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New Jersey Conservation
FOUNDATION

January 20, 2012

VIA HAND DELIVERY
Ocean County Section Chief
Division of Land Use Regulation
Department of Environmental Protection
501 East State Street - 2nd Floor
Post Office Box 420 501-02A
Trenton, New Jersey 08625

Re: CAFRA Application #1500-04-0001.2 - CAF090001
Wal-Mart, Ocean County
Block 505, Lots 14 & 15
Toms River Township, Ocean County
Block 44, Lots 2, 3, 4 & 5
Manchester Township, Ocean County

Dear Sir:

New Jersey Conservation Foundation, New Jersey Audubon Society, Stony Brook-Millstone Watershed Association, NY/NJ Baykeeper, New Jersey Environmental Federation, Environment New Jersey, and Sierra Club (New Jersey Chapter) are strongly opposed to the Stipulation of Settlement dated December 20, 2012, between the NJDEP and Jaylin Holdings, LLC, in regard to an application for a CAFRA permit that will allow the construction of a Wal-Mart Super Center located on the above described property, located in the CAFRA Zone overlap area of the Pinelands National Reserve.

The New Jersey Conservation Foundation (NJCF), New Jersey Audubon Society, Stony Brook-Millstone Watershed Association, NY/NJ Baykeeper, New Jersey Environmental Federation, Environment New Jersey, and Sierra Club (New Jersey Chapter) have been actively engaged in protecting the natural resources of the New Jersey Pine Barrens, in some cases for nearly 50 years. Many of us were leaders in advocating for the Pinelands Protection Act and the establishment of the Pinelands Comprehensive Management Plan. NJCF in particular is a major conservation landowner in Ocean County, as it owns and manages over 4000 acres within Lacey and Ocean Townships, and New Jersey Audubon Society) manages significant protected acreage at its Hovnanian Preserve that houses the same meta-population of Northern Pine Snake that NJDEP has agreed will be negatively impacted by this proposed Wal-Mart construction project. Some of the signatories to this letter have also served as board members, from time to time, of the New Jersey Natural Lands Trust (NJNLT) since its inception about 30 years ago, and have assisted the NJNLT in managing populations of rare plant and animal species at its Crossley Preserve in Berkeley Township, Ocean County, which also houses the same meta-population of Northern pine snake to be negatively impacted by this proposal.

The Northern Pine Snake habitat in both the NJNLT Crossley and NJAS Hovnanian Preserves is contiguous with habitat being utilized by the meta-population of Northern Pine Snakes that occur on the site of the proposed Wal-Mart. NJCF staff has assisted in long-term ecological research on this meta-population of Northern Pine Snakes for over 20 years, with Dr. Joanna Burger of Rutgers University and the research staff of Herpetological Associates, Inc.

NJCF, NJAS, and some of the other co-signatories to this letter have had representatives on the New Jersey Endangered and Non-Game Species Advisory Committee (ENSAC) for at least 15 years. Drawing on our expertise with regard to the New Jersey populations of Northern Pine Snakes, the ENSAC concurred with and supported the determinations made by the NJ Endangered and Non-Game Species Program Pine Snake Status Assessment in 2008, when the threatened species status was re-affirmed.

The undersigned groups are in full and complete agreement with the comments submitted by the Pinelands Preservation Alliance (PPA) in opposition to this proposed settlement, in a letter dated 10 March 2011 from the law office of Gasiorowski and Holobinko. We are also in full and complete agreement with the expert reports regarding the protection of this Northern Pine Snake meta-population and its habitats at and near the proposed Wal-Mart project site. One expert report was prepared by Dr. Joanna Burger of the Department Ecology and Evolution and Natural Resources at Rutgers University, and was included in the comments submitted by the Pinelands Preservation Alliance in March of 2011. We are also in agreement with updated comments and reports submitted by the Pinelands Preservation Alliance and Dr. Joanna Burger of Rutgers University at this time (January 2012).

Expert Report: We attach the expert report of Dr. Walter Bien and his colleagues. Dr. Bien's CV is also attached. Dr. Bien is a Research Professor in the Biology Department at Drexel University and Director of the Laboratory of Pinelands Research of Drexel University. He holds a Ph.D. from Drexel University in Bioscience and Biotechnology (1999) and has conducted extensive research on pine snakes and other wildlife and ecosystem functions in the New Jersey Pinelands, among other research experience. He has authored and coauthored dozens of research papers and reports on Pinelands ecology, including studies of pine snakes. His current and recent research projects include, among other topics, inferring changes to northern pine snake movement behaviors in New Jersey using current and historical data; herpetological survey Warren Grove Range, Burlington Co., NJ; spatial ecology of the northern pine snake at the Warren Grove Range; population ecology, genetics, and biogeography of the northern pine snake; nesting ecology of the northern pine snake; buffering hibernacula: conservation strategy for the protection of the northern pine snake; modeling density of the northern Pine snake in NJ; and analysis of vegetation restoration on severely disturbed upland pine barren landscapes.

On 16 March, 2010, the New Jersey Department of Environmental issued a denial of the CAFRA permit that is required to construct a Wal-Mart at this site, based on the habitat protection provisions for threatened and endangered species in the CAFRA rules, as well as other grounds. NJCF, NJAS, PPA, and others were quick to applaud NJDEP Commissioner Martin and other DEP staff for their steadfast protection of the habitat of rare species. Within one week, Governor Christie was quoted in the Asbury Park Press on 23 March 2010, indicating that NJDEP staff would be working on "*a way around*" the CAFRA regulations. The sequence of events raises the appearance that the Department is proposing this settlement because of a political directive, regardless of the regulations and the rule of law.

When compared to the proposal that was denied on 16 March 2010, the stipulated settlement includes absolutely no changes to the project design or enhanced protections for the population of Northern Pine Snakes that occur on or near the proposed Wal-Mart site. The proposal to conduct speculative, unproven enhancements on possible Northern Pine Snake habitat miles away, which the NJ DEP admits in their own assessment is disconnected by complete habitat barriers from the meta-population which occurs at the Wal-Mart site, does not conform to the requirements of the CAFRA rules, will not result in local or regional improvements to the conservation of the threatened Northern Pine Snake, and will set a terrible precedent for ignoring the protection of critical habitats and local populations of rare species in the vicinity of developing areas.

In August 2010, the NJDEP developed a Habitat Evaluation Method (HEM) to estimate (in a qualitative, but not quantitative way) impacts of various activities on Northern Pine Snake Habitat. The method was never presented to the NJ Endangered and Non-Game Advisory Committee (ENSAC) for comments and feedback. Historically, the Endangered and Non-Game Species Program (ENSP) staff has requested input from their Endangered and Non-Game Species Advisory Committee (ENSAC) on virtually every important threatened and endangered species issue in NJ, particularly the development and implementation of new approaches or methods. ENSAC routinely comments on all important aspects of scientific inquiry regarding endangered species conducted by ENSP, and also comments on how the scientific parameters are translated into regulatory procedures. In specific, ENSAC was kept informed of the Pine Snake Status Assessment conducted by ENSP in 2008, yet despite the presence of Pine Snake experts on the advisory committee, was never informed of the development of the HEM as natural follow-up to the status assessment.

The NJ Endangered and Non-Game Species Program states in letters of both January and August 2011 to the NJDEP Land Use Regulation Program and the permit applicant that the HEM approach here is ***"similar"*** to the HEP method used by the Federal Government in the development of Habitat Conservation Plans, and that the use of this HEM by the applicant in this proposed mitigation scheme, meant to offset the admitted negative impacts to the Northern Pine Snake population at the proposed project site, follows the ***"general HCP paradigm approach"*** used by the Federal Government in the development of Habitat Conservation Plans. We strongly disagree with both of these representations made by the NJDEP, because the habitat management methods used here contain a critical flaw in a key underlying assumption that make them different from the process used by Federal HCPs. This underlying conceptual flaw makes it impossible for any possible benefits of the proposed mitigation scheme to result in a "no net loss of habitat value" to the meta-population of Northern Pine Snake that is present at the proposed site of the Wal-Mart. The habitat "improvement" approach used to develop this Stipulation of Settlement regarding a CAFRA permit application is not **"similar"** to the process used by the Federal Government in establishing HCPs, and cannot achieve success.

The NJDEP Endangered and Non-Game Species Program, in its August 31, 2011 environmental review of the proposed Wal-Mart project, a review forwarded to Dave Fanz of the Bureau of Coastal Regulation on December 20, 2011, states: "When approving an HCP to offset adverse habitat impacts, the USFWS is operating under the assumption that **a species population can be maintained** or enhanced if offsetting actions are implemented to adequately improve habitat **in the area surrounding the area of adverse impact.** The current application is following the general HCP paradigm approach…."

It is not possible for the NJDEP ENSP to reach the conclusion that they have followed the federal HCP paradigm, because by their own admission in the same letter of August 31, 2011, the bulk of the habitat modifications proposed will not occur within the same meta-population of Northern Pine Snake. ENSP states that the applicant has chosen to conduct the majority of beneficial enhancement activities in areas more distant from the development site than individual pine snakes have been documented to move, and therefore benefits, if any, would accrue to the *regional* pine snake population. We assume the choice of the word *regional* is deliberate, because by their own definitions, ENSP acknowledges that the applicant will not be enhancing habitat within the meta-population where negative impacts from the proposed development will occur. The bulk of the proposed mitigation will occur at the Beckerville Road site, which the NJDEP ENSP Northern Pine Snake Status Assessment of December 17, 2009, defines as an unconnected meta-population from the Wal-Mart area, too distant and completely isolated by major highway and development barriers. This approach of trying to create or improve a different meta-population of animals will result in irreversible adverse impacts to the Northern Pine Snake population at the Wal-Mart site, and fails to satisfy CAFRA rule at N.J.A.C. 7:7E -3C.2., that requires a demonstration of no impact to the threatened wildlife habitat at the proposed site or in an area abutting the site. The CAFRA rule does not allow for off-sets or mitigation in an unrelated, unconnected, distant meta-population. Moreover, the Federal HCP procedures also do not rely on such strategies.

Repeated use of the proposed methodology could only lead to one outcome – extinction of the local populations which occur in and near development areas. This approach leads to eventual loss of populations, geographic range collapse, and through isolation and fragmentation, an increase in the vulnerability of remaining populations of the threatened or endangered species in question. This approach also violates the CAFRA rule's rare species protections.

The New Jersey Conservation Foundation has closely studied the methodology used in creating the off-site habitat management scheme. This scheme cannot benefit the meta-population of Northern Pine Snakes that lives at the proposed Wal-Mart site and is connected to and part of a large contiguous patch of habitat that spreads to the south and west of the Wal-Mart site. The great majority of habitat modifications proposed will occur in habitat areas that are not near or connected to this meta-population habitat patch. The methodology uses subjective rankings of habitats and habitat improvements that have no basis in any objective, peer-reviewed research and quantitative study, and cannot be tracked or followed to determine success or failure, since there is no baseline data. They have simply been 'conjured-up' from very general concepts on Northern Pine Snake ecology, as, in Governor Christie's exact words pertaining to the original denial of this permit, "a way around" the CAFRA requirements.

The properties proposed for habitat management were chosen out of convenience of land acquisition, and have little to offer toward improving the conservation status of the Northern Pine Snake. In fact, the Beckerville Road abandoned sewage sludge-dump/farm property, proposed for habitat restoration even though the soils are so nutrient-enriched that they cannot be converted back to Pine Barrens habitat, is located within a heavily-traveled 3 road triangle (two roads are busy highways). This triangle contains no living pine snake records, only "dead-on-road" data records near the intersection of highway 539 and 70. The chance that Northern Pine Snakes could ever successfully colonize and maintain a population within this highway triangle is unknown and is likely to be near zero, yet many of the subjectively-assigned mitigation points come from this ill-fated restoration proposal at Beckerville.

In its comments submitted in March 2011, the Pinelands Preservation Alliance (PPA) touches on numerous flaws regarding this Notice of Settlement in this CAFRA proceeding. As stated earlier, New Jersey Conservation Foundation agrees with the entire comments document and expert report submitted by PPA. Here we wish to emphasize two of these critical points.

First, the proposed settlement is based on the premise that CAFRA rules permit off-site mitigation to justify destruction or degradation of on-site threatened and endangered wildlife species habitats. This is patently not the case. The CAFRA rules state that "Development of endangered or threatened wildlife or plant species habitat is prohibited unless it can be demonstrated, through an Endangered or Threatened Wildlife or Plant Species Impact Assessment as described at N.J.A.C. 7:7E-3C.2, that endangered or threatened wildlife for plant species habitat would not directly or through secondary impacts on the relevant site or in the surrounding area be adversely affected." N.J.A.C. 7:7E-3.38. The CAFRA regulation's discussion of Habitat Impact Assessments also does not permit off-site compensation for on-site destruction, but states that a Habitat Impact Assessment "shall demonstrate that the proposed development will not negatively affect the population(s) or habitat of the endangered or threatened wildlife species that resulted in identification of the site, or an area abutting the site, as endangered or threatened wildlife species habitat …." N.J.A.C. 7:7E-3C.2. These provisions do not mention or permit off-site compensation or mitigation as proposed here. In fact, the CAFRA rules do expressly permit and provide standards for off-site mitigation with respect to other regulatory standards, such as wetlands. The omission of off-site compensation and mitigation in the threatened and endangered wildlife provisions means the proposed settlement violates these regulations.

Second, the settlement relies on a new, untested, and flawed model of habitat value for Northern Pine Snake habitats.

As mentioned earlier, attached to this comment letter is an expert report from of Dr. Walter Bien, et. al. of Drexel University, who is conducting ongoing, long-term studies of a Pine Snake meta-population at the Warren Grove Range within the NJ Pinelands Preservation Area. Dr. Bien's report discusses the flaws of the NJ DEP ENSP Northern Pine Snake "Habitat Evaluation Method" dated August 25, 2010, which was the basis for the determination of impacts to Northern pine Snake at the proposed Wal-Mart site, as well as the speculative values of proposed off-site habitat compensation. Dr. Bien's report also indicates serious flaws in the scientific arguments presented in two other documents: the August 31, 2011 *ENSP Environmental Review* prepared by David M. Golden of ENSP for Eric Virostek of LURP, and the November 29, 2010 ***Analysis of Conceptual Habitat Evaluation Method for Northern Pine Snakes" prepared by EcolSciences, Inc.***

An expert report of Dr. Joanna Burger was submitted in March 2011, and it is presently updated with an amended letter submitted by the Pinelands Preservation Alliance. In combination, the Burger and Bien et.al. expert reports show that the HEM and its application in this case are not a scientifically valid basis for the stipulated settlement. The two expert reports support and reinforce the findings summarized in PPA's comments from March 2011, which include the following:

a. The proposed mitigation plan is fatally flawed because, even if it worked as claimed, it will not avoid or mitigate the impacts of the development on the Pine Snake population using the proposed Wal-Mart development site. All but one of the properties to be

managed are disconnected from proposed Wal-Mart development site by distances and roads that create barriers to Pine Snake movement.

b. All but one of the properties to be managed are also separated from the pine snake population in question by the very large Heritage Minerals tract, which has no permanent protection and could be developed in the future in ways that would further separate the development site from the mitigation properties.

c. The No Net Loss of Habitat Value model proposed for use in this case is not accepted in the scientific community.

d. The model has never been tested in the field.

e. The model has not been subjected to peer review, has not been discussed by the Endangered and Nongame Species Advisory Committee, and has not been subjected to public review and comment.

f. The model, and the approach it embodies, has never been adopted by the state of New Jersey as a means to protect rare species populations of any species of snake, either under CAFRA or any other state program or regulation.

g. The model has numerous flaws, detailed in Dr. Burger's report.

h. As applied by NJDEP and the developer in this case, the model assumes the Wal-Mart development will reduce but not eliminate the habitat value of the existing critical habitat on site. But, as noted above, NJDEP has previously concluded that it is unlikely the existing Pine Snake population will tolerate the proposed development, thus eliminating the existing habitat values on the property.

i. The proposed habitat improvements to be carried out on the mitigation properties are flawed, unproven, and unlikely to succeed. Dr. Burger's report includes a detailed analysis of each mitigation site and habitat improvement measure.

Moreover, these flaws in the modeling are especially telling because there is no evidence that any Northern Pine Snakes are present on or finding critical habitat within the proposed sites for habitat management.

There are vast stretches of New Jersey, outside of the Pinelands, Highlands, and CAFRA zones, where no regulatory mechanism exists to protect habitats and populations of threatened and endangered species that utilize uplands. The concept of "improving nearby habitat value" has been proposed as a mechanism to assist rare species where their acreage of critical habitat is about to be lost. This approach has not been proposed, tested, or shown to be reliable enough to be used, as here, to justify destruction or damage to known critical habitats of specific rare wildlife populations. Here, in the CAFRA zone, threatened and endangered species populations and their habitats are clearly protected from destruction by the existing CAFRA regulations. Proposing to assist a distant meta-population, even if it could be shown to be successful, will not protect this particular meta-population of Northern Pine Snake whose habitat is explicitly protected by CAFRA regulations.

It is the opinion of the undersigned groups that the proposed Notice of Settlement, which proposes 1) the loss of Pine Snake habitat acreage at the proposed Wal-Mart site, and 2) the mitigation of habitat "value" for Northern Pine Snake in a disconnected meta-population elsewhere within the range of Northern Pine Snake in New Jersey, ignores and circumvents habitat protection afforded to the Northern Pine Snake by CAFRA.

We, the undersigned groups, respectfully request that the proposed Stipulation of Settlement be abandoned.

Respectfully submitted,

Dr. Emile DeVito, Ph.D., Manager of Science and Stewardship, New Jersey Conservation Foundation
Eric Stiles, Chief Operating Officer, New Jersey Audubon Society
Jennifer M. Coffey, Policy Director, Stony Brook-Millstone Watershed Association
Deborah A. Mans, Baykeeper & Executive Director, NY/NJ Baykeeper
David Pringle, Campaign Director, New Jersey Environmental Federation
Megan Fitzpatrick, Environment New Jersey
Jeff Tittel, Director, Sierra Club (New Jersey Chapter)

attachments: Expert Report of Dr. Walter Bien, et.al., pages 8-18 (continued as part of this letter).
CV of Dr. Walter Bien, pages 19-44 (continued as part of this letter).

Comments and Response to the NJDEP Habitat Evaluation Model (HEM) for the State Threatened Northern Pine Snake; Dated August 25, 2010

From: Dr. Walter Bien, Ronald M. Smith, and Dane C. Ward (Drexel University)
Date: January 18, 2012

Overview of Scientific Response:

It is our expert opinion that the NJDEP Habitat Evaluation Model (HEM) for northern pine snakes is subjective, lacks scientific merit and should not be considered a viable method for evaluating northern pine snake habitat. The HEM:

1. Uses incomplete data that can be misleading,
2. Is speculative and not based on quantitative data,
3. Uses methodology that is not field tested,
4. Violates several ecological and conservation principles,
5. If used to offset loss of northern pine snake (hereafter pine snake or NPS) from development, has the potential to increase loss of NPS habitat, and
6. Devalues viable NPS habitat and undervalues marginal and historical NPS habitat.

It is our expert opinion, if the HEM is used as standard by the NJDEP to evaluate NPS habitat it will fail to meet conservation goals needed for the protection of the NPS.

Specific Comments:

1. The HEM uses incomplete data that can be misleading.

The HEM establishes several "minimum standards" that must be met for a site to be considered viable northern pine snake habitat. The language and intent of the cited data can be misleading. For example, the data cited in point 3 from our research conducted at Warren Grove Gunnery Range (WGR) is misleading. The following is a quotation from the HEM:

> *Point 3. Is the site located within a pine snake habitat patch (based on the NJDFW"s 2009 SBP Pine Snake Habitat Model; Golden et al. 2009), and, if so, is the overall area of that pine snake habitat patch greater than 200 ha? If the site is not within a modeled pine snake habitat patch greater than 200 ha it should not be evaluated in the "Guided Qualitative Assessment" section of this method (unless enhancements are being proposed that would "create" suitable habitat resulting in a pine snake habitat patch of greater than 200 ha). The 200-ha threshold is taken from the partial study results of W. Bien and R. Smith's pine snake research at the Warren Grove Range. Their preliminary findings suggest that 200 hectares of habitat encompassed the activity ranges of all study snakes within dens at the Warren Grove Range."(p. 2, emphasis added).*

It is disturbing that NJDEP would use this information for the HEM, since it reflected preliminary data that was never presented or intended to represent final conclusions or to provide a representation of minimum habitat requirements. It was only the smallest area used by one of a number of pine snakes tracked during a given period of time. Other snakes moved farther, and pine snakes moved in different, apparently random directions, from their dens. The 200 ha figure embodied in the HEM represents a misuse of our results.

In discussion with and by letter to NJDEP staff, Dr. Bien specifically objected to the HEM before it was finalized. These objections were largely ignored.

2. The HEM uses "qualitative expert opinion" rather than quantitative data

The HEM states, "NJDEP's pine snake HEM takes the biological and physical characteristics of a site into consideration and assigns a score (or value) to the site being considered based on guided expert opinion rather than on quantitative models."

This approach is inappropriate and fails to consider whether pine snakes actually use a given area. It is important to first establish the presence of a pine snake population using field surveys and radio-telemetry studies to determine movement patterns. In contrast, the HEM relies on the NJDEP database (reported location data) for estimating the distribution of the pine snake in New Jersey. Because the state database only represents a limited reported dataset (dead on road and known occurrence data) it most likely under estimates where pine snakes occur. This sampling bias needs to be addressed. Locations where it is unknown if pine snake occur should first be surveyed prior to any further evaluation. The occurrence of pine snakes must precede any other evaluation method.

Collection of quantitative data (i.e., measuring variables with numbers) is the only appropriate measure in science. Understanding what is observed initially is imperative for evaluating what is observed at some later point in time. Only this method can elucidate appropriate management practices.
The HEM's field assessment also lacks scientific backing and does not take into account previous data. The HEM protocol states, "The following habitat features should be considered when making this determination: soil type, canopy closure, ecological community type (ONLM), stand density, understory density, apparent time since last fire, and proximity to roads." This field-based assessment then ranks habitat quality from 0 to 10 without ever analyzing at any previously collected data. Our data indicate that pine snakes preferentially choose a wide array of both habitat types (Fig. 4) and canopy closure (Fig. 5). An assessor cannot reasonably use the HEM's canopy type assessment to determine whether habitat is or is not beneficial for pine snakes, because our data show pine snakes prefer both open and closed canopy sites over intermediate canopy closure. There exists no simple, linear relationship or gradient in pine snake habitat preference. The habitat value points assigned by the HEM to forest thinning are not supported by our research on habitat selection by pine snakes in the New Jersey Pine Barrens.
The HEM's Threat Assessment, moreover, is biased and contains deterministic variables. This particular section is tragically flawed and relies on subjective measures such as "What is the threat of development at the site?" Such questions without objective metrics for assigning relative values based on quantitative analysis of habitat features and population densities cannot form the basis for a scientifically-justified measure of habitat value. In addition, a site may be supporting a large pine snake population and still be slated for development, giving it a low value under the HEM even though it in fact has high value for pine snakes and conservation of the local population. This section reflects the biases of this HEM and its disconnection from sound conservation practices.
Indeed, throughout the HEM, there are several instances where habitats are qualitatively assigned value without proper regard to pine snake biology. Several of the measures utilized that are inappropriate for the biology of this species include: distance to nesting areas, size of nesting areas, meta-population patch size, and distribution of critical habitat and non-suitable habitat. Other ecological measures that are important in the maintenance of local populations are not even considered, including size of minimum viable population, foraging requirements, patch size carrying capacity, sex ratios, age distribution, and genetic composition and inbreeding pressure.

a. Inappropriate measures with regard to pine snake biology

i. Distance to nesting area. The HEM protocol asks "Is there adequate suitable habitat in close proximity (500 ft) to the sampling point?" 500 feet is an arbitrary measure as female pine snakes have been documented to move more than 2,000 meters (>6,550 feet) to reach suitable nesting (Ward & Bien unpublished data)
ii. Size of nesting area. The HEM protocol asks "How many clearings of suitable nesting habitat, measuring at least 1.5ha and defined using the parameters described in Burger & Zappalorti 1986 are found on the site?" Current data support that nesting locations smaller than 1.5 ha are often used for nesting and that nesting requirements are not as stringent as those defined in the 1986 Burger & Zappalorti publication.
iii. Meta-population patch size. The HEM protocol asks "Is the site contained within a 'meta-population patch' greater than or equal to 607ha in size?" No data exist to suggest that 607ha is a pertinent threshold for supporting pine snakes. Current data indicate that pine snakes can occupy areas as small as 34.3 ha (Smith *et al. In Press*). The definition provided for meta-population patch is incorrect and not scientifically based, see section 4 "Violations to Ecological and Conservation Principles".
iv. Distribution of critical habitat and non-suitable habitat. The HEM protocol asks "How are suitable and critical habitats interspersed in the area around (within 1000 feet) the sampling point?" The qualification of this factor is random and non-scientific, there currently exists no data discussing how landscape features and habitat distribution affect pine snakes.

b. Ecological considerations not incorporated into the HEM:
i. Size of minimum viable population. It is important to understand how many snakes are required in a given population for its long-term viability. This is not well understood, making it impossible to conclude that proposed habitat manipulations will support a viable population of any given size.
ii. Foraging requirements. It is well understood that pine snakes utilize large expanses of landscape to meet their annual requirements. Yet the HEM does not consider or require the provision of habitat to meet foraging requirements.
iii. Breeding system, age structure, and sex ratios. The HEM does not include any analysis or provisions to ensure that snake reproduction occurs on the population level within any habitat modification areas.
iv. Genetic composition and inbreeding pressure. In recent years understanding the genetic composition of threatened and endangered species has become of great concern. Eliminating periphery populations can have profound implications on the long-term viability of a species (e.g. genetic bottlenecks and inbreeding depression). The destruction of known pine snake habitats and the resulting decrease in the population using that site can be expected to reduce the local genetic diversity and opportunities for genetic exchange. Yet the HEM completely ignores this impact.

3. Violates well tested and accepted ecological and conservation principles

The primary goal of conservation and the New Jersey Endangered Species Conservation Act of 1973 is "to protect species whose survival in New Jersey is imperiled by loss of habitat, over-exploitation, pollution, or other impacts". The Endangered Non-game Species Program (ENSP) of New Jersey is charged with the suitable management of state threatened and endangered species. This goal clearly states that development (i.e. habitat loss) measures that would obviously impact known occurrences of pine snakes (e.g. Wal-Mart of Toms River) are inappropriate and illegal.

a. The use of off-site mitigation in conservation is an unproven and inappropriate approach. This HEM assumes that habitat modifications to un-connected parcels will lead to "no-net loss" of habitat value. This conclusion is not supported by data or ecological studies. If such off-setting habitat management is to be used in conservation, several methods must first be employed: First, a localized (multi-year) population survey will need to be conducted. Second, habitat modifications would need to be conducted and a secondary (multi-year) population survey would be required to measure the effects of modifications. Third, modifications would be required to exhibit positive benefit to the local pine snake population. Fourth, habitat with these modifications and sufficient additional surrounding habitat would need to be preserved to ensure that beneficial modifications are sustained over time for local populations into the future. Finally, only after the habitat measures have been proven successful could ground breaking on the development site begin.
b. The NJ DEP use of the term "meta-population patches" in this HEM is not the correct definition. Meta-populations are scientifically defined as "a set of local populations occupying an array of habitat patches and connected to one another by the movement of individuals among them."(Ricklefs & Miller 2000) HEM defines meta-populations as portions of landscape that are delineated by roads. This is inappropriate, as roads are known to retard the movement of pine snakes across them. (Golden et al. 2009) Maintaining current meta-populations, as scientifically defined, is imperative as this allows for genetic exchange and increased species viability.
c. Maintaining genetic exchange among extant locations of pine snakes is imperative as inbreeding yields deleterious effects in other animals just the same as it does in humans.
d. The general lack of understanding with regard to this species ecology makes it improbable that HEM qualitative approaches will accurately reflect factors that determine the success of this species.

References:

Golden, D. et al. (2009) Status Assessment of the Northern Pine Snake (*Pituophis m. melanoleucus*) in New Jersey: An Evaluation of Trends and Threats. New Jersey Department of Environmental Protection: Trenton, NJ.

Ricklefs, R. E. and G. L. Miller. (2000) Ecology. W.H. Freeman and Company Fourth Edition. pp. 329.

Comments in Response to the NJDEP Environmental Review for Project Name: #1500-04-0001.2 - Jaylin Holdings, LLC; Review Dated August 31, 2011

From: Dr. Walter Bien, Ronald M. Smith and Dane C. Ward (Drexel University)

Date: January 18, 2012

General Position Statement:

It is our opinion that the HEM developed by the NJDEP (ENSP) used to evaluate northern pine snake habitat has some very serious flaws and does not protect the northern pine snake (NPS) in the short or long term. One major flaw with the HEM is that it devalues viable NPS habitat and under values the importance of protecting marginal and historic northern pine snake habitat. After review of the relevant documents, it is our expert opinion that the proposed development, including the habitat alterations on site and on disjunct sites, will negatively affect the population and the habitat of northern pine snakes on the proposed Wal-Mart site and areas abutting the site. More specifically I conclude that:

Specific Comments in Response to the NJDEP Environmental Review of Project #1500-04-0001.2-Jaylin Holdings, LLC; Review Dated August 31, 2011:

1. Top of page 2 states that snake experts were consulted to provide data to help select habitat parameters to be included in the HEM. The DEP does not cite which snake experts were consulted and does not state in the public record or HEM document that we were opposed to the HEM.

2. Page 2, top paragraph states that the DEP's HEM allows an area's value for pine snakes to be estimated in units referred to as "pine snake habitat units" (HUs) and that HUs for an area will be determined by conducting a series of computer-based and field-based evaluations. This is a critical flaw because this approach devalues marginal and historical northern pine snake habitat that is critical for buffering the effects of development (again see letter to DEP dated July 11, 2010). Unless qualified pine snake researchers conduct extensive surveys, this approach will fail to detect if pine snakes are actually using the location being evaluated. The HU concept in our opinion is arbitrary and capricious because it uses untested and subjective methods to evaluate pine snake habitat. The DEP agrees that there are flaws in this methodology (page 2, top paragraph, last sentence) and states that, "it must be understood…that HUs are not an exact or quantitative measurement but instead provide only a relative estimate of pine snake habitat value…." Unproven policy by a state agency that is mandated to protect threatened and endangered species should be relying on quantitative data rather than an arbitrary and qualitative assessment.

3. Throughout the document, starting on page 4, there is reference to improving (enhancing) land parcels for pine snake habitat. This approach has several conceptual flaws. If pine snakes are known to occur on land proposed for development (Wal-Mart site), it is illogical for the DEP to support enhancements on land that is deemed to be marginal pine snake habitat by the DEP's own HEM. This approach is arbitrary and capricious and assumes that pine snakes will use enhanced land parcels that by the DEP's own standards do not have high pine snake habitat value. Unless there are pre- and post-enhancement studies that evaluate the effectiveness of enhancements, this approach has no scientific merit and remains speculative. If the enhanced habitat fails to provide the benefits to the NPS then the DEP is actually assisting in the loss of pine snake habitat.

4. Page 4, middle paragraph, the last two sentences contradict one another. The next to last sentence states that the area (Block 77, Beckerville-road parcel) will be planted as a dense forest

stand so that pine snakes are not attracted to the area to bask or nest. Previously the DEP states that dense forests have reduced habitat value for NPS. In this case, however, the DEP contradicts its own HEM, and increases the HU value when trees are planted, under a separate assumption that a dense closed canopy may lessen road mortality. In actuality, it is possible that the planting of these trees will actually encourage female NPS to nest or bask closer to the warmth and sun of the roadway, thus increasing the potential for road mortality. It will take many years for the canopy of the planted trees to close enough to possibly discourage NPS from using this area for nesting and basking. Before any assumptions can be made with any scientific basis, one would need to test the various habitat alteration scenarios by radio-tracking pine snakes (provided that the NPS actually occurs at the location) over several years to determine the spatial movements and habitat use of NPS in the area. Furthermore, our data (radio-telemetry relocations) found that snakes utilized closed canopy 25% of the time, so it is not possible to predict the impact of habitat alterations without a baseline understanding of snake habitat preferences.

Thus, before any assumptions can be made it would be necessary for a survey and radio-tracking study to be conducted, using compositional analysis to determine real rather than perceived habitat use by NPS. See Smith et al. 2008 for an example of how compositional analysis was used at the Warren Grove Gunnery Range to evaluate habitat use by timber rattlesnakes.

5. Page 7, bottom paragraph, states that three artificial hibernacula will be constructed to mitigate and enhance Block 75.01, lot 3 for NPS that would experience loss of habitat and den use at the Wal-Mart site. This again is a flawed concept. It remains unknown if the dens will be used by displaced NPS. Data suggest (from the Stafford Business Park studies) that it takes several years and often intensive human assistance before snakes will use artificial dens. Although artificial dens have the potential to be used by NPS, a pre- and post radio-telemetry study would be necessary to evaluate any the benefits of the artificial dens.

   The plan is also flawed in failing to provide a proven methodology, based on field data of habitat selection, and use by NPS, for determining the location of artificial dens Similarly, there appears to be no basis for the choice of three artificial dens based on published data that elucidates NPS den density (dens per area or dens per population size). Finally, there is no explanation of field procedures required to ensure that NPS will use these dens or be left to the vagaries of displacement to find dens on their own. Again, without data to support the artificial hibernacula plan, the project remains arbitrary and capricious.

6. Throughout the document, but especially where proposed enhancements are scheduled near or within wetlands, there is no discussion of possible impacts to other threatened and endangered species of wildlife or plants. Unless a thorough survey and species inventory is conducted other threatened and endangered species have the potential to be impacted.

7. Third sentence, top of Page 10 states that a determination of “no net loss in habitat value” has been reached by ENSP as a result of the proposed enhancements. This is a biased statement and not based on scientific evidence. Although the land acreage is comparable between enhanced land and developed land, the DEP does not know if the enhanced land will actually provide any benefit to the NPS. Thus, it is speculative and presumptuous to imply that enhanced land is equal to actual NPS habitat. The only way to determine the efficacy of the proposed

enhancement projects is by conducting a pre- and post enhancement study that examines the spatial ecology and habitat use of displaced and potential resident NPS.

References:

Smith, R.M., W.F. Bien, H.W. Avery and J.R. Spotila 2008. Coexistence of Rattlesnakes and Military Operations: Occurrence and Spatial Ecology of the Timber Rattlesnake (*Crotalus horridus*) on the Warren Grove Gunnery Range in the Pinelands of New Jersey. Pp. 317-326 in W.K. Hayes, K.R. Beaman, M.D. Caldwell, and S.P. Bush (eds.), The Biology of Rattlesnakes. Loma Linda University Press, Loma Linda, CA.

Comments in Response to the Document "Analysis of Conceptual Habitat Evaluation Method for Northern Pine Snakes" prepared by EcolSciences, Inc.; Dated November 29, 2010

From: Dr. Walter Bien, Ronald M. Smith and Dane C. Ward (Drexel University)
Date: January 18, 2012

Overview of Scientific Opinion:

The report prepared by EcolSciences, Inc. states that the Wal-Mart site will have a lower NPS habitat value (HEM) after development and that other land parcels, deemed poor northern pine snake (hereafter, pine snake or NPS) habitat by the NJDEP, will need to be enhanced to prevent a "no net loss" of NPS habitat.

The DEP and EcolSciences, Inc. assume that the proposed ""mitigation"" measures will benefit the NPS. This assumption is flawed because these measures will be apply almost entirely to land that is disconnected from the development parcel and cannot benefit the same NPS population as that whose habitat is to be degraded or destroyed. Just as important, it remains unknown if the enhancements will work. Thus, without supporting field data on the benefits of the enhancements, the only scientifically justifiable position is that construction of the Wal-Mart will result in a "net loss" of pine snake habitat. The DEP has not conducted a meaningful pine snake survey to ascertain if pine snakes are using existing habitat near the proposed enhancements sites; nor has it tested its proposed enhancement measures and determined their efficacy on NPS and their habitats. Without a pre- and post study on the spatial ecology and movements of resident and displaced pine snakes, it will be impossible to evaluate any benefits derived from the enhancement projects.

Several mitigation parcels of land are disjunct and located at a considerable distance from the proposed Wal-Mart development site. Some of the parcels are so small, degraded by past land use, and not surrounded by protected open space land, that they currently are not included (they currently do not even rate) as Species Based Patch (SBP) pine snake habitat according to the NJ DEP analysis embodied in the state's Landscape maps. Thus, snakes displaced at the construction will have no, or at most very limited, benefit from the proposed enhancements. Because the DEP does not require any long-term conservation-ownership of the unprotected portions of the SBP containing the proposed mitigation sites (even if one were to assume the parcels provide some benefit), it is questionable whether any long-term benefits will be realized, regardless of the efficacy of the measures taken to justify the habitat loss at the development site. The proposed parcels are separated from preserved lands, not only by distance but also by busy roads. EcolSciences, Inc. merely speculates that over time the parcels will become continuous NPS habitat with preserved lands, even though most of the intervening land is privately

owned and may never be protected. There is no justification for these critical assumptions on which the EcolSciences report is founded. Success cannot be anticipated without supporting data.
There are 54.6 habitat value points suggested from habitat enhancements [project site (4.3HUs), block 75.01 lot 3 (12.5HUs), block 73 lot 21 (11.6HUs), block 77 lots 2, 4, 5, and 6 (15.3 and 8.9HUs)]. It is our expert opinion that all of the 54.6 habitat enhancement points are speculative, and there is no proof that the enhancements will provide any benefit to pine snakes.
Tree thinning is a suggested enhancement for NPS common throughout this project, however, to the best of our knowledge, there are no published data to support this position.

Response to Summary:

1. EcolSciences and NJDEP ENSP independently arrived at similar HUs values for the project site and mitigation parcels using the HEM combination of desktop analysis and field evaluation. They conclude this validates the HEM is a reliable means to evaluate "pine snake habitat."
    a. Response: Utilizing opinions of two parties does not generate a consensus, especially when one of the parties is the creator of the HEM.
2. EcolSciences states "that "a portion of the project site will retain some habitat value following construction and can also be enhanced.""
    a. Response: This is unlikely, as the site will be greatly modified from what the NJ DEP considered suitable NPS habitat. Enhancement of this site, assuming it would even be successful, could even have the effect of facilitating NPS with the developed site, thereby increasing the potential for incidental takes and road mortality.

Response to Section II:

1. "We applied the SBP model to several sites where we have tracked pine snakes in the past, including the project site. A majority of our radio tracking data coincide with SBP pine snake habitat."
    a. Response: This claim is not scientifically reliable or justified. EcolSciences fails to detail the telemetry-relocation events that coincide with SBP pine snake habitat, or, just important, those that they implicitly acknowledge did not coincide. Before the model could reasonably be used as the basis for action, it would be necessary to perform a compositional analysis regarding the relative abundance of each habitat type available versus the habitat type being selected by an individual NPS each time it is relocated (tracked and found) using telemetry, and that the number of telemetry-relocations be reported. If a majority of the habitat types available were SBP pine snake habitat, then one would expect most relocation data to occur in SBP pine snake habitat. Similarly, if the habitat composition is weighed toward SBP pine snake habitat and a significant number of relocations occur in less available habitat (which is not considered SBP pine snake habitat) then the snakes are selecting that habitat. This would indicate a severe flaw in NJ DEP approach to SBP pine snake habitat evaluation. Our data from the Warren Grove Range suggest that 5% of all relocations occur in lowlands/wetlands that are not considered SBP pine snake habitat, and greater than 20% of all relocations occurred in disturbed but intact Pinelands habitats.
2. "DEP selected a total of 21 sample points for the project site and five mitigation parcels."
    a. Response: The selection process of sampling points for the HEM is not discussed. How are sampling points determined so that an appropriate number of samples are collected per parcel? A small sample size (sampling points) can introduce sampling bias. Two parcels have only two sampling points and another two parcels only have 3 sampling points. It is unlikely that two or three sampling points per parcel will provide an adequate

representation of habitat composition. In addition, several sampling points occur in wetlands that are not considered NPS habitat. It is our expert opinion, therefore, that the sampling methodology is not valid.

Response to Section III:

1. Section III-A "Suppositions were made that a 2.90-hectare portion of the on-site habitat nearest the construction would have reduced value (60%), while the value of a 2.17-hectare portion of habitat farthest from the construction site would remain unchanged."
    a. Response: Suppositions are not appropriate in science and conservation of threatened and endangered species. The uncertainty expressed in this important statement, regarding the range and severity of negative impacts as a result of the project, underscores the inability of the HEM to act as a useful tool for conservation.
2. "Selective tree thinning would occur in uplands characterized by a dense canopy where pine snakes would benefit from the creation of forest openings and reduced canopy closure. These enhancements would result in an increase to the CPS by 2.0 points and offset the total habitat value lost by 4.3 points."
    a. Response: This statement is not scientifically supported; our data (Smith and Bien, unpublished report) indicate that NPS preferentially select closed and open canopy forest types as opposed to an intermediate canopy. In addition, the forest response from thinning is unpredictable. Greater sunlight exposure has the potential to increase a dense shrub cover. Thus, a thick shrub cover would decrease the potential for pine snakes to nest. The DEP does not mention that forest thinned sites will be maintained as open canopy sites. It is our expert opinion that the tree thinning methodology does not represent a proven or reliable enhancement technique.
    b. For this reason the consultant should not consider this modification a gain of a 4.3 habitat value.

Response to Section III-B:

3. "The portion of the Heritage Minerals tract adjacent to this parcel is also contiguous to other extensive areas of open space including Whiting Wildlife Area and the Crossley Preserve."
    a. Response: It is inappropriate for the consultant to consider a property between parcels and preserved lands to be a corridor. This property (Heritage Minerals) is held by a private business and has not been preserved. The actions that currently occur or will occur in the future on this land are not controlled or certain and therefore cannot add benefit to the parcel being discussed (Block 75.01 Lot 3).
4. "Selective clearing and construction of hibernacula in the vicinity of all three samples points, and selective tree thinning throughout the site is proposed. Selective tree thinning would occur in uplands characterized by a dense canopy where pine snakes would benefit from the creation of small forest openings and reduced canopy closure. With these enhancements, Dave Golden concluded that the mean CPS could be augmented by an additional 1.5 points (Figure 4). Multiplying this value with the area of SBP pine snake habitat (8.3 hectares) on this parcel results in a total habitat value increase of 12.5."
    a. Response: No published exist supporting the success of artificial hibernacula for relocated NPS or on a long-term basis. Creation of artificial hibernacula requires snakes to be introduced by anthropogenic measures to newly created hibernacula sites.

b. Because no published data exist supporting or quantifying the tree thinning and artificial hibernacula methods to be used here as benefits to NPS, it is our expert opinion that the 12.5 habitat value is without justification.

Response to Section III-D:

5. "The two sampling points located in wetlands and scored a relatively high value according to remote sensing interpretation and threat assessment, but lower during the field-based assessment."
    a. Response: If the NJ DEP does not consider wetlands and lowlands as pine snake habitat they should not use sampling points located in wetlands as appropriate points for evaluating this parcel. This will bias interpretation.
6. Proposed ""enhancements" would include two one-acre clearings in the uplands north and south of South Ruckels Branch and selective tree thinning throughout the 3.0-hectares of uplands." This would generate an additional 6.0 habitat value points.
    a. Response: Sampling points were not included from the uplands. It would be entirely biased to include enhancements for an area that was not even part of the assessment. If an HEM is to be used, it must at least be applied consistently.
    b. Suggested modifications are not supported by sampling points or data suggesting clearings will benefit snakes. Again, there is no data to support this evaluation.
7. "Selective tree thinning throughout the 3.7-hectares of mapped pine snake habitat would increase the potential of this parcel as a nest site. . . An increase of the mean CPS by 1.5 would result in a gain of 5.6 in total habitat value."
    a. Response: This habitat value calculation is not supported, as selective tree thinning is not a proven, scientifically-acceptable conservation strategy for this species.

Response to Section III-F:

8. "Sampling Points 3, 4, and 5 are all located in wetlands and scored lower in the field than at the desktop."
    a. Response: Three out of six (50%) data points occurred in wetlands. These points bias the interpretation and are likely to lead to an inaccurate calculation of "habitat value".
9. "This area in its present state is not valued as SBP pine snake habitat."
    a. Response: if the area is currently not considered SBP pine snake habitat, it is unlikely that any enhancements will improve habitat quality and turn the area into actual pine snake habitat. Since this site is severely degraded, contains imported soil and residues from past application of sewage sludge, it is unknown whether the site is contaminated, which potentially could impact a fossorial (burrowing) species such as the pine snake. Further, it is unknown if a pine snake would detect and avoid a site with soil residues.
10. "Proposed improvements include blocking access to keep out off-road vehicles, removing glass piles, cutting down deciduous trees and replacing with pines and native grasses, scarifying the ground, and introducing 100 cubic yards of sand."
    a. Response: Removing glass, deciduous trees, and adding sand are not known to increase habitat value for pine snakes. This site is so greatly degraded it is unlikely that these modifications will benefit pine snakes. Adding sand amendments is a questionable approach. Simply adding sand will not generate soils similar to those the pine snakes utilize in natural settings. The sandy soils in naturally occurring pine snake locations are well formed and to a degree have compaction properties. Pilot nests should be constructed with any amended sand before it is applied to the project site.

11. “Assuming the improved area approaching the road augments the CPS by 1.0 while the remaining area enhances the CPS by 2.5, this results in an increase of total habitat value by 13.3 points.”
    a. Response: It is not possible to judge whether modifications for the near road property (4.0 hectares) are even qualitatively advantageous or disadvantageous for pine snakes. The report fails to identify the modifications that are supposed to generate an estimated 4.0 increase in habitat value.
    b. Selective thinning again is not supported because it is unproven if it has any real value.
    c. We cannot support the supposed 15.3 increase in habitat value (4.0 from near road “enhancements” and 11.3 from selective thinning and clean-up)
    d. More proposed tree thinning is suggested in areas away from the road that will increase habitat value by 8.9 more points.
    e. We cannot support the increase of 8.9 habitat points with selective thinning.

Curriculum Vitae

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Education:

1999 -- Ph.D.	Drexel University, Philadelphia, PA: Bioscience and Biotechnology
1981 -- Cert	Pennsylvania State University, PA: Environmental Education
1973 -- MA	Trenton State College: Education
1966 -- BS	West Chester State College: Education

Experience:

2007 – present	Research Professor, Drexel University
2010 - present	Research Associate, Botany Department, The Academy of Natural Sciences
2003 -- 2007	Research Associate Professor, Drexel University
2001 -- 2003	Research Assistant Professor, Drexel University
1999 – 2001	Instructor and Adjunct Professor, Drexel University
1998 -- 1999	Graduate Assistant, Drexel University
1999 -- 2000	Research Fellow, Science and Technology Research Institute, Rider University
1999 -- 2002	Part time faculty, Purdue-Indiana University
1981 -- 1994	Instructor, The Pennsylvania State University
1966 -- 1996	Secondary Education, Neshaminy School District

Drexel Administrative Experience:
Director, Laboratory of Pinelands Research (www.drexel.edu/academics/coas/pinelands)

Current or Recently Completed Drexel Research:
Herpetological Studies

1. Inferring changes to Northern Pine Snake (*Pituophis melanoleucus*) movement behaviors in New Jersey using current and historical data (current)
2. Herpetological survey Warren Grove Range, Burlington Co., NJ (completed)

3. Bog Turtle survey Warren Grove Range, Burlington Co., NJ (completed)
4. Spatial ecology of the timber rattlesnake at Warren Grove Range (completed)
5. Spatial ecology of the Northern pine snake at Warren Grove Range (ongoing)
6. Population ecology, genetics, and biogeography of the Northern pine snake (current)
7. Nesting ecology of the Northern pine snake (current)
8. Buffering hibernacula: conservation strategy for the protection of the northern pine snake (current)
9. Estimating the population size of the Northern Pine snake in NJ: density model (current)
10. Range Determination and Inventory of Threatened Red-bellied Turtles and Invasive Red-eared Slider Turtles in Pennsylvania (completed)
11. Earthwatch Institute: Ecology of Diamondback Terrapins at Barnegat Bay, New Jersey (ongoing)

Restoration Ecology

1. An analysis of vegetation restoration on severely disturbed upland pine barren landscapes (completed)
2. Experimental use of *Panicum virgatum* and *Schizachyrium scoparium* to restore a helicopter landing zone at Warren Grove Range (completed)
3. Nitrogen allocation as a factor for success on a restored gravel pit in the New Jersey Pinelands (completed)
4. Experimental use of *Arctostaphylos uvi ursi* to control slope erosion (current)
5. Native grasses for the restoration of severely disturbed landscapes in the New Jersey Pinelands (completed)

Fire Ecology

1. Assessment of the Fire Management Program at Warren Grove Range (ongoing)
2. Evaluation of prescribed burning as a management practice to restore or maintain natural plant communities in the New Jersey Pine Barrens (ongoing)
3. Development of fire fuels model (collaboration with the USDA and NJFFS; completed)

Vegetation Studies

1. Rare plant monitoring study at the Warren Grove Range (completed)
2. Comprehensive floral survey including T/E species at Warren Grove Range (completed)
3. Field germination experiments on Knieskern's beaked-rush (*Rhynchospora knieskernii*) (current)
4. Seed bank, dispersal, and soil-water dynamics in Knieskern's beaked-rush (current)
5. Distribution of invasive and noxious plants at Warren Grove Range (completed)
6. Systematics of the Genus Monina (current)

Mammal Studies

1. Small mammal survey at Warren Grove Range (completed)
2. Spatial ecology of the southern bog lemming (*Synaptomys cooperi*) and meadow jumping mouse (*Zapus hudsonius)* at Warren Grove Range (completed)
3. Diet and Spatial Use of *Synaptomys cooperi* and *Zapus hudsonius* in Bog Savannahs of the NJ Pinelands (completed)

Entomology Studies

1. Lepidoptera survey with special emphasis on Arogos skipper (Federal-listed species) at the Warren Grove Gunnery Range (completed)
2. Pollination ecology of the pine barrens gentian at the Warren Grove Gunnery Range

Other

1. Comprehensive fish survey at Warren Grove Range (completed)
2. Water quality at Warren Grove Range (completed)
3. Avian survey of Warren Grove Range (completed)

Recent and Current Collaborative Research:

1. Estimating the population size of the Northern Pine snake in NJ: density model (Dave Golden, NJDEP)
2. Use of culverts for safe Northern Pine Snake movement under roads (Dave Golden, NJDEP)
3. Population genetic study of the Northern Pine Snake in NJ (Dave Golden, NJDEP)
4. Ecosystem Fire Control Model (Dr. Ken Clark and Dr. Nick Skowronski, USDA) (completed)
5. The role of subsurface clays in the storage release of hardly-soluble phosphorus in oligotrphic fire prone habitats (Dr. John Dighton and Dr. Dennis Gray, Rutgers University)
6. *Rhynchospora knieskernii* monitoring (Dr. Matt Palmer, Columbia University).
7. Fire Influenced Soil Development in the New Jersey Pine Barrens: Investigation of clay mass budget, chemistry, and carbon sequestration (Dr. Jennifer Callanan and Dr. Gregory Pope, Montclair University; Dr. John Dighton and Dr. Dennis Gray, Rutgers University)
8. Forest fire's role as a catalyst for clay mineral alteration in soil and its effects on cation exchange capacity (Dr. Greg Pope, Dr. Matt Goring (Montclair University) and Dr. Jen Callanan (William Patterson)
9. Sphagnum in the diets of small bog rodents (Eric Karlin, Ramapo College)
10. Effect of disturbance on tiger beetles at the Warren Grove Gunnery Range (Dan Duran, Drexel University).

Publications:

2011

Smith, R., H.W. Avery, J.R. Spotila and **W.F**. **Bien,** The spatial ecology of the northern pine snake (*Pituophis melanoleucus*) with emphasis on disturbance in the Pinelands of New Jersey. Journal of Herpetology. In review.

Shenko, A.N., **W. F. Bien**, J. R. Spotila and H.W. Avery 2010. Effect of disturbance on small mammal community structure in the New Jersey Pinelands. Journal of Integrative Zoology. In Press.

Wnek, J., **W.F. Bien** and H.W. Avery 2010. Effects of nest substrate and shading on the development and survivorship of diamondback terrapin embryos (Malaclemys terrapin). Journal of Integrative Zoology. In Press.

2010

Basile, Emily R., Harold W. Avery, **Walter F. Bien** and Jennifer M. Keller 2011. Diamondback terrapins as indicator species of persistent organic pollutants: Using Barnegat Bay, New Jersey as a case study. Chemosphere. 82:137-144.

Sheridan, C.M., J.R. Spotila, **W.F. Bien** and H.W. Avery 2010. Sex-biased dispersal and natal philopatry in the diamondback terrapin, Malaclemys terrapin. Molecular Ecology 19:5497–5510.

Sheridan, C.M., J.R. Spotila, W. Roosenburg, **W.F. Bien** and H.W. Avery 2010. Inter-population variation of multiple paternity in the diamondback terrapin, Malaclemys terrapin. Molecular Ecology. In Revision.

Prior 2010

Bien, W.F., Spotila, J.R., and T. Gordon 2009. Distribution trends of rare plants at the Warren Grove Gunnery Range. *Bartonia* 64:1-18.

Bien, W.F. 2008. Case Study in Chapter 8: Disturbance Regimes and Landscape Process: Fire Management at Warren Grove Range. Conserving Biodiversity on Military Lands: *A Handbook for Natural Resource Managers.*

Bien, W,F., Moore, G., and Gordon, T. 2008. The invasive *Microstegium vimineum* (Poaceae) new to Costa Rica and Mesoamerica. Brenesia 69: 67-70.

Smith, R.M., **Bien, W.F**., Spotila, J.R. and Avery, H.W. 2008. Coexistence of rattlesnakes and military operations: occurrence and spatial ecology of the timber rattlesnake (*Crotalus horridus*) on the Warren Grove Gunnery Range in the Pinelands of New Jersey. *In:* The Biology of the Rattlesnake. W. Hayes, K. Beaman, M. Caldwell and S. Bush (eds.), Loma Linda University Press, Loma Linda, CA pp. 606.

McKessey, A.N., **Bien, W.F**. and Spotila, J.R. 2005. Winter Burns Maintain Natural Dwarf Pine Plains Communities in the New Jersey Pine Barrens. *Ecological Restoration* 23:53-54.

Dietl, G.P., Alexander, R.R. and **Bien, W.F**. 2000. Temporal, geographic, and spatial variation in durophage-induced shell repair in reclining oysters (Gryphaeide) from the Late Cretaceous Atlantic Coastal Plain of North America. *Paleobiology* 26: 215-237.

Bien, W.F., Wendt, J.M. and Alexander, R.R., 1999. Site selection and behavior of sponge and bivalve borers in shells of the Cretaceous oysters *Exogyra cancellata* and *Pycnodonte mutabilis* from Delaware, U.S.A. Historical Biology 13:299-315.

Bien, W.F. and Andrus, R.R. 1999. New state and county records for the genus *Sphagnum* from Delhaas Woods, Bucks County, Pennsylvania. *Evansia* 16: 16-19.

Bien, W.F., Wendt, J.M. and Alexander, R.R. 1995. Paleoecology of the Late Cretaceous oysters from New Jersey and Delaware. In: Baker, J.E.B. [ed.], Contributions to the Paleoecology of New Jersey. 12: 62-71.

Bien, W.F. 1997. Photosynthesis and water relations in *Sphagnum flavicomans* and *Sphagnum pulchrum* from the New Jersey Pine Barrens. *American Journal of Botany* 84 (6, Suppl.): 13.

Bien, W.F. 1996. Seasonal growth patterns and niche dynamics of two interacting *Sphagnum* species from the New Jersey Pinelands. *American Journal of Botany* 83 (6, Suppl.): 13-14.

Bien, W.F. 1996. *Sphagnum* species from the New Jersey Pinelands. p: 18. In: IAB Second International Symposium on the Biology of *Sphagnum*, Québec City, Canada.

Publications In Review:

Contreneo, L., R.M. Smith, **W.F. Bien** and J.R. Spotila 2010. Cross-amplification and characterization of 9 microsatellite markers developed for the black rat snake (*Elaphe obsolete*) in the northern pine snake (*Pituophis m. melanoleucus*). Molecular Ecology Resources. In Review.

Sheridan, C.M., K. Scribner, J.R. Spotila, **W.F. Bien** and H.W. Avery 2010. Landscape genetic structure of diamondback terrapins (*Malaclemys terrapin*) in a fragmented estuary system. PLOS. In review.

Sheridan, C.M., J. Wnek, J.R. Spotila, **W.F. Bien** and H.W. Avery 2010. Constraints on egg size, optimal egg size theory, and latitudinal reproductive variation in the Diamondback terrapin (Malaclemys terrapin). Oikos. In Review.

Zolkewitz, M.A, **W.F. Bien,** and J.R. Spotila 2010. An evaluation of reforestation on highly disturbed sites in the New Jersey Pinelands. Restoration Ecology. In Review.

Publications in Draft:

Bien, W.F., Ward, D., Smith, R., Avery, H., Zappalorti, R., Golden, D., Spotila, J. Pine snake density model: How many pine snakes are in the NJ pine barrens?

Bien, W.F. Influence of space competition, growth, and water balance on the distribution of *Sphagnum flavicomans* and *S. pulchrum* at natural and reciprocally transplanted positions.

Bien, W.F., Brooks, K. and Sobel, M. Avian species at the Warren Grove Gunnery Range.

Bien, W.F. and Smith, R. Fish species at the Warren Grove Gunnery Range.

Bien, W.F. and Sobel, M. Vascular flora of Warren Grove Range, Burlington County, New Jersey. *Bartonia*.

Bien, W.F., Sobel, M., and Spotila, J.R. Non-native plants at the Warren Grove Gunnery Range

Buchanan, A., **Bien, W.F.** and Spotila, J.R. Diet and Spatial Use of *Synaptomys cooperi* and *Zapus hudsonius* in Bog Savannahs of the NJ Pinelands. *Journal of Mammalogy*.

McKessey, A., **Bien, W.F.** and Spotila, J.R. Fire management at Warren Grove Range.

Smith, R., **Bien, W.F.** and Spotila, J.R. Herpetofauna of the Warren Grove Gunnery Range. NJ

Smith, R., **Bien, W.F**., H.W. Avery and Spotila, J.R. The spatial ecology of the northern pine snake (*Pituophis melanoleucus*) with emphasis on disturbance in the Pinelands of New Jersey.

Smith, R., **Bien, W.F**., H.W. Avery and Spotila, J.R. Buffering hibernacula: conservation strategy for the protection of the northern pine snake (*Pituophis melanoleucus*) in the New Jersey Pinelands.

Sobel, M., **Bien, W.,** Avery, H. and Spotila. Effect of disturbance on four selected populations of rare plant species.

Sobel, M., **Bien, W**., Avery, H. and Spotila. Dispersal, seed banking, fire effects and soil-water relationships in *Rhyncospora knieskernii.*

Ward, D., **W.F. Bien,** H. Avery and J. Spotila. Lepidoptera as bioindicators at the Warren Grove Gunnery Range

Zolkewitz, M., **Bien, W.F**., and Spotila, J.R. The use of native grasses for the restoration of severely disturbed landscapes in the New Jersey Pinelands: A Case Study. *Ecological Restoration.*

Zolkewitz, M., **Bien, W.F.**, Spotila, J.R., Kilham, S. Factors contributing to successful establishment of *Schizachyrium scoparium* on and abandoned gravel pit in the New Jersey Pine Barrens. *Restoration Ecology*

Zolkewitz, M., **Bien, W.F**., and Spotila, J.R. An analysis of vegetation restoration on severely disturbed upland pine barren landscapes. *Forest Ecology and Management or Ecological Restoration.*

Zolkewitz, M., **Bien, W.F**., Dighton, J., and Spotila, J.R. Nitrogen allocation as a factor for success on a restored gravel pit in the New Jersey Pinelands. *Ecology.*

Non-Referred Publications, Reports, News Articles, Editorial Opinions:
2011

Bien, W.F. and M.C. Sobel 2011. Ecological Studies in Support of the Warren Grove Gunnery Range Integrated Natural Resources Management Plan: Rare Plant Monitoring Study. Final Report to the Air National Guard, Andrews Air Force Base, MD. Award# DAMD17-02-2-0045.

Ward, D., M. Sobel and **Bien, W.F.** 2011. Ecological Studies in Support of the Warren Grove Gunnery Range Integrated Natural Resources Management Plan: Bog Turtle Survey and Comprehensive Lepidoptera Survey. Final Report to the Air National Guard, Andrews Air Force Base, MD. Award# USAMRAA #DAMD17-02-2-0045 CLIN0008 and CLIN00011.

Bien, W.F. 2011. Pre-Burn Ecological Assessment for Warren Grove Range's Prescribed Burn Plan FY2011. Unpublished report submitted to New Jersey Air National Guard.

Bien, W.F. 2011. Post-Burn Ecological Assessment for Warren Grove Range's Prescribed Burn Plan FY2011. Unpublished report submitted to New Jersey Air National Guard.

Bien, W.F. 2011. Mowing and Fuel Reduction Report. Unpublished report submitted to New Jersey Air National Guard.

2010

Bien, W.F. 2010. Pre-Burn Ecological Assessment for Warren Grove Range's Prescribed Burn Plan FY2010. Unpublished report submitted to New Jersey Air National Guard.

Bien, W.F. 2010. Post-Burn Ecological Assessment for Warren Grove Range's Prescribed Burn Plan FY2011. Unpublished report submitted to New Jersey Air National Guard.

Bien, W.F. 2010. Habitat and T/E Species Survey, Road and Fireline Improvement Project. Unpublished report submitted to New Jersey Air National Guard.

2009

Bien, W.F. 2009. Pre-Burn Ecological Assessment for Warren Grove Range's Prescribed Burn Plan FY2010. Unpublished report submitted to New Jersey Air National Guard.

Bien, W.F. 2009. Proposed Parking Lot Environmental Assessment. Unpublished report submitted to New Jersey Air National Guard.

Bien, W.F. 2009. Perimeter Line Survey. Unpublished report submitted to New Jersey Air National Guard.

Bien, W.F., Smith, R., Spotila, J.R., H.W. Avery, N.S. Skowronski and K.L. Clark 2009. Ecosystem Fire Control Model. In Support of the Integrated Natural Resources Management Plan Support: Final Report to the Air National Guard, Andrews Air Force Base, MD. Award# DAMD17-02-2-0045.

2008

Bien, W.F. and Spotila, J.R. 2008. Ecological Studies at Warren Grove Gunnery (Part 3) in Support of the Integrated Natural Resources Management Plan Support: Final Comprehensive Avian Report to the Air National Guard, Andrews Air Force Base, MD. Award# DAMD17-02-2-0045.

Bien, W.F. 2008. Pre-Burn Ecological Assessment for Warren Grove Range's Prescribed Burn Plan FY2008. Unpublished report submitted to New Jersey Air National Guard.

Bien, W.F. 2008. Post-Burn Assessment of the 2008 Prescribed Burn at Warren Grove Range. Unpublished report submitted to the New Jersey Air National Guard.

Bien, W.F. 2008. New Target Environmental Impact Study. Unpublished report submitted to New Jersey Air National Guard.

Bien, W.F. 2008. Fire Perimeter Line Review Study. Unpublished report submitted to New Jersey Air National Guard.

2007

Bien, W.F. and Spotila, J.R. 2007. Ecological Studies at Warren Grove Gunnery (Part 2) in Support of the Integrated Natural Resources Management Plan Support: Final Report to the Air National Guard, Andrews Air Force Base, MD. Award# DAMD17-02-2-0045.

Bien, W.F. 2007. Pre-Burn Ecological Assessment for Warren Grove Range's Prescribed Burn Plan FY2007. Unpublished report submitted to New Jersey Air National Guard.

Bien, W.F. 2007. Post-Burn Assessment of the 2007 Prescribed Burn at Warren Grove Range. Unpublished report submitted to the New Jersey Air National Guard.

Prior to 2007

Bien, W.F. 2006. Environmental Impact Survey, Warren Grove Range, Road Improvement Project. Unpublished report submitted to New Jersey Air National Guard.

Bien, W.F. 2006. Post-Burn Assessment of the 2006 Prescribed Burn at Warren Grove Range. Unpublished report submitted to the New Jersey Air National Guard.

Bien, W.F. 2006. Pre-Burn Ecological Assessment for Warren Grove Range's Prescribed Burn Plan FY2006. Unpublished report submitted to New Jersey Air National Guard.

Bien, W.F. 2006. Post-Burn Assessment of the 2005 Prescribed Burn at Warren Grove Range. Unpublished report submitted to the New Jersey Air National Guard.

Bien, W.F. 2006. Pre-Burn Ecological Assessment for Warren Grove Range's Prescribed Burn Plan FY2005. Unpublished report submitted to New Jersey Air National Guard.

Bien, W.F. 2006. Refuge Update: What's the Rush at the Grove Gunnery Range? USFS.

Bien, W.F. 2005. Post-Burn Assessment of the 2004 Prescribed Burn at Warren Grove Range. Unpublished report submitted to the New Jersey Air National Guard.

Bien, W.F. 2005. Pre-Burn Ecological Assessment for Warren Grove Range's Prescribed Burn Plan FY2005. Unpublished report submitted to New Jersey Air National Guard.

Bien, W.F. 2005. Fire Management at Warren Grove Gunnery Range: An Ecological Model. Inside the Pinelands, A Report by the Pinelands Preservation Alliance 12(5):1-3.

Bien, W.F. and Spotila, J.R. 2005. Warren Grove Gunnery Range Integrated Natural Resources Management Plan Support: Final Report to the Air National Guard, Andrews Air Force Base, MD. Award# DAMD17-02-2-0045.

Bien, W. 2004. Drexel University Pinelands Institute Studies Bioindicators and Water Quality. P. 12, New Jersey Flows, New Jersey Water Resource Research Institute, Vol. V (2).

Bien, W.F. 2004. Post-Burn Assessment of the 2004 Prescribed Burn at Warren Grove Range. Unpublished report submitted to the New Jersey Air National Guard.

Bien, W.F. 2004. Pre-Burn Ecological Assessment for Warren Grove Range's Prescribed Burn Plan FY2005. Unpublished report submitted to New Jersey Air National Guard.

Bien, W.F. 2004. Fish Survey and Water Quality Assessment at Warren Grove Range. Unpublished report submitted to the New Jersey Air National Guard.

Bien, W.F. and Spotila, J.R. 2003. Warren Grove Gunnery Range Integrated Natural Resources Management Plan Support: Annual Report to the Air National Guard, Andrews Air Force Base, MD. Award# DAMD17-02-2-0045.

Bien, W.F. 2003. Fish Survey and Water Quality Assessment at Warren Grove Range. Unpublished report submitted to the New Jersey Air National Guard.

Bien, W.F. 2003. Post-Burn Assessment of the 2002 Prescribed Burn at Warren Grove Range. Unpublished report submitted to the New Jersey Air National Guard.

Bien, W.F. 2002. Pre-Burn Ecological Assessment for Warren Grove Range's Prescribed Burn Plan FY2002. Unpublished report submitted to New Jersey Air National Guard.

Bien, W.F. and Spotila, J.R. 2001. Ecological Restoration of the Widgeon Helicopter Landing Zone,Warren Grove Range. Unpublished report submitted to New Jersey Air National Guard.

Bien, W.F. and Spotila, J.R. 2000. Preliminary Assessment of Vegetaion Restoration at Warren Grove Range. Unpublished report submitted to New Jersey Air National Guard.

Bien, W.F. 1984. Natural History of the Snodgrass Farm. Bucks County Nature Conservancy, Bucks County, PA.

Bien, W.F. 1982. Comprehensive Faunal Survey. Camp Sheppherd's Mill, NJ.

Bien, W. F. 1981. Comprehensive Botanical Survey: Camp Sheppherd's Mill, NJ.

Spotila, J.R., S. Kilham, H. Avery and **W. Bien 2002.** MacArthur trees can't be replaced. Courier-Post, NJ, March 10, 2002.

Wnek, J. and **W.F. Bien** 2006. Earthwatch in New Jersey? Quarterly Bulletin of the New Jersey Marine Education Association.

Highlighted Articles, Notes and Newscasts:
2009
New Jersey News, Science and Technology, June 26; "Pine Barrens Ecology"

New Jersey News, Science and Technology, June 24; "Butterfly Survey"

Shore News Today.Com, August 12; "Rescued turtles are released to their habitat"

Atlantic City Press, August 6; Drexel University scientists to release diamondback terrapins in Margate

2008
New Jersey News (NPR), Sounds of Science: Ecology of the Pine Barrens, Broadcast August 26, 2008 (http://www.njn.net/radio/programs/soundsofscience.html)

WHYY webcast July 18, 2008; fire and the pinelands (C:\Documents and Settings\Walt\Desktop\Health and Science News and Information WHYY.mht)

New Jersey News, Science and Technology, June 20; "fire ecology"

New Jersey News, Science and Technology, June 18; “May 15, 2007 wildfire one year latter”

Asbury Park Press: Highlighted video and interview of Dr. Walter F. Bien on fire ecology in the pine barrens. aired May 15, 2008.

Presentation highlighted in The Press of Atlantic City, March 2, 2008. Fire is the hot topic at the Pinelands Short Course at Burlington County Community College.

2007

Dr. Bien, featured in *People of the Pines* by Lexus Press. Highlights Drexel research at Warren Grove Range.

Dr. Bien featured in the Missouri Botanical Gardens, “The Cutting Edge” Volume XIV, Number 2, April 2007 for discovery of the adventive Asian grass *Microstegium vimineum* (Trin.) in Costa Rica. This is the first time this species has been documented in Central America

New Jersey May 15-16 wildfire on KYW-TV (CBS-3), WPVI-TV (ABC-6) and WABC-TV (ABC-New York) on May 17, 2007.

Quoted in an *Ocean County Observer* (N.J.) story published on June 5, 2007.

Marine Academy of Technology and Environmental Sciences’ "Teach at the Beach" program and talked about the recent New Jersey wildfire.

Defending Conservation at the Warren Grove Gunnery Range, The Scientist, February Issue 2007, page 17.

Prior to 2007

2006 New Jersey News: restoration ecology at Warren Grove Range
2005 New Jersey News: snake research at Warren Grove Range
2005 New Jersey News: mammal research at Warren Grove Range

Grants (as PI):

2011-2013	Northern Pine Snake Density and Hibernaculum Translocation Study	**$149,997**
2010-2011	Northern Pine Snake Density and Hibernaculum Translocation Study	**$99,917**
2009-2010	Communication CD: ecosystem management	**$24,079**
2009-2010	Lepidoptera and Bog Turtle Habitat Survey, Warren Grove Gunnery Range (2)	**$96,992**
2009-2010	Monitoring rare plants at the Warren Grove Gunnery Range (Part 2)	**$97,884**
2008-2009	Ecosystem Fire Control Model, Warren Grove Gunnery Range	**$98,316**
2008-2009	Lepidoptera and Bog Turtle Habitat Survey, Warren Grove Gunnery Range (Part 1)	**$48,663**
2007-2008	Monitoring rare plants at the Warren Grove Gunnery Range (Part 1)	**$96,884**
2007-2008	Avian Survey at Warren Grove Range (Part 2)	**$95,319**

2006-2007 Effect of Fire on Pine Plains in the NJ Pine Barrens (USDA) **$18,900**

2006-2007 Avian Survey at Warren Grove Range (**Part 1**) **$81,116**

2003-2005 New Jersey Air National Guard: Small Mammal Survey at Warren Grove Range **$348,800**

2003-2004 New Jersey Air National Guard: Herbarium and Voucher Plant Specimens Collected at Warren Grove Gunnery Range (with interactive CD). **$21,760**

2003-2004 New Jersey Air National Guard: Monitoring Home Range Movements and Identifying the Location of the Timber Rattlesnake (*Crotalus horridus*) and Pine Snake (*Pituophis melanoleucus*) at Warren Grove Gunnery Range. **$114,668**

2002-2003 New Jersey Air National Guard: Herpetofauna Survey, Comprehensive Floral Survey, Revegetation Analysis, Fire Management Analysis at Warren Grove Range **$276,771**

2000 New Jersey Air National Guard: Monitoring pitch pine restoration areas, Warren Grove **$1,800**

2000 New Jersey Air National Guard: Restoration helicopter landing zone with native vegetation, Warren Grove Gunnery Range. **$18,000**

2000 NJANG: Monitoring Pitch Pine Restoration Sites, Warren Grove Range. **$1,800**

Grants (as CO-PI):

2010 Population Ecology of the diamondback terrapin (*Malaclemys terrapin*) at Barnegat Bay, New Jersey. (Collaborators: Co-PI Walter Bien, Co-PI James Spotila, Co-PI Dr. Edward A. Standora [SUNY Buffalo]). Earthwatch Institute.

$56,375

2009 Ecology of Diamondback Terrapins (*Malaclemys terrapin*) at Barnegat Bay, New Jersey. PI. Avery, H. (Collaborators: Co-PI Walter Bien, Co-PI James Spotila, Co-PI Dr. Edward A. Standora [SUNY Buffalo]). Earthwatch Institute. **$56,375**

2009 Range Determination and Inventory of Threatened Red-bellied Turtles (*Pseudemys rubriventris*) and Invasive Red-eared Slider Turtles (Trachemys scripta). PI. Avery, H. (Collaborators: Co-PI Walter Bien, Co-PI James Spotila). Pennsylvania Fish and Boat Commission. **$99,900**

Current Professional Organizations and Society Memberships:

American Association for the Advancement of Science
American Entomological Society
Ecological Society of America
Conservation Foundation of New Jersey
Geological Association of New Jersey
Partnerships for New Jersey Plant Conservation
Philadelphia Botanical Club
Pinelands Preservation Alliance
Sigma Xi, The Scientific Research Society

Society of Conservation Biologists
Torrey Botanical Society
Whitesbog Preservation Trust

Honors and Service Awards:

2011

(Third Place): Ryan Rebozo 2011. The effects of land management, pollination and density dependence on the fecundity and gene flow of *Gentiana autumnalis.* 14th Annual Greater Philadelphia AMP Research Symposium and Mentoring Conference, Sponsor National Science Foundation, Sheraton University Hotel, 36th and Chestnut St, Philadelphia. October 15, 2011. Graduate Oral Presentation.

2007 Outstanding Research and Education Award, New Jersey Marine Education Association.

2007 (First Place): Smith, R. M., Bien, W. F., Avery, H. W., and Spotila, J. R. 2007. Coexistence of rattlesnakes and military operations: occurrence and spatial ecology of the timber rattlesnake (*Crotalus horridus*) at Warren Grove Range. Drexel University, College of Arts and Science Research Day. Philadelphia, Pennsylvania.

2006 Environmental Excellence Award, United States Air Force Air National Guard, Research at Warren Grove Range

2006 (Honorable Mention): Buchanan, A., J.R. Spotila and W.F. Bien 2006. Ecology of Small Mammals in the New Jersey Pinelands with Special Reference to *Synaptomys cooperi* and *Zapus Hudsonius* Drexel University Seventh Annual Research Day, April 25, 2006.

2005 (Honorable Mention): Buchanan, A., J.R. Spotila and W.F. Bien 2005. Small Mammal Communities of the New Jersey Pinelands . Drexel University, Sixth Annual Research Day, April 26, 2005.

2005 (Honorable Mention): Ron Smith, J.R. Spotila and W.F. Bien 2005. Spatial Ecology of the timber Rattlesnake at the Warren Grove Gunnery Range, Burlington County, New Jersey. Drexel University Seventh Annual Research Day, April 26, 2005.

2005 Environmental Excellence Award, United States Air Force Air National Guard, Research at Warren Grove Range

2005 Natural Resource Education Foundation: Century Club Award.

2005 New Jersey Department of Environmental Protection, Dedication and Service Award.

2003 New Jersey Department of Environmental Protection Environmental Excellence Award, Research at Warren Grove Range

Bien Lab: Funded Student Awards

2011

Ryan Rebozo 2011. The effects of land management, pollination and density dependence on the fecundity and gene flow of *Gentiana autumnalis.* 14th Annual Greater Philadelphia AMP Research Symposium and Mentoring Conference, **Sponsor National Science Foundation**, Sheraton University Hotel, 36th and Chestnut St., Philadelphia. October 15, 2011. Graduate Oral Presentation (Third Place $275.00).

Marilyn Sobel, Bayard Long Award for Botanical Research, Philadelphia Botanical Club, ANS ($500.00)
Title: Seed banking, germination requirements, and dispersal mechanisms in *Rhynchospora knieskernii*

Ryan Rebozo, Bayard Long Award, Philadelphia Botanical Club, ANS ($680.00)
Title: Effects of Density, Fire and Climate Change on *Gentiana autumnalis*

2010
Ryan Rebozo, The Bridge to the Doctorate Fellowship Program funded by NSF (30K/year, 2 years)

Supervising
Graduate Students (my lab):

Anika McKessey, Ph.D., Bioscience and Biotechnology	2006 (defended)
Alicia Buchanan, MS, Bioscience and Biotechnology	2006 (defended)
Ron Smith, MS Bioscience and Biotechnology	2007 (defended)
Michael Zolkewitz, Ph.D., Bioscience and Biotechnology	2010 (defended)
Ron Smith, PhD., Bioscience and Biotechnology	2012
Dane Ward, MS, Environmental Science	2014
Marilyn Sobel, MS, Environmental Science	2014
Ryan Rebozo, Ph.D, Environmental Science	2014
Kevin Smith, Ph.D, Environmental Science	2014
Alina Freire-Fierro, Ph.D, Environmental Science	2014

Undergraduate, graduate, STAR, Coop, Volunteers, and Work Study Students in my Lab
2011

Leeann Haaf, Environmental Science, BS/MS (research assistant)	2012
Inferring changes to Northern Pine Snake (Pituophis melanoleucus) movement behaviors in New Jersey using current and historical data	
Christopher Ball, Environmental Science, BS (independent study)	2012
Melanie Jeske , Economics and Environmental Policy, BS (STAR)	2014
Dan Spracklin, Biology, Drexel BCC, BS (Co-op)	2012
Steve Hromada, Biology, BS (Co-op)	2012
George Wilson, Biology (Drexel BCC), BS (Co-op)	2012
Derek Rahe, Chemical Engineering, BS (work study)	2014
Araks Ohanyan, Biology, BS (volunteer)	2015
Hayley Tintle, Health Sciences, BS (volunteer)	2013
Theresa Ruane, (volunteer)	
Shane Cutrufello, Biology, BS	2015
Kristina Manzanedo, Biology, MS	2011
Chelsea Gowton, Susquehanna University, BS (volunteer)	2013
Brandon Curtis, Stockton, BS (volunteer)	2012
Chris Watson, Stockton, BS (volunteer)	2012

2010

Avalon Mehta, Environmental Science, BS (work study)	2010 (graduated)
James Houck, Environmental Science, BS (work study)	2010 (graduated)

Graduate Committees (other labs):

Nick Procopio, Ph.D. Environmental Engineering (Drexel)	2006 (defended)
Meshagae Hunte, Ph.D., Bioscience and Biotechnology (Drexel)	2006 (defended)
Bryan Franks, PhD., Bioscience and Biotechnology (Drexel)	2007 (defended)
Jennifer Reynard, PhD., Earth and Environmental Studies (Montclair University)	2007 (defended)
Chris Coughenour, PhD., Bioscience and Biotechnology (Drexel)	2009 (defended) John
Wnek, Ph.D. Bioscience and Biotechnology (Drexel)	2010 (defended)
Clair Sheridan, PhD., Bioscience and Biotechnology (Drexel)	2010 (defended)

Emily Basile, PhD., Bioscience and Biotechnology (Drexel)	2010 (defended)
Julia Stone, MS., Biology Department (Drexel)	2010 (defended)
Alicia Shenko. Ph.D., Ecology (Rutgers University)	2011
Lori Lester, Ph.D., Environmental Science	2011
Steven Pearson, Ph.D. Biology Department (Drexel)	2012
Julianne Winters, Ph.D., Environmental Science (Drexel)	2013
Abigail Dominy, Ph.D., Biology Department (Drexel)	2014

Student Research Collaboration (other Colleges and Universities)
2011
Sarah Smith, Island Biogeography, plant mychorrizae in an abandoned sand pit, Rutgers (MS)

2010
Sarah Keith Blauvelt, The spatial ecology of the pine snake, Mercer CCC
Holly Hagy, Growth patterns and population size of four rare plants in the NJ pine barrens, Mercer CC
Chris Watson, Radio-tracking, Northern pine snake at the Warren Grove Gunnery Range, Stockton
Selected Courses Taught at Drexel University:
Field Botany (2009, 2007, 2002)
Marine Biology Field Methods (Summer 2011, 2010, 2009, 2008, 2007, 2005, 2003, 2001,1999)
Ecology of the New Jersey Pine Barrens (2011, 2010, 2008, 2006, 2004, 2002, 2000)
Tropical Ecology Field Studies (2006)
Great Work of the National Park System: Yosemite National Park (Spring 2001)

Independent Study:
2010 Dane Ward, Insect survey and field methods
2010 Christopher Ball, Ecology field methods
2010 Elizabeth Heckman, Field methods in marine ecology
2010 Kevin Smith, Field methods in marine ecology
2009 Stuart Burg, Influence of soil particle size and water relations on rare plant species
2008 Christopher Wiggins, Fish Communities of the Sassafras River
2008 Christopher Wiggins, Submerged Aquatic Vegetation of the Sassafras River
2007 Brian Smith, Fire Ecology of the New Jersey Pine Barrens
2007 Kathleen Brooks, Birds of the New Jersey Pine Barrens
2006 Joseph Bundens, Landuse and Water Quality in the New Jersey Pine Barrens
2005 Kelly Anderson, Wetland Habitats in the New Jersey Pine Barrens
2004 Scott McBurney, Herpetofauna of the New Jersey Pine Barrens

Selected Courses Taught at the University Level (not Drexel):
Natural History of the Mid-Atlantic Coastal Marine System (Penn State University)
Introduction to Field Marine Sciences (Rider University)
Field Studies in Ecology: Pocono Mountains (Penn State University)
Natural History and Coral Reef Ecology of Bermuda (Penn State University)
Selected Studies in Science Education: Bermuda Marine Nature Study (Penn State University)
Natural History of the Gulf of Maine, USA (Penn State University)
Selected Studies in Science Education: Coastal Nature Study (Penn State University)
Selected Studies in Science Education: Pocono Nature Study (Penn State University)
Shallow Marine Organisms and Habitats of the Florida Keys (Rider University)
Natural History, Delaware Water Gap and Pocono Mountains of Northeastern PA (Penn State University)
Regional Environmental Survey: Natural History PA Piedmont (Penn State University)
Travel Study: Ecology of the Pacific Northwest, U.S.A. (Penn State University)

Posters*, Invited Seminars,* and *Oral Presentations*:

2011

Jeske, M. **and W.F. Bien, W.F.** *Promoting Conservation at the Warren Grove Gunnery Range, Constructing an Educational and Informational Website*. STAR Scholars program poster. August 24, 2011.

Bien, W.F. Northern pine snake research methods. Rutgers University (Dr. John Dighton), July 28, 2011.

Friere-Fierro, A., Spotila, J.R.,Russell, J.A., Dorr, L., Schuyler, A.E., Kilham, S.S. and **Bien, W.F.** Systematics of Monnina (Polygalaceae). Botanical Society of America. Annual Meeting, St. Louis, MO July 9 -13, 2011.

Bien, W.F. and R. Smith. Pine snake and rattlesnake research at the Warren Grove Bombing Range. New Jersey Chapter of The Wildlife Society. Waretown, NJ, May 12, 2011.

Bien, W.F. Fire Effects on the Ecology of the NJ Pine Barrens. New Jersey Forest Fire Annual Conference, Coyle Field, Chatsworth, NJ, May 14, 2011.

Friere-Fierro, A., Spotila, J.R.,Russell, J.A., Dorr, L., Schuyler, A.E., Kilham, S.S. and **Bien, W.F.** Systematics of Monnina (Polygalaceae). COAS Research Day 2011, April 5, 2011

Rebozo, Ryan and **Walter F. Bien**. The effects of density, fire, and climate change on the plant pollinator community of *Gentiana autumnalis*. COAS Research Day 2011, April 5, 2011.

Smith, K. and **Walter F. Bien**. Nesting Ecology and Dispersal Patterns of Emerging *Pituophis melanoleucus* Neonates. COAS Research Day 2010, April 5, 2011.

Smith, R.M. Harold W. Avery, James R. Spotila and **Walter F. Bien** The Spatial Ecology of the Northern Pine Snake in Relation to Military Activities in the New Jersey Pinelands. COAS Research Day 2010, April 5, 2011.

Sobel, M.C. and **Walter F. Bien**. Disturbance, Fire Effects, and Seed Banking in a Federally Threatened Sedge Rhynchospora knieskernii (Cyperaceae). COAS Research Day 2011, April 5, 2011.

Ward, D.C., Smith, R.C., Harold W. Avery, James R. Spotila and **Walter F. Bien**, Population estimate of the Northern Pine Snake in New Jersey. COAS Research Day 2010, April 5, 2011.

Dominy, A., **W.F. Bien,** J.R. Spotila, and H.W. Avery. *The Visual Ecology of the Diamondback Terrapin* College of Arts and Sciences Research Day. Poster. COAS Research Day, April 5, 2011.

Lester, L., A.S. Harrison, E.A. Standora, **W.F. Bien** and H.W. Avery. Diamondback Terrapins do not Behaviorally respond to Boat Engine Sounds. Poster. COAS Research Day, April 5, 2011.

Winters, J., N.M. Wood, **W.F. Bien,** J.R. Spotila, E.A. Standora and H.W. Avery. The Effect of Bulkheading on Diamondback Terrapins in Barnegat Bay New Jersey. Poster. COAS Research Day, April 5, 2011.

Bien, W.F. The Status of the Northern Pine Snake in NJ. Temple University. 3-23-2011.

2010

Basile, E.R., H.W. Avery, **W.F. Bien**, J.R. Spotila and J. M. Keller. 2010. Atypical polybrominated diphenyl ether (PBDE) pattern in Diamondback Terrapins of Barnegat Bay, New Jersey. Atlantic Estuarine Research Society. Spring Conference, Atlantic City, NJ. April 15, 2010.

Bien, W.F. Disturbance: bombs, fire, and rare plants. *Conservation lessons learned at the Warren Grove Gunnery Range*. Invited Seminar. New Jersey State Museum Lecture Series. January 10, 2010.

Bien, W.F. *Wetland Ecology of the New Jersey Pine Barrens*. Invited Seminar. University of Pennsylvania, September 29, 2010.

Lester, L. A., E. A. Standora, **W. F. Bien**, and H. W. Avery. Behavioral Responses of Diamondback Terrapins *(Malaclemys terrapin)* to Recreational Boat Sounds. Effects of Noise on Aquatic Life Conference, Cork, Ireland. August 15-20, 2010.

Lester, L. A., E. A. Standora, **W. F. Bien**, and H. W. Avery. The effects of anthropogenic sound on diamondback terrapins (*Malaclemys terrapin*) College of Arts and Sciences Research Day. Poster. COAS Research Day, April 6, 2010.

Lester, L. A., E. A. Standora, **W. F. Bien**, and H. W. Avery. The effects of anthropogenic sound on diamondback terrapins (*Malaclemys terrapin*) College of Arts and Sciences Research Day. Poster. Drexel Research Day, April 15, 2010.

Sheridan, C., James R. Spotila, Willem M. Roosenburg, **Walter F. Bien**, Harold W. Avery. Sex ratio and inter-population variation of multiple paternity in the diamondback terrapin (*Malaclemys terrapin*). Drexel Research Day, April 15, 2010.

Sheridan, C., Kim T. Scribner, James R. Spotila, **Walter F. Bien**, Harold W. Avery. Landscape Genetic Structure in a Highly Fragmented Ecosystem. Drexel Research Day, April 15, 2010.

Sheridan, C., Kim T. Scribner, James R. Spotila, **Walter F. Bien**, Harold W. Avery. *Landscape Genetic Structure in a Highly Fragmented Ecosystem*. Oral Presentation. Immaculata University Biology Symposium, March 25, 2010.

Shenko, A.N, Jordan, R. C., **Bien, W.F.** *Small mammal population implications for wetland conservation and restoration dynamics*. Oral presentation. 95th Ecological Society of America Annual Meeting, Pittsburgh, PA, August 4, 2010.

Sobel, M., **Walter F. Bien**, Harold W. Avery, and James R. Spotila The Effect of Disturbance on Four Rare Plant Populations at Different Successional Stages in the New Jersey Pineland. Ecological Society of America, August 4, 2010.

Sobel, M., **Walter F. Bien**, Harold W. Avery, and James R. Spotila The Effect of Disturbance on Four Rare Plant Populations at Different Successional Stages in the New Jersey Pineland. COAS Research Day, April 6, 2010

Ward, D.C., **Walter F. Bien,** Harold W. Avery, and James R. Spotila, The effect of habitat disturbance on common Lepidoptera in the New Jersey Pinelands. Ecological Society of America, August 4, 2010.

Ward, D.C., **Walter F. Bien**, Harold W. Avery, and James R. Spotila, The effect of habitat disturbance on common Lepidoptera in the New Jersey Pinelands. COAS Research Day 2010, April 6, 2010.

Ward, D.C., **Walter F. Bien**, Harold W. Avery, and James R. Spotila, The effect of habitat disturbance on common Lepidoptera in the New Jersey Pinelands. Mid-Atlantic ESA Meeting Fredricksburg Virginia, April 17, 2010.

Winters, Julianne M., **Walter F. Bien**, Edward A. Standora, James R. Spotila, and Harold W. Avery. Where Terrapins and Humans Meet: Nesting Behavior and Reproduction of the Diamondback Terrapin in Relation to Anthropogenic Activities in Barnegat Bay, NJ. Drexel Research Day, April 15, 2010.

Winters, Julianne M., **Walter F. Bien**, Edward A. Standora, James R. Spotila, and Harold W. Avery. Where Terrapins and Humans Meet: Nesting Behavior and Reproduction of the Diamondback Terrapin in Relation to Anthropogenic Activities in Barnegat Bay, NJ. COAS Research Day, April 6, 2010**.**

Winters, Julianne M., **Walter F. Bien,** Edward A. Standora, James R. Spotila, and Harold W. Avery. The Behavior of a Reproductive Diamondback Terrapin in Relation to Bulkheading: Where Will She Go To Nest? The 5th National Symposium on the Ecology, Status, and Conservation of the Diamondback Terrapin. Chauvin, LA. November 2010.

Wnek, John P., **Walter F. Bien**, James R. Spotila, and Harold W. Avery Effects of soil texture and microenvironmental factors on the hatching success of northern diamondback terrapins (*Malaclemys t. terrapin*). COAS Research Day, April 6, 2010.

Wnek, John P., **Walter F. Bien**, James R. Spotila, and Harold W. Avery Effects of soil texture and microenvironmental factors on the hatching success of northern diamondback terrapins (*Malaclemys t. terrapin*). Drexel University Research Day. April 15, 2010.

Wnek, John P., **Walter F. Bien**, James R. Spotila, and Harold W. *Anthropogenic impacts on the nesting ecology of diamondback terrapins,* Malaclemys terrapin*: a comparison of soil texture types and shade.* Oral Presentation. Scientific Conference Presentation at Kean University, NJ. April 24, 2010.

2009

Basile, E.R., J. Keller, **W.F. Bien,** H.W. Avery. Unique polybrominated diphenyl ether (PBDE) patterns in diamondback terrapins of Barnegat Bay, NJ. Poster at COAS and University Research Day.

Basile, E. R., H. W. Avery, **W. F. Bien**, and J. M. Keller. *Organohalogen contaminant concentrations in diamondback terrapins from Barnegat Bay, New Jersey.* Oral Presentation. SETAC North American 30th Annual Meeting, New Orleans, LA. November 19-23, 2009.

Bien, W.F. Disturbance: bombs, fire, and rare species. March 11, 2009. Burlington County Natural Science Club.

Callanan, J., Pope, G., Gorring, M., **Bien, W.F.,** McDougall, A., LaPoma, J., 2009. Long-term implications of forest fires on soil chemical properties and mineral alterations in the New Jersey Pine Barrens. *Association of American Geographers Annual Meeting.* March 24, 2009. Las Vegas, NV.

Winters, J.M. H.W. Avery, J.R. Spotila, **W.F. Bien** and E.A. Standora. Utilization of passive sonic telemetry as indicators of movement and nesting of the Northern diamondback terrapin (*Malaclemys terrapin terrapin*). Poster at COAS and University Research Day.
*Award: Best Graduate Student Poster Presentation in Biological and Biomedical Research.
Award and Poster Archived Here**:** (http://idea.library.drexel.edu/handle/1860/3023)

Winters, J. M., H.W. Avery, J.R. Spotila, **W.F. Bien**, and E.A. Standora. Utilization of Passive Sonic Telemetry as Indicators of Movement and Nesting of the Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*). August 29, 2009, Mid-Atlantic Diamondback Terrapin Working Group Meeting. Research Poster Presentation and Discussion.

Winters, J. M., H.W., HW Avery, JR Spotila, **W.F. Bien**, and EA Standora The Effects of Anthropogenic Noise on the Behavior of Northern Diamondback Terrapins. Poster Presentation, COAS Research Day - April 6, 2009.

Winters, J. M., H.W., HW Avery, JR Spotila, **W.F. Bien**, and EA Standora The Effects of Anthropogenic Noise on the Behavior of Northern Diamondback Terrapins, Poster Presentation,

Drexel Research Day - April 23, 2009.

2008

Bien, W.F. 2008. Botanical Society of America. Lecture: Fire Effects on the ecology of the dwarf pine plains forest type. June 1, 2008.

Bien, W.F. 2008. Botanical Society of America. Field trip leader: Dwarf pine plains forest type at the Warren Grove Gunnery Range. June 2, 2008.

Bien, W.F. 2008. Distribution of Herpetofauna at the Warren Grove Gunnery Range, April 28, 2008. 64th Annual Northeastern Fish and Wildlife Association Conference, April 27-30, 2008. Galloway, NJ.

Smith, R. and Bien, W.F. 2008. Spatial Ecology of the Timber Rattlesnake at the Warren Grove Gunnery Range, April 28, 2008. 64th Annual Northeastern Fish and Wildlife Association Conference, April 27-30, 2008. Galloway, NJ.

Shenko, A. and Bien, W.F. 2008. Spatial Ecology of Small Mammals at the Warren Grove Gunnery Range, April 28, 2008. 64th Annual Northeastern Fish and Wildlife Association Conference, April 27-30, 2008. Galloway, NJ.

Holding, J., Bien, W.F., Avery H.W., and Spotila, J.R. 2008. Rare Plant Monitoring Study in the New Jersey Pinelands. Drexel University, College of Arts and Sciences Research Day, April 14, 2008. Philadelphia, PA.

Coleman, C., Avery, H., Bien, W.F. and Spotila, J.R. 2008. Habitat Fragmentation in the Barnegat Bay Estuary and Variation in the Mating System and Dispersal of the Northern Diamondback Terrapin (Malaclemys terrapin terrapin). Drexel University, College of Arts and Sciences Research Day, April 14, 2008. Philadelphia, PA.

Wnek, J., Avery, H.W., Potila, J.R. and Bien, W.F. Nesting Ecology of the Diamondback Terrapin (Malaclemys terrapin): A Comparison of Hatching Success at Barnegat Bay, New Jersey. Drexel University, College of Arts and Sciences Research Day, April 14, 2008. Philadelphia, PA.

Basile, E., H.W. Avery, J.M. Keller, W.F. Bien and J.R. Spotila 2008. Persistent Organic Pollutant Concentrations in the Diamondback Terrapins of Barnegat Bay New Jersey. Drexel University, College of Arts and Sciences Research Day, April 14, 2008. Philadelphia, PA.

Bien, W.F. 2008. Bombs, Fire, and Rare Species: Lessons from the Warren Grove Gunnery Range. Rutgers University Ecology and Evolution Graduate Program Seminar Series, April 22, 2008. New Brunswick, NJ.

Bien, W.F. 2008. Disturbance, Fire Effects, and Rare Species: Lessons from the Warren Grove Gunnery Range. The 19th Annual Pinelands Short Course sponsored by the New Jersey Pinelands Commission, March 1, 2008. Burlington County Community College, NJ.

Prior to 2008:

Bien, W.F. 2007. A Tour Through the Pines. Keynote Speaker: Teach at the Beach, Annual Meeting of the New Jersey Marine Education Association, May 18, 2007. Manahawkin, New Jersey.

Bien, W.F. 2007. Fire Effects on Rare plants and their Habitats in the New Jersey Pine Barrens, New Jersey Forest Fire Service Conference, February 24, 2007, Coyle Field, New Jersey.

Bien, W.F. and Smith, R.M. 2007. Fish Assemblages for Assessing Water Quality at Warren Grove Range. The New Jersey Academy of Science. 52th Annual Meeting, April 21, 2007. Kean University.

Bien, W. 2007. New Jersey Audubon Society: Center for Research and Education. Drexel Research at Warren Grove Range (field trip August 23, 2007).

Bien, W. 2007. Fire in the Pines, the May 15th, 2007 wildfire. Earthwatch, Lighthouse Center, Waretown, NJ. (presentation August 11, 2007).

Bien, W. 2007. Ecology of the New Jersey Pine Barrens. Earthwatch, Lighthouse Center, Waretown, NJ

Bien, W. F. and Smith R. M. 2007. Fire in the Pines, the May 15th, 2007 wildfire. Wildlife Action Plan, Pinelands Regional Landscape Implementation Meeting. Richard Stockton College of New Jersey. Presentation.

Bien, W.F. 2007. Philadelphia Botanical Club field trip to Warren Grove Range, July 29, 2007.

Bien, W.F. 2007. Pinelands Preservation Alliance, Pines to Beaches Program for Educators, Lighthouse Center. Waretown, NJ.

Bien, W.F. 2007. Fire Effects from the May 15-16 Wildfire at Warren Grove Range, Northeast Association of State Foresters Annual Conference, field trip July 17, 2007, Warren Grove Range.

Smith, R. M., Bien, W. F., Avery, H. W., and Spotila, J. R. 2007. Distribution of the herpetofauna at Warren Grove Gunnery Range within the Pinelands of southern New Jersey. Drexel University, College of Arts and Science Research Day. Philadelphia, Pennsylvania. Poster Presentation.

Smith, R. M., Bien, W. F., Avery, H. W., and Spotila, J. R. 2007. Distribution of the herpetofauna at Warren Grove Gunnery Range within the Pinelands of southern New Jersey. Drexel University, Research Innovation Scholarship and Creativity Day. Philadelphia, Pennsylvania. Poster Presentation.

Smith, R. M., Bien, W. F., Avery, H. W., and Spotila, J. R. 2007. Coexistence of rattlesnakes and military operations: occurrence and spatial ecology of the timber rattlesnake (*Crotalus horridus*) at Warren Grove Range. Drexel University, College of Arts and Science Research Day. Philadelphia, Pennsylvania. Poster Presentation.

Smith, R. M., Bien, W. F., Avery, H. W., and Spotila, J. R. 2007. Coexistence of rattlesnakes and military operations: occurrence and spatial ecology of the timber rattlesnake (*Crotalus horridus*) at Warren Grove Range. Drexel University, Research Innovation Scholarship and Creativity Day. Philadelphia, Pennsylvania. Poster Presentation.

Smith, R. and Bien, W.F., Avery, H., Spotila, J.R. 2007. Coexistence of rattlesnakes and military operations: occurrence and spatial ecology of the timber rattlesnake (*Crotalus horridus*) at the Warren Grove Gunnery Range in the Pinelands of New Jersey. Mid Atlantic Chapter of the Ecological Society of America, Fourth Annual Mid-Atlantic Region Scientific Meeting, March 17, 2007, York, PA.

Smith, R.M., Bien, W.F., Avery, H., Spotila, J.R. 2007. Distribution of Herpetofauna at the Warren Grove Gunnery Range. The New Jersey Academy of Science. 52th Annual Meeting, April 21, 2007. Kean University.

Smith, R. and Bien, W.F., Avery, H., Spotila, J.R. 2007. Coexistence of rattlesnakes and military operations: occurrence and spatial ecology of the timber rattlesnake (*Crotalus horridus*) at the Warren Grove Gunnery Range in the Pinelands of New Jersey. The New Jersey Academy of Science. 52th Annual Meeting, April 21, 2007. Kean University.

Zolkewitz. M., Bien, W.F. and Spotila, J.R. 2007. Soil dynamics as an indicator of restoration success in the New Jersey Pinelands. 52th Annual Meeting, April 21, 2007. Kean University.

Zolkewitz. M., Bien, W.F. and Spotila, J.R. 2007. Soil dynamics as an indicator of restoration success in the New Jersey Pinelands. 2007 Research Day, Drexel University, Philadelphia, PA

Zolkewitz. M., Bien, W.F. and Spotila, J.R. 2007. Nitrogen availability and plant community structure on a restored gravel pit 4 years after restoration. ESA/SER Joint Meeting, 5-Aug to 10-Aug-2007, San Jose, CA.

Avery, H. Spotila, J.R. and Bien, W.F. 2007. Effects of Wetland Fragmentation on Freshwater Turtle Populations in the Delaware Estuary. Delaware Estuary Science Conference and Environmental Summit, January 22, 2007, Cape May, New Jersey.

LaPoma, J., Reyanard, J., Pope, G., Gorring, M., Bien, W., McDougall, A. and Wolff, B. 2007. Influence of Fire on soil pH: A multi-ecosystem analysis, Sigma Xi Conference, May 5, 2007, Montclair State University.

Pope, G.A., Reynard, J., Bien, W. and Gorring, M. 2007. Fires and pedogenesis in the New Jersey Pine Barrens: Preliminary Results. Association of American Geographers, Annual Meeting, April 21, 2007, San Francisco, California.

Bien, W. 2006. New Jersey Pinelands: Disturbance, Bombs and Rare Species. Natural Resources Education Foundation, Waretown, NJ.

Buchanan, A., Bien, W.F. and Spotila, J.R. 2006. Ecology of Small Mammals in the New Jersey Pinelands with Special Reference to the Southern Bog Lemming (*Synaptomys cooperi)* and Meadow Jumping Mouse (*Zapus hudsonius).* American Society of Mammalogists Annual Meeting, June 17- 21, University of Massachusetts Amherst.

Reynard, J. Pope, G. and Bien, W. 2006. Forest's fire role as a catalyst for clay mineral alteration in soil and its effects on cation exchange capacity. Geological Society of America, Annual Meeting, 22-25 October 2006, Philadelphia, PA.

Zolkewitz. M., Bien, W.F. and Spotila, J.R. 2006. An improved method for restoring abandoned gravel pits in the New Jersey Pinelands. Society of Conservation Biology, 20th Annual Meeting, San Jose, CA, June 24 – 28.

Reynard, J. Pope, G. and Bien, W. 2006. Forest Fire as a Unifying Soil Weathering Agent in Differing Ecosystems. Ecological Society of America Middle Atlantic Ecology Conference, April 8-9, New Jersey School of Conservation, Montclair State University, NJ.

Buchanan, A., Bien, W.F. and Spotila, J.R. 2006. Ecology of Small Mammals in the New Jersey Pinelands with Special Reference to *Synaptomys cooperi* and *Zapus Hudsonius.* Drexel University Seventh Annual Research Day, April 25, 2006.

Bien, W.F. 2005. Non-native species at Warren Grove Range. Model National Military and Wildlife Association Training Session, March 14-17, Arlington VA.

Bien, W. Flora of Warren Grove Range, Philadelphia Botanical Club.

Bien, W. Ecological Research at Warren Grove Range, Warren Grove Gunnery Range Community Council.

Bien, W. Disturbance: Planes, Bombs and Rare Species, Ocean Nature and Conservation Society.

Smith, R. and Bien, W.F. 2005. The spatial ecology of timber rattlesnakes at Warren Grove Range. Biology of the Rattlesnakes Symposium, January 15-18, 2005, Loma Linda University, CA.

Smith, R. and Bien, W.F. 2005. Spatial ecology of timber rattlesnakes and pine snakes at Warren Grove Range. National Military and Wildlife Association Training Session, March 14-17, Arlington VA.

Smith, R. and Bien, W.F. 2005. Monitoring home range movements and identifying hibernacula of the timber rattlesnake and northern pine snake at the Warren Grove Gunnery Range. Department of Defense Strategic Environmental Research and Development Program (SERDP) Threatened and Endangered Species Symposium, June 7-9, Baltimore, MD.

Buchanan, A. Bien, W.F. and Spotila, J.R. 2005 Small mammal communities of the New Jersey pinelands American Society of Mammalogists Annual Meeting, June 15-19. Southwest Missouri State, MO.

McKessey, A., Bien, W.F. and Spotila, J.R. 2005. Fire management at Warren Grove Range. National Military and Wildlife Association Training Session, March 14-17, Arlington VA.

Zolkewitz, M., Bien, W.F. and Spotila, J.R. 2005. Restoration ecology at Warren Grove Range. National Military and Wildlife Association Training Session, March 14-17, Arlington, VA.

Avery, H.W., K.Klein, J.R. Spotila and W.F. Bien. 2005. Ecology and population structure of sympatric turtle species inhabiting a highly urbanized freshwater ecosystem: a case study for determining the effects of habitat fragmentation, modification, and isolation on a model reptilian community. Fifth World Congress of Herpetology, June 19-24, 2005, Stellenbosch, South Africa.

Avery, H.W., K.M. Klein, J.R. Spotila and W.F. Bien. 2005. Ecology and population structure of a model community of vertebrates in wetland habitats of the Delaware Estuary Ecosystem: A case study of the effects of habitat fragmentation, modification, and isolation on turtles. Delaware Estuary Conference, Cape May NJ January 10-12, 2005.

Avery, H.W., J.R. Spotila, W.F. Bien and K.M. Klein. 2005. Red-bellied turtle (*Pseudemys rubriventris*) population study at the Philadelphia International Airport: End-of-year meeting. Interagency Meeting, U.S. Fish and Wildlife Service, John Heinz National Wildlife Refuge, Tinicum PA.

Posters

Buchanan, A.N., Bien, W.F. and Spotila J.R. 2005. Small Mammal Communities of the New Jersey Pinelands. Drexel University Seventh Annual Research Day, April 26, 2005.

McKessey, N.A., Bien, W.F., Avery, H.W. and Spotila, J.R. 2005. Fire Management Effects on Vegetation at Warren Grove Air National Guard Range. Drexel University Seventh Annual Research Day, April 26, 2005.

Smith, R. and Bien, W.F. 2005. Ecological Society of America Middle Atlantic Ecology Conference, March 12-13, University of Maryland, Baltimore, MD: presented poster on timber rattlesnake and northern pine snake spatial ecology

Smith, R., Bien, W.F. and Spotila, J.R. 2005. Spatial Ecology of the Timber Rattlesnake at the Warren Grove Gunnery Range, Burlington County, New Jersey Drexel University Seventh Annual Research Day, April 26, 2005.

Zolkewitz, M., Bien, W.F. and Spotila, J.R. 2005. Factors Contributing to Successful Establishment of Schizachyrum Scoparium on an Abandoned Gravel Pit in the New Jersey Pine Barrens. Drexel University Seventh Annual Research Day, April 26, 2005.

Avery, H.W., K.M. Klein, J.R. Spotila and W.F. Bien. 2005. Freshwater turtle communities as indicators of the effects of anthropogenic perturbation and habitat fragmentation in the Delaware Estuary ecosystem: a model for linking environmental science and habitat management. Delaware Estuary Conference, Newark, DE, May 2005.

Klein, K.M., H.W. Avery, J.R. Spotila and W.F. Bien. 2005. Ecology and population structure of the red-bellied turtle, *Pseudemys rubriventris*, in a highly fragmented urban ecosystem. Drexel University Seventh Annual Research Day, April 26, 2005.

Wnek, J., H.W. Avery, J.R. Spotila and W.F. Bien. 2005. Nesting ecology of the Diamondback terrapin (*Malaclemys terrapin*) on human-impacted versus natural nest locations at Barnegat Bay, New Jersey. Drexel University Seventh Annual Research Day, April 26, 2005.

McKessey, N.A., Bien, W.F., Avery, H.W. and Spotila, J.R. 2004. Fire management effects on vegetation in the New Jersey Pine Plains at Warren Grove Air National Guard Range. Ecological Society of America Annual Meeting, August 1-6, Portland OR.

Posters

McKessey, N.A., Bien, W.F., Avery, H.W. and Spotila, J.R. 2004. Fire management effects on vegetation in the New Jersey Pine Plains at Warren Grove Air National Guard Range. Ecological Society of America Mid-Atlantic Chapter Meeting, March, Lancaster, PA.

Zolkewitz, M., Bien, W.F. and Spotila, J.R. 2004. Factors contributing to successful establishment of Schizachyrium scoparium on an abandoned gravel pit in the New Jersey Pine Barrens. Society for Conservation Biology, 18th Annual Meeting, July 30-August 2, 2004. Columbia University, NY.

Zolkewitz, M., Bien, W.F. and Spotila, J.R. 2004. A model for reclaiming severely disturbed upland areas in the New Jersey pinelands Society for Conservation Biology, 18th Annual Meeting, July 30-August 2, Columbia University, NY.

Other:

Warren Grove Gunnery Range Community Council, Research at Warren Grove Range
Natural Resources Education Foundation
Ocean Fun Day, New Jersey Department of Environmental Protection
American Fern Society, Ferns of the New Jersey Pine Barrens (field trip leader)
New Jersey Forest Education Center: Earth Day at Warren Grove Range
Conserve Wildlife, NJ Teacher Education Workshop

2003

Introduction to Fire Effects, The Nature Conservancy
New Jersey Forest Education Center: Earth Day at Warren Grove Range
Drexel Research at WGR: Pinelands Preservation Alliance and TNC
American Fern Society, Ferns of the New Jersey Pine Barrens (field trip leader)
The Philadelphia Botanical Club: Flora of Warren Grove Gunnery Range (field trip leader)

2002

Northeast High School, Philadelphia, PA, " Environmental Careers in the 21st Century"
New Jersey Marine Education Association Teacher Workshop, Barnegat Bay's Teach at the Beach
Rotary Club of Langhorne, "Leatherback Turtles and the Kids of Matapalo, Costa Rica"
Langhorne Borough Council, "The Sinda Dump and Environmental Action"

American Fern Society, field trip New Jersey Pine Barrens
Green Meadow Waldorf School, field trip New Jersey Pine Barrens
Marine Academy of Technology and Environmental Science, "Restoration at Warren Grove Range"
Rotary Club of Bristol, "Leatherback Turtles and the Kids of Matapalo, Costa Rica"
Rotary Club of Yardley, "Leatherback Turtles and the Kids of Matapalo, Costa Rica"
New Jersey Marine Education Association Teacher Hands on Workshop, "Diamondback Terrapins"
Montgomery County Science Teacher's Association Mini-Convention, "Ecology of the NJ Pine Barrens"

2001
Center for Talented Youth, Explorations in Environmental Science, Johns Hopkins University
Montgomery County Science Teachers Annual Meeting, Ecology of the New Jersey Pine Barrens
Lower Bucks County Chamber of Commerce, " Environmental Careers in the 21st Century"
Drexel University, "Workshop on the Environment," School of Environmental Science
ARTT Meeting, "The effectiveness of revegetation and remediation strategy in the New Jersey Pinelands
Rancocas Valley Regional High School, NJ, " Environmental Careers in the 21st Century"
Neshaminy High School, PA, " Environmental Careers in the 21st Century"
Bucks County Technical School, PA, " Environmental Careers in the 21st Century"

Prior to 2001
Glassboro State College Faculty Outdoor Club
The Pennsylvania State University: PROBE
The Philadelphia Herpetological Society
Pocono Environmental Education Center (PEEC)
New Jersey School of Conservation
Wetland's Institute, Stone Harbor, NJ
Four Lanes End Garden Club
The Garden Club Federation of America: National Convention
Neshaminy School District Humanities Program
Churchville Nature Center
North Penn School District
Yardley Garden Club
Parkland Garden Club
Old York Road Garden Club
Holly Shores Girl Scout Council
Peace Valley Nature Center
Boy Scouts of America
Montgomery County Sciences Teachers Association
Silver Lake Nature Center
Langhorne Gardens Senior Citizens
Pennington School Elder Hostel
The Symposium
Longwood Gardens
Bucks County Audubon Society
Pocono Audubon Society
Sierra Club of western New Jersey
Whitesbog Preservation Trust
Sierra Club: Philadelphia Chapter
Forks of the Delaware Garden Club
Idlewood Environmental Station
Neshaminy School District Wellness Program
Kirtland Society

Star Island Nature Center: Isles of Shoals
Rider University
Princeton Outdoor Club
Yardley Methodist Church
National Association of Biology Teachers: National Convention
47th Annual Meeting of the American Institute of Biological Sciences, University of Washington
48th Annual Meeting of the American Institute of Biological Sciences, Montreal, Canada
Second International Symposium on the Biology of Sphagnum, Laval University, Quebec City, Canada
The Geological Society of America
Pennsylvania Earth Science Teachers Workshop: PEEC
Academy of Natural Sciences, Philadelphia
Montclair State College
United States Fish and Wildlife Service
Mount Misery Methodist Church Camp

Community and Education Outreach
Drexel Alumni Day
Earthweek Warren Grove Gunnery Range, NJ
Carl Sandburg Junior High School

External Consultancies, Boards, Committees, Editorial Reviews:

Co-Chair	Science/Policy Forum Initiative: Pinelands Preservation Alliance
Advisory Committee	Rutgers Pinelands Field Station
Advisory Committee	Partnerships for Plant Conservation: NJDEP
Advisory Committee	NJ Pineland Forestry Advisory Committee: NJ Pinelands Commission
Technical Reviewer	New Jersey Terrestrial Non-game Mammal Status Review: NJDEP
Guest Editor	Northeast Naturalist (2005)
Committee	Flora of New Jersey Project
Environmental Consultant	**BN Applied Ecological and Biological Sciences: Plant and Wildlife Consultant** (*Ecological Research/Assessments ~ Wetland Delineation/Hydric Soils ~Landscape Restoration ~ Biological Inventories/Surveys/Monitoring/Habitat Evaluation*
Environmental Consultant	Warren Grove Gunnery Range, New Jersey Air National Guard
Board of Directors	Natural Resource Education Foundation of New Jersey
Science Review Committee	Natural Resource Education Foundation of New Jersey
Advisory Board	Marine Academy of Technology and Environmental Science
Advisory Board	Leatherback Trust
Advisory Board	The Las Baulas Educational and Community Development Program Costa Rica
Volunteer	Wildlife Conservation Corps, Division of Fish and Wildlife of New Jersey
VIP Panel	The Wheelabrator Environmental Symposium 2001

Technical Advisor	Carl Sandburg Junior High School Sea Turtle Project
Task Force	New Jersey Pinelands Commission: Toms River Corridor
Task Force	New Jersey Pinelands Commission: New Jersey Rare Snake Protection
Committee	Pinelands Preservation Alliance: Partnerships for NJ Plants
Community Council	Warren Grove Gunnery Range
Councilman	Langhorne Borough, Bucks County, PA (2001-2004)
Member	Langhorne Borough Shade Tree Commission
Member	Langhorne Borough Environmental Advisory Committee
Advisor	Langhorne Borough Recreation Board
President	The Symposium Club (2002-2003)

External Presentations, Teacher Workshops, and Community Outreach:

2012
Research on the Northern Pine Snakes in New Jesrey. Pinelands Shortcourse, March 24, 2012

New Jersey Symphony Orchestra Winter Festival: Fire. January 14 and 15, 2012
2011
The Northern pine snake. Toms River High School Environmental Majors Field Trip. October 13, 2011

Margate Fun Fest, Community outreach, Drexel Research. September 24, 2011.

Dwarf pine plains fire ecology and fire effects. NJ Foresters Annual Meeting and Field Trip. September 9, 2011.

Earthweek at Warren Grove Range (visits by K-12 students from local schools), April 18-22.

The Status of the Northern Pine Snake in NJ. Citizens United. March 9, 2011.

2010
Garden Club of America field trip, fire ecology of the NJ pine barrens, field trip to Warren Grove Range, May 13, 2010.

National Association of Foresters, fire ecology of the NJ pine barrens, field trip to Warren Grove Range, June 16, 2010.

Northern pine snake research at Warren Grove Range, Rutgers University ecology course, July 12, 2010.

Lepidoptera society of southern NJ, field trip to Warren Grove Range, July 18, 2010.

Lepidoptera society of northern NJ, field trip to Warren Grove Range, August 8, 2010.

New York Fern Society Annual field trip, Ferns of the NJ pine barrens, September 11, 2010.

Margate Fun Fest, Community outreach, Drexel Research, September 25, 2010.

Langhorne Rotary, Bombs. Fire, and Rare Species, October 21, 2010.

Ecology of the NJ Pine Barrens, Delaware Valley College field trip to Warren Grove Range, October 24, 2010.

Fire Dependent Ecosystems, Firewise Seminar, New Jersey Forest Fire Service, November 4, 2010.

2008
Botanical Society of America Annual Field Trip and Meeting (Co-Chair and Trip Leader), June 1-5, 2008. Lighthouse Center, Waretown, NJ.

NJ Soil Conservation Teacher's Roundtable. Frogs and Toads of the NJ Pine Barrens. April 30, 2008. Lighthouse Center, Waretown, NJ.

New Jersey Soil Conservation Environthon 2007
Teach at the Beach, New Jersey Marine Education Association
Pocono Environmental Education Center (PEEC)
New Jersey School of Conservation
Pennsylvania Earth Science Teachers Workshop: PEEC
Montgomery County Sciences Teachers Association
New Jersey Marine Education Association Teacher Workshop, Barnegat Bay's Teach at the Beach
Environmental Education Activities for Elementary Teachers, North Penn School District
Neshaminy School District Inservice Workshop
New Jersey Department of Environmental Protection, Conserve Wildlife

Contributing Technical and/or Scientific Survey Data:
Flora of New Jersey Project
Camp Shepherd's Mill, NJ
Herpetological Associates, Inc., NJ
John Heinz National Wildlife Refuge: amphibians
The Nature Conservancy
The New Jersey Conservation Foundation
New Jersey DEP, Department of Fish and Wildlife, Freshwater Fisheries
New Jersey DEP, Department of Fish and Wildlife, Marine Fisheries
New Jersey Natural Heritage Database
New Jersey Pinelands Rare Snake Protection Task Force
New Jersey Pinelands Commission
Partnerships for New Jersey Rare Plant Conservation
Toms River Corridor Task Force
United States Fish and Wildlife Service
USGS, Frogwatch Program
Western Connecticut College: *Clemmys mulenbergi*

Other:
Certified in Basic First Aid and CPR
Marine Operator's License (Master's Class); United States Coast Guard Certified
New Jersey Marine Operator's License

Community Service:
Langhorne Borough Council
Langhorne Borough Environmental Action Committee
Sinda Dump Task Force
"SAVE the FARM"

Children's Peace Park Playground
Rotary Club of Langhorne
Library for the Matapalo School, Matapalo, Costa Rica

Summary of Key Highlights:
Dr. Walter F. Bien is research professor in the Biology Department at Drexel University where he is Director of the Laboratory of Pinelands Research. Dr. Bien is Principal Investigator at the Warren Grove Gunnery Range (WGR), Burlington County, New Jersey where his research focuses on community ecology, conservation biologywith special emphasis on the Northern Pine snake, natural resource management, and military impacts to the Pine Barrens ecosystem. Dr. Bien received the 2006 Environmental Excellence Award from the United States Air Force Air National Guard for research at Warren Grove Range. His research has been highlighted on New Jersey News Science Edition, New Jersey NPR: Sounds of Science, and in People of the Pines (2007) by Plexus Press. He has collaborated with researchers from Rutgers University, Columbia University, Montclair University, Ramapo College, William Patterson, USDA, New Jersey Pinelands Commission, and New Jersey DEP on Pinelands issues.

Dr. Bien is a member of numerous professional organizations and has taught graduate and undergraduate courses in marine field methods, tropical ecology, terrestrial ecology and field botany. He currently supervises six PhD and and serves on five other graduate student committees. Dr. Bien is a strong advocate for environmental conservation and has collaborated with other scientists, government agencies, and NGOs with research interests in the Pine Barrens.

Before coming to Drexel University Dr. Bien was a public educator for 31 years. He has been involved with secondary education outreach since coming to Drexel and serves on several external education committees. Dr. Bien received the 2007 Outstanding Research and Education Award from the New Jersey Marine Education Association. He has been on the Board of Directors for the Natural Resources Education Foundation at the Lighthouse Center in Waretown, New Jersey since 2001 where he facilitated the establishment of a Drexel Field Station. Several Drexel ecology courses and research projects are centered at the Lighthouse Center including the Earthwatch Diamond Back Terrapin Project (Dr. Bien serves as CoPI). In addition, Dr. Bien has served as CoPI on the Learherback Turtle Conservation project (Drexel University/Earthwatch) in Costa Rica.