

***Herpetological Associates, Inc. - Environmental Consultants  
- Plant and Wildlife Specialists -***

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November 13, 2009

**David M. Golden, Principal Zoologist**  
***Endangered and Nongame Species Program***  
Division of Fish and Wildlife  
New Jersey Department of Environmental Protection  
2201 Route 631, Woodbine, New Jersey 08270

Re: New Jersey Builders Association Petition for Rulemaking Request to Amend Rules to Delist the Northern Pine Snake as a Threatened Species & Rebuttal to Dr. Joseph C. Mitchell's Report.

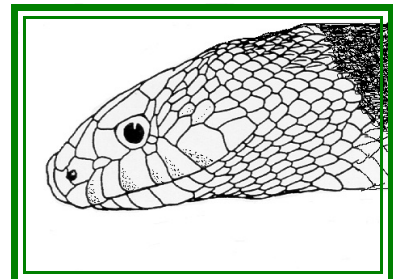
Dear Mr. Golden:

As you know, on August 6, 2009, Elizabeth George-Cheniara, Esq., representing the New Jersey Builders Association, submitted a "Petition for Rulemaking (e.g., Division of Fish and Wildlife Rules, N.J.A.C. 7:25-4.17)," request to amend the rules to delist the northern pine snake (*Pituophis m. melanoleucus*) as a threatened species in New Jersey.

I'm writing this letter urging the Division of Fish and Wildlife, New Jersey Department of Environmental Protection to keep the northern pine snake, as a "threatened" species because I strongly disagree with the New Jersey Builders Association's (hereafter NJBA) petition and the report written by their hired consultant, Joseph C. Mitchell, Ph.D. (hereafter Dr. Mitchell), for several reason which are detailed below in this document. I argue herewith, that not only should the northern pine snake remain on the state of New Jersey's "threatened species list," but my personal observations suggest that the species may actually be on the decline within its known range in New Jersey and elsewhere in eastern United States.

**My Background and Qualifications**

I, along with several colleagues such as Joanna Burger, PhD, Rutgers University; Michael Gochfeld (PhD, MD- UMDNJ-Robert Wood Johnson Medical School); Howard K. Reinert, PhD, College of New Jersey; Michael Torocco, MS, PA Regional Manager, Herpetological Associates, Inc. (hereafter HA); Dave Schneider, Southern NJ Regional Manager, HA; Matthew McCort, Northern NJ Regional Manager, HA; and many others who have studied the ecology and behavior of snakes in general and the northern pine snake in particular over the past 35-years.



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Between 1974 and 1977 I served as Associate Curator of Herpetology and Education, at the Staten Island Zoological Society in New York. The responsibilities of this position included curatorial administration, in-house lecturing, teaching, scientific and popular writing, herpetological research, inventory of zoo specimens, zoo exhibit planning, assist zoo veterinarian with animal care, scientific collection, public relations, education programs, film-making and wildlife photography. Between 1964 and 1974 I was a Reptile Keeper at the Staten Island Zoo and reported directly to the late Carl F. Kauffeld, Zoo Director and Curator of Reptiles.

In 1977, I founded Herpetological Associates, Inc., an environmental consulting company that specializes in the conservation biology of threatened and endangered plants and wildlife species. HA also does environmental monitoring, wildlife assessments, habitat evaluations and designs management plans for plants and wildlife. We also conduct adverse impact analysis, assess development projects and design mitigation plans. I and my staff have conducted over 250 herpetological surveys for a variety of clients and sometimes provided expert witness and testimony.

I am a published author and wildlife photographer. Many of my photographs have appeared in books and magazines, including National Geographic. I have served as a consultant to the Endangered and Nongame Species Program, Division of Fish and Wildlife (NJDEP), the Division of Coastal Resources, the New Jersey Pinelands Commission, the Trust for Public Land, the Pinelands Preservation Alliance, the NJ Conservation Foundation and The Nature Conservancy.

I have been invited to lecture and be a guest speaker at numerous museums, zoos and universities from 1964 to 2009 such as: Taiwan Normal University - Republic of China, New York University, Trenton State College, University of Western North Carolina, Rutgers University, Trenton State Museum, Morris Museum, Staten Island Museum, Staten Island Zoo, Philadelphia Zoo, Atlanta Zoo, Taipei Zoo, Taiwan, Republic of China, New Jersey Audubon Society, National Audubon Society, New York Herpetological Society, Connecticut Herpetological Society, Florida Herpetological Society, Georgia Herpetological Society, North Carolina Herpetological Society, All Florida Herpetological Conference, and The Nature Conservancy.

I have also given oral papers at several annual meetings of the Society for the Study of Amphibians and Reptiles (SSAR), the University of Georgia - Savanna River Ecology Laboratory Site (SREL) and the National Zoo, Washington, D.C. I am a "Life Member" of the New Jersey Academy of Science, the SSAR and the Gopher Tortoise Council. I am also listed as a "Qualified Bog Turtle Surveyor and Trapper" by the US Fish and Wildlife Service.

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**Specific Northern Pine Snake Research**

While working at the Staten Island Zoo, my colleagues and I began studies on the pine snake in New Jersey (see: Zappalorti, R. T., E. W. Johnson, and Z. Leszczynski. 1983. The Ecology of the Northern Pine Snake (*Pituophis melanoleucus*), (Daudin - Reptilia, Serpentes, Colubridae), in Southern New Jersey, with special notes on habitat and nesting behavior. Bulletin, Chicago Herpetological Society 18:57-72). I also co-authored a preliminary management plan for pine snakes for the Division (Frier and Zappalorti 1983). I have observed pine snakes throughout their range in the eastern United States, which includes southern New Jersey, North Carolina, South Carolina, Georgia, and Florida.

In 1986, I began collaborating with Dr. Joanna Burger and together we have studied northern pine snakes ever since (1986 to 2009). Our studies were conducted both in the laboratory and the field. Jointly, we have internationally published more scientific papers on the northern pine snake than any other person or group (see the bibliography in this document). Dr. Burger and I have studied habitat use, mating, nesting behavior, movements and home range, hibernation behavior and the effect of incubation temperature on egg/neonate development, among several other topics. We have studied their behavior and ecology on private non-profit wildlife sanctuaries and on state protected lands. Our hibernation research on northern pine snakes are probably the longest continuous studies in the U.S. We and colleagues have monitored the same hibernacula since 1986. These hibernation studies continue today and are on-going. Therefore, I feel qualified to comment upon and make recommendations to the Endangered and Nongame Species Program, Division of Fish and Wildlife (hereafter the Division), New Jersey Department of Environmental Protection on this pine snake delisting matter.

**New Jersey Builders Association Petition for Rulemaking and Request to Delist the Pine Snake as a Threatened Species in New Jersey, Based Upon Dr. Mitchell's Report**

***NJBA - The Petitioner's Assertions***

The NJBA asserts that, after initially listing the northern pine snake as "threatened" in 1979 based upon a 1977 report, the pine snake has been re-evaluated twice during the 1999 through 2001 time frame utilizing the "Delphi Method." The petitioner asserts that the definition of "threatened" specified in the instructions for expert panelists participating in reviewing status assessments for reptiles and amphibians under the Delphi Method is more expansive than the regulatory definition of a threatened species set forth in NJ. A.C. 7:25-4.1.

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***My Response***

Even if the definition under the Delphi Method is more expansive than the regulatory definition of a threatened species set forth in N.J. A.C. 7:25-4.1, it was only meant as a guideline for the reviewers and is not a legal description. It had no bearing on my decision making for the use of the Delphi process of ranking rare species in New Jersey.

***The Petitioner's Assertions***

Additionally, the petitioner asserts that the Delphi Method was inappropriately applied because the Department did not utilize a principal investigator from outside the agency to ensure limited agency influence on participating panelists.

***My Response***

In my opinion, a principal investigator from outside the agency was not needed. Both the former Endangered and Nongame Species Program Chief, Dr. Larry Niles, and the current Chief, David Jenkins, know enough about pine snakes to make sound conservation and management decisions. Both men have worked for the Division for over 25-years. Dave Jenkins was my direct contact person while I worked under contract for the Division and he advised me on many snake issues and reviewed all my yearly reports. Dave also worked on the pine snake Landscape Mapping Project and the Herp Atlas Project, so in my opinion he qualifies as a pine snake expert. Nevertheless, I would like to point out that neither Larry Niles, nor Dave Jenkins from the Division tried to influence any decisions with respect to the Delphi Method. I can assure you that there was no agency influence on participating panelists.

***The Petitioner's Assertions***

The petitioner indicates that various other methodologies are available to evaluate the population status of species that the Department could have used in addition to the Delphi Method to result in a more precise evaluation of the species' current status. The petitioner asserts that the information used by the Department related to known locations of northern pine snakes does not include any quantitative estimates of the number of northern pine snakes in New Jersey, nor is there any demonstration by the Department that the northern pine snake population in the State has declined.

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### *My Response*

In my opinion, any other methodologies used in addition to the Delphi Method would only be speculative and would not give an exact population size of wild pine snakes. Even if a quantitative estimate of all known individual northern pine snake numbers in New Jersey could be used, it would still not be an accurate population size, just a mathematical estimate. Furthermore, I doubt that any other state has these type of data for every rare wildlife species on their bonafide official state lists.

As for the erroneous assumption by the NJBA that pine snakes have not declined in New Jersey, I would like to point out that the main threat to wildlife biodiversity in general is critical habitat loss, fragmentation and degradation (Wilcove et al., 1998). Reptiles, as a group have been largely ignored in conservation biology (Gibbons et al., 2000), yet they are strongly affected by habitat loss. Franz (1992 and 2005) suggested that Florida pine snake populations are declining, and felt that habitat loss was the most likely factor.

Back in the late 1970's, 1980's and 1990's era, I have personally seen the loss of critical pine snake habitat throughout many counties in southern New Jersey. As an example, areas that were developed in Berkeley, Dover, Lacey and Manchester Townships, Ocean County removed over 2000 acres of upland habitat. This happened because the state review agencies (CAFRA, Pinelands Commission and the Division) did not have a consistent, inter-agency standard protocol for consultants to use while conducting presence or absence surveys for pine snakes (and other rare species). This problem has since been corrected (see: Zappalorti and Torocco 2002).

As an example of pine snake decline in the wild, HA is currently conducting a long-term study in Ocean County, New Jersey. We started in the Spring of 2007 with 40 adult pine snakes. Each snake was injected with a micro-chip (Pit Tag) and surgically fitted with a radio-transmitter for identification and monitoring purposes. By the end of the 2007 field season, 13 were dead from various causes and 27 snakes were alive.

In the Spring of 2008 we started with 28 adult pine snakes. By the end of the 2008 field season 4 were dead from various causes and 24 were alive. Finally, in the Spring of 2009 we started with 25 adult pine snakes. By the end of the 2009 field season 6 were dead from various causes and 19 snakes remained alive in our study. Over a three-year monitoring period 23 pine snakes were lost from this population. **Table 1** below shows the various causes of pine snake mortality in their pine/oak habitat.

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If we use this decline of 23 adults from one monitored pine snake population as an example, and extrapolate this loss throughout the Pinelands, clearly there are many combinations of threats which effect the overall abundance and survivorship of pine snakes in southern New Jersey. Moreover, thousands of acres of important habitat has been lost in the Pinelands over the past 25-years from various and numerous development projects. Add to this the increase of mammalian predators such as coyote, fox and skunk, the increase of motor vehicles and ATV's on all roads in the Pine Barrens, and illegal collection for the pet market; one can see that the future is not bright for pine snakes (or other rare species at the northern limit of their range) in New Jersey (Dodd and Seigel 1991; Reinert 1991; Himes et al, 2006).

**Table 1. Example of a Wild Northern Pine Snake Population Decline over a 3-Year period from Various Causes of Mortality in Stafford Township, Ocean County, New Jersey.**

Specific Cause of Snakes Death	Number of Dead Snakes	Percent of Snakes Lost from Various Causes
Died in Hibernation	5	21.7
Died from Poor Health	1	4.3
Killed by Raptor	7	30.4
Killed by Mammal	3	13.1
Killed by Human	1	4.3
Killed by Forest Fire	3	13.1
Killed by Motor Vehicle - DOR	2	8.6
Unknown Cause	1	4.3
		23 Dead Pine Snakes Total

***The Petitioner's Assertions***

The petitioner also asserts that the number of pine snake sightings may indicate that the species is not in jeopardy of becoming endangered, but has a robust population. Further, because the snakes' primary habitat is the preservation area of the Pinelands Area, which is protected from virtually any development and is subject to extensive public and non-profit conservation ownership, the northern pine snake's habitat is unlikely to deteriorate as required by the definition of "threatened."

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### *My Response*

The Division provided the NJBA with a map identifying 387 known locality records of where pine snakes had been documented from within thirteen land use categories. (See Dr. Mitchell's Report, Figures 1-3; Table 1). It should be pointed out that each of these locality records only represents a confirmed individual pine snake, and not a viable population. A sighting plotted on a map may only represent one snake seen crawling in the forest or crossing a sand road, or a snake found DOR. These 387 known locality records have no bearing on a meta-population or an entire population's size, survivorship of the group or habitat suitability at the sighting location. Additionally, 387 pine snake locality records from a forested area the size of **1.1 million acres** is not a large number of pine snakes. Furthermore, 387 sighting records doesn't prove that pine snakes are not in jeopardy.

The NJBA is basing their erroneous assumption that the number of pine snake sightings may indicate that the species is not in jeopardy of becoming endangered because more pine snakes are being caught when intensive drift fence trapping surveys are conducted at proposed development sites. Just because more pine snakes are being found during surveys does not necessarily mean they are more common, it just demonstrates that if consultants conduct intensive drift fence trapping survey pine snakes will be found in their pine-oak forest habitat. It should be noted that the Pinelands Commission, CAFRA and the Division now insist that consultants conduct a minimum of one-year drift fence surveys on potential development sites following the protocol outlined by Zappalorti and Torocco (2001).

In spite of all the protected lands in the New Jersey Pinelands, the northern pine snake population has declined in some habitat types over the past 30 years, especially in portions of the perimeter counties outside the Pinelands National Reserve in the Pine Barrens (e.g., Monmouth, Atlantic, Camden, Gloucester, Cumberland and Cape May). There are many reasons which are cited in this letter for its decline throughout the historic and current range. This decline was noticeable back in April of 1975, when the Division of Fish and Wildlife first identified "endangered" and "threatened" categories for reptiles and amphibians in New Jersey. The list was prepared by Deputy Director, Pete Mc Lain (retired) and Section Chief, Joanne Frier (retired) based upon information from various herpetologists, zoologists and research done by the late, James D. Anderson, of Rutgers University.

The status list was published in the New Jersey State Register on 10 April 1975. Between 1977 and 1979, I gathered opinions on the perceived status of northern pine snakes from approximately 20 local herpetologists, naturalists, college professors, zoologists, members of the Philadelphia Herpetological Society and the New York Herpetological Society. The opinions and data obtained on pine snakes (and other reptiles and amphibians) were provided in my report to the Division (Zappalorti and Johnson, 1977, 1978, 1979 unpublished confidential reports submitted to the Division of Fish and Game, NJDEP).

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Based upon a consensus of opinions and my own investigations, we agreed with the late Dr. James Anderson, that the pine snake was indeed a “threatened” species in New Jersey. This consensus of opinions lead to the official listing in the New Jersey State Register in 1979. In keeping with the historic consensus of opinions, the late Dr. James Anderson and the current Delphi Method process, the Division has continued to list the northern pine snake as state threatened species in 2009. The Delphi Process was conducted in 1999 through 2001, in which consensus among the 16-18 people participating was reached. Most everyone agreed that the constant loss of critical habitat is one of the main causes for northern pine snake population declines.

However, the New Jersey Pinelands has plenty of public land, some of which already has northern pine snake populations on it, but other large tracts of federal and state lands only have small, relict populations or lack northern pine snakes altogether. Why do such large forested areas such as Turkey Swamp State Park, Allaire State Park (Monmouth County), Belleplain Sate Park (Cape May and Cumberland Counties), Estell Manor County Park (Atlantic County), and Double Trouble State Park (Ocean County) only have small marginal northern pine snake populations, or no populations at all? Northern pine snakes have not been seen in some of these areas for 15 to 20 years (NJDEP Herp Atlas Program and Robert Zappalorti, personal observation).

Yet, these public lands are managed by prescribed burning of the pine/oak forest to some degree, are large enough (greater than 1000-acres), have suitable forest types and habitat structure, and have ample prey resources. Does this paucity of viable northern pine snake populations in certain Pinelands areas suggest that purchasing, protecting and managing habitat by prescribed burning may not be enough to ensure the long-term survival of the species? While I agree that more habitat management is needed on existing protected lands, it is not clear why some populations have already gradually declined and are in no way “*maintaining a robust population,*” as Dr. Mitchell implies in his report.

Is it possible that there are other, more subtle or unnoticed reasons for northern pine snake declines that are not being observed or measured by scientists? Are northern pine snakes, on a slow, constant decline in the New Jersey Pine Barrens (Tuberville et al., 2000)? After 25 years of studies, it was learned that although the adult snakes were mating and laying eggs under natural conditions, many eggs were not hatching because of predation by increasing populations of mammal predators. Even the NJBA’s consultant, Dr. Mitchell acknowledges this growing problem in his report. For instance, coyote, red fox, gray fox, striped skunk, racoon, weasel and shrew are all known predators of pine snakes and their eggs (Burger, Zappalorti et al, 1992). I have seen this intense predation on several occasions where coyote and fox are digging up nests and eating the eggs and hatchlings. To a lesser extent, eastern kingsnake and northern scarlet snake also prey upon pine snake eggs in natural nest chambers (Burger, et al, 1992; Zappalorti, personal observations).



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Additionally, off-road vehicles are destroying eggs by crushing them in the burrows under their wheels. Moreover, illegal reptile poachers are also taking gravid females and/or the eggs from nesting areas for incubation and sale in the pet industry (Burger and Zappalorti 1991; Burger et al, 2007; Zappalorti, personal observations). Nesting areas and winter hibernacula are generally located in relatively exposed sandy areas dominated by pitch pine (*Pinus rigida*) and various oak tree species (*Quercus* spp.)(Zappalorti and Burger 1985; Burger and Zappalorti 1986, 1988a, 1989). Some of our study areas have been vandalized by illegal snake poachers. In fact, adult female pine snakes, and/or their eggs in nests (near hibernacula) were poached and removed nearly 40 % of the time in years we studied nesting behavior (Burger and Zappalorti 1991; Burger et al., 1992).

Another major contributing problem and cause of pine snake declines in New Jersey is highway mortality (e.g., Garden State Parkway and Atlantic City Expressway) and back country road kill. HA staff finds several dead on road (DOR) pine snakes every year in the Pine Barrens. Some drivers go out of their way to run over snakes. There are many new roads being built with all new housing and commercial developments in southern New Jersey. Moreover, there are more cars and trucks on older existing paved roads. There is also a movement in many rural townships to pave old sand roads and horse trails, which would only serve to increase DOR snakes as they attempt to cross these roads while moving about within their home range. Paved roads also cause fragmentation of important pine snake habitat and tend to isolate their meta-populations (Fitch 1949; Kauffeld 1957; Rudolph and Burgdorf 1997; Rudolph et al. 1998; and Andrews et al., 2006, 2007 and 2009).

### *Summary of the Petitioner's Assertions*

The NJBA has focused its argument to remove the pine snake from the threatened category on eight (8) various issues. These are: **1.** Most pine snake studies in New Jersey were conducted under contract to environmental consulting firms. These studies only focused on surveys for additional locations, biological studies on behavior, ecology and anecdotal observations of road-and predator-caused mortality over the past 20+ years. **2.** There have been no attempts to obtain quantitative estimates of population sizes or population growth or decline. **3.** There have been no attempts to develop a comprehensive management plan by partnering with all the stakeholders in the Pinelands. **4.** No attempt to develop quantitative computer models to evaluate effects of various threats. **5.** They suggest that just because there are 387 confirmed pine snake sightings in the Pinelands that this is a large number and it does not support two of the criteria in the official definition of the "threatened" category, namely, restricted range and narrow habitat affinities. **6.** Aside from anecdotal observations and statements by the experts involved in the Delphi process, the NJDEP has not demonstrated that the pine snake population in New Jersey has declined in size quantitatively. **7.** The NJDEP has not generated a quantitative estimate of population size of the pine snake in New Jersey. **8.** The NJDEP has not proven publicly that the "conditions surrounding the pine snake begin or continue to deteriorate" (from the definition of threatened) criterion has been analyzed or met.

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***My Summary and Response***

The NJBA's consultant, Dr. Mitchell acknowledged in his report and supports all the research and efforts that the Division and NJDEP has done to study and protect the northern pine snake. He mentioned the importance of finding and identifying hibernacula in the field and the development and construction of effective artificial hibernacula. He stated that these hibernacula are critical features on the landscape, without which the pine snake would not survive. I agree with these statements. Additionally, Dr. Mitchell said that "the location and understanding of nest site location, nest construction by females, and threats to the eggs and hatchlings is critical to any conservation or management plan on the pine snake," which I also strongly agree with.

However, that's where our agreement ends, because he goes on to say that the use of radio-telemetry to obtain information on movement patterns, home range sizes, habitat use, and behavior of the pine snake has yielded much valuable information, but unfortunately, has not been used in any estimates of population size and dynamics or in development of conservation or management plans. This is not true, because the former Bureau Chief, Joanne Frier and I wrote a management plan for reptiles and amphibians in 1983 (see Frier and Zappalorti. 1983. Reptile and amphibian management techniques. Transactions of the North American Wildlife Society, 40:142-148). This research was followed-up with another published paper by Zappalorti and Reinert (1984).

Dr. Mitchell also expressed great criticisms of the "Delphi Technique" and asserts that the information used by the Department related to known locations of northern pine snakes does not include any quantitative estimates of the number in New Jersey, nor is there any demonstration by the Department that the northern pine snake population in the State has declined.

Then on the other hand Dr. Mitchell points-out that "pine snakes suffer from poaching of their hibernacula and nest sites by people collecting this animal illegally for the pet trade. There is mortality of pine snakes by vehicles on hard surface roads and off-road vehicles on sand roads. That there is predation by subsidized predators of which all are threats to the survival and persistence of the pine snake. Collectively, the impacts from poachers, vehicles, and subsidized predators form a serious threat to the long-term survival of the pine snake." My question is with all these adverse impacts why should the pine snake be removed from the list?

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In his conclusions, Dr. Mitchell opined that although this information was taken into account by the NJDEP when it was listed the pine snake as “threatened,” in New Jersey, this information was “weak at best and based only on expert opinion and not on any quantitative estimates of population sizes or trends or land use analyses.” Going through a tedious and unrealistic effort to conduct mark and recapture studies throughout the Pine Barrens to obtain some general quantitative estimates of population size would not protect the pine snake. Keeping it status quo on the list is the only way to protect the species and its critical habitat. Removing the pine snake from the list would give the NJBA freedom to increase their ability to build on upland sandy pine-oak habitat throughout the Pinelands. The un-checked approval for the building of new roads and development of the land would reduce pine snake populations even further than they are today. I also remind the NJBA and point out that both the “endangered” corn snake (*Elaphe guttata*) and timber rattlesnake (*Crotalus horridus*) share the same upland sandy habitat with the pine snake.

The NJBA stated that: “They hired as a consultant, Joseph C. Mitchell, Ph.D., a herpetologist with Northern Pine Snake expertise, to provide technical and scientific support in evaluating the listing of the Northern Pine Snake (*Pituophis m. melanoleucus*) as “threatened.”

While Dr. Mitchell is a well known and distinguished herpetologist who has authored dozens of scientific papers, articles and books, in my opinion he is not “*a herpetologist with Northern Pine Snake expertise.*” Aside from the pine snake account in his book: “The Reptiles of Virginia,” Dr. Mitchell has not published one single scientific paper dealing with any subject specifically on the northern pine snake. In fact he has never captured a pine snake in his home state of Virginia. Therefore, what qualifies him on as an expert on pine snakes in New Jersey? Most of his arguments in his report are based on speculation and opinion and not on any of his own research.

Therefore, I strongly disagree with the NJBA and Dr. Mitchell’s assertions that the northern pine snake should be removed from the NJDEP’s official state list as a “threatened” species. As a person who has studied the northern pine snake for over 40-years in New Jersey, I truly believe that this species is neither in need of reevaluation, nor that the listing process should be based on quantitative data. I think the Division (NJDEP) has enough data on the northern pine snake to understand the numerous existing threats that the species has in New Jersey. Furthermore, for all the reasons I cited above the New Jersey Department of Environmental Protection is clearly justified and correct in listing the northern pine snake as a state “threatened” species.



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Thank you for the opportunity to comment on this important conservation issue. If you or any members of the Endangered and Nongame Species Council have any questions, or need additional information, please do not hesitate to call upon me.

Sincerely yours,



Robert T. Zappalorti  
Executive Director/President

**HERPETOLOGICAL ASSOCIATES, INC.**

c: Dave Jenkins, Chief ENSP  
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**✿ LITERATURE CITED & R. ZAPPALORTI'S BIBLIOGRAPHY ✿**

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