, references used to support this statement (e.g. Bowman, 1991; Sheperd, 1975; Visocky, 1993) do not relate these impacts to amphibians but rather acknowledge that, in general, droughts occur and can lower water tables, deforestation can lead to drier ground conditions and higher water temperatures, and deteriorating water quality can impact stream biota. Studies that have investigated these effects specifically on herps would have been far more appropriate.

IMPLICATIONS FOR AMPHIBIAN CONSERVATION

A common goal of conservation is to protect, maintain, and enhance viable populations over the long-term. Most, if not all, conservation biology literature suggests that this is best done by protecting core populations and landscapes and by protecting or providing biological linkages of value to the populations of concern (e.g. Noss & Cooperrider, 1994 and references therein). The introduction of species well outside their historic ranges creates isolated populations that will likely not contribute to the long-term persistence of the species. Such efforts would seem to be more closely associated with captive breeding programs of arboreta, aquaria, and zoos than the stewardship of biological systems in the field.

Of concern to us is the implication from Thurow (1997) that mitigating damage to natural populations can be easily achieved by creating new populations almost anywhere. We are especially concerned about the "attractiveness" of such conservation measures for species in which a large numbers of individuals or their propagules can be easily collected (e.g. some plants, and many amphibians).

Translocation and reintroduction are arguably the most visible and publicly interesting methods of species protection, much more so than habitat protection or management, and

frequently proceed with less political controversy. Indeed, one of the first questions asked of one of us (RES) when rare species are put at risk by a particular action is "Can't you move them somewhere else?". Reviews of translocation efforts have suggested that success is low (Dodd & Seigel, 1991) and even those numbers may be inflated by the lack of reporting all failed attempts. In our opinion, translocation should be the method of last resort, yet the notion of "moving them" is widely held by the general public.

We do not suggest that Thurow (1997) advocates widespread releases of amphibians. Indeed, Thurow (1994) provides some guidelines for conducting species releases, including that they should not: 1) be done for no reason, 2) over-collect donor populations, 3) place released animals far outside of the region or biome they came from, nor 4) greatly alter any patterns of genetic polymorphisms that may exist. To this we would most strongly add that if releases are biologically justified, they should be done within the known recent or current range of the species and as close to core populations as feasible. The implication that amphibian conservation can be achieved by creating small, isolated population outside the species known range does a disservice to efforts to promote the stewardship of Illinois' natural heritage and the concept of ecosystem management.

ACKNOWLEDGMENTS

The authors thank Christopher A. Taylor, Kevin S. Cummings, and 3 anonymous reviewers for helpful comments on an earlier draft of the manuscript.

REFERENCES

Blaustein, A. R., D. B. Wake, and W. P. Sousa. 1994. Amphibian declines: judging stability, persistence, and susceptibility of populations to local and global extinctions. Cons. Biol. 8:60-71.

Bock, J. H., C. E. Bock, and R. J. Fritz. 1981. Biogeography of Illinois reptiles and amphibians: a numerical analysis. Am. Midl. Nat. 106:258-270.

Bowman, J. A. 1991. Groundwater supply and demand in Illinois. Illinois State Water Survey, Champaign, IL. 91pp.

Dodd, C. K. and R. A. Seigel. 1991. Relocation, repatriation, and translocation of amphibians and reptiles: are they strategies that work? Herpetol. 47:336-350.

Fentem, A. D. 1996. The physical environment: climate, vegetation, and soils. pp. 63-104 in Nelson, R. E. (ed.) Illinois - A Geographical Survey. Kendall/Hunt Publ., Dubuque, IA. 344pp.

Hoffmeister, D. F. 1989. Mammals of Illinois. Univ. Ill. Press, Urbana. 348pp.

King, J. E. 1981. Late quaternary vegetational history of Illinois. Ecol. Monog. 51:43- 62.

Maurer, B. A. 1986. Predicting habitat quality for grassland birds using density-habitat correlations. J. Wildl. Manage. 50:556-566.

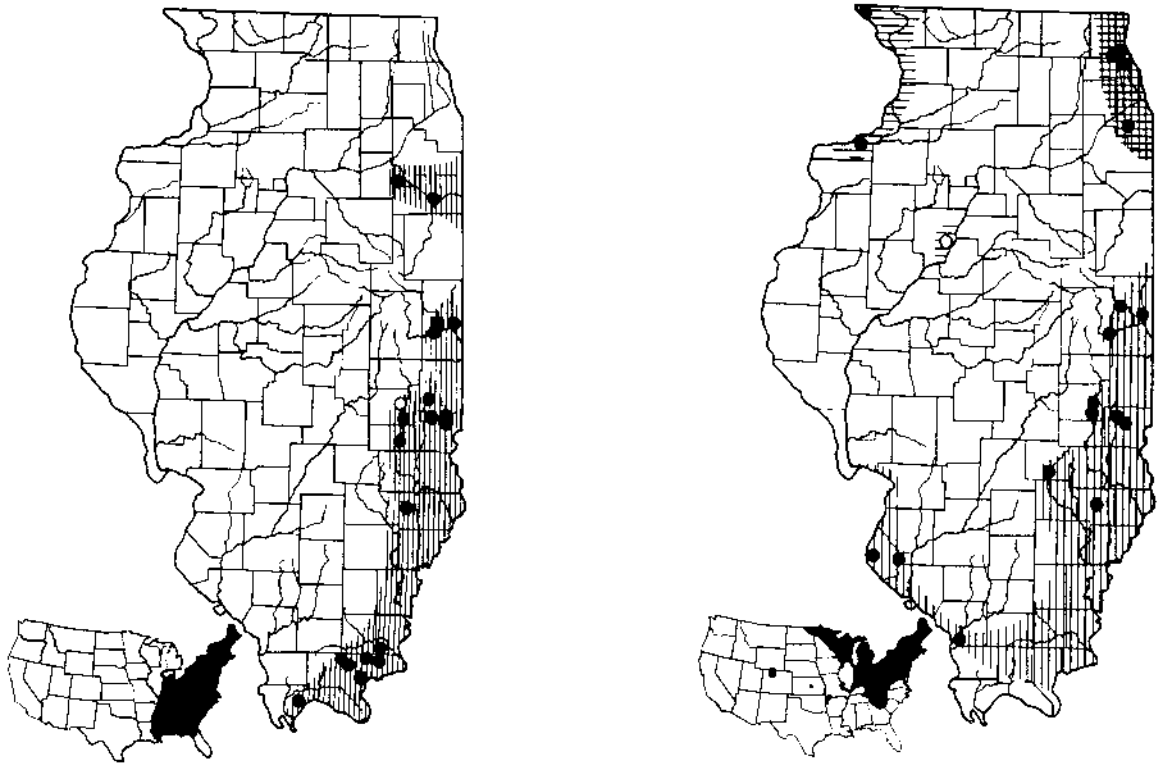
Mierzwa, K. S. 1989. Distribution and habitat of the two-lined salamander, *Eurycea cirrigera*, in Illinois and Indiana. Bull. Chicago Herp. Soc. 30:248-250.

Mohlenbrock, R. H. and D. M. Ladd. 1978. Distribution of Illinois vascular plants. SIU Press, Carbondale. 282pp.

Neely, R. D. and C. G. Heister. 1987. The natural resources of Illinois: introduction and guide. Ill. Nat. Hist. Sur., Special Publ. 6. 224pp.

Noss R. F. and A. Y. Cooperrider. 1994. Saving Nature's Legacy. Island Press, Covelo, CA. 416pp.
Petranka, J. W., M. E. Eldridge, and K. E. Haley. 1993. Effects of timber harvesting on southern Appalachian salamanders. Cons. Biol. 7:363-370.
Redmer, M. 1998. Status and distribution of two uncommon frogs, pickerel frog and wood frog, in Illinois. pp. 83-90 in Lannoo, M. J. (ed.) Status and Conservation of Midwestern Amphibians. Univ. Iowa Press, Iowa City. 507pp.
Robinson, S. K., F. R. Thompson, III, T. M. Donovan, D. R. Whitehead, and J. Faaborg. 1995. Regional forest fragmentation and the nest success of migratory birds. Science 267:1987-1890.
Shepard, J. 1975. The forest killers. Weybright and Turvey, NY. 423pp.
Smith, P. W. 1957. An analysis of post-Wisconsin biogeography of the Prairie Peninsula region based on distributional phenomena among terrestrial vertebrate populations. Ecol. 38:205-218.
Smith, P. W. 1961. The amphibians and reptiles of Illinois. Ill. Nat. His. Sur. Bull. 28(1):1-287.
Smith, P. W. and S. A. Minton. 1957. A distributional summary of the herpetofauna of Indiana and Illinois. Am. Midl. Nat. 58:341-351.
Thurow, G. R. 1994. Experimental return of wood frogs to west-central Illinois. Trans. Ill. Acad. Sci. 87:83-97.
Thurow, G. R. 1997. Ecological lessons from two-lined salamander translocations. Trans. Ill. Acad. Sci. 90:79-88.
Transeau, E. N. 1935. The Prairie Peninsula. Ecol. 16:423-437.
Visosky, A. P. 1993. Water-level trends and pumpage in the deep bedrock aquifers in the Chicago region, 1985-1991. Illinois State Water Survey. Circ. 177. 44pp.
Webb, T., III, and R. A. Bryson. 1972. Late- and postglacial climatic change in the northern Mid-west, USA: Quantitative estimates derived from fossil pollen spectra by multivariate statistical analysis. Quater. Res. 2:70-115.
White, J. 1978. Illinois Natural Areas Inventory - Technical Report. Univ. Ill, Urbana and Natural Land Institute, Rockford, IL. 426pp.
Wyman, R. L. 1990. What's happening to amphibians? Cons. Biol. 4:350-354.

Figure 1. a) Illinois and United States distribution of the two-lined salamander, *Eurycea cirrigera* (formerly *E. bislineata*) and b) the wood frog, *Rana sylvatica* from Smith (1961).



a

b