Eileen A. Murphy, Ph.D., Director  
Department of Environmental Protection  
Division of Science, Research & Technology  
P.O. Box 409  
Trenton, NJ 08625

Dear Dr. Murphy,

I have reviewed the draft report entitled “An analysis of the feasibility of using fertility control to manage New Jersey black bear populations” prepared by Mark Fraker, Paul Curtis and Marc Mansour. A copy of my review is attached along with my CV and Conflict of Interest Disclosure. Please contact me if you have any questions.

Sincerely,

Gary Killian, Ph.D.  
Distinguished Professor  
Reproductive Physiology
Gary Killian, Ph.D.
Expertise: Reproduction and Fertility Control
Peer Review
Draft Report: “An analysis of the feasibility of using fertility control to manage New Jersey black bear populations” prepared by Mark Fraker, Paul Curtis and Marc Mansour

The report prepared by Fraker et al. provides a thorough overview of the current status of fertility control agents used in mammals and their past use or potential use in the future with wildlife species. The report also provides a reasonable overview of the problems and challenges New Jersey faces in dealing with the increased numbers and range of black bears in the state. The report realistically looks at “bear biology” in the context of what kind of fertility control approaches are desirable and feasible to apply. This document is well written and comprehensive, and supports the conclusion that fertility control to reduce bear populations numbers would not be successful at this time. The primary reasons for this conclusion are the lack of long lasting and appropriate fertility control technology, bear biology and the challenges of capturing significant numbers of bears in order for the treatment to have a significant impact on population reduction.

Fertility control agents and approaches to address over abundant wildlife and feral species are actively being developed and tested. However, the published literature to date does not provide adequate choices to consider for use in controlling black bear populations. This could change within the next 5-10 years when certain fertility control approaches under development reach a stage where they have proven long-term efficacy and have practical feasibility for black bears.

One of the difficulties with the development of fertility control agents for wildlife is that testing and registration of a product with a regulatory agency such as the FDA is time consuming and very costly. Although several contraceptive vaccines and other fertility control approaches have been researched in the past and are currently being evaluated, the information gained from these studies is quite limited. It is unknown whether most of the approaches under investigation will be useful for wildlife since they have not been tested in the wildlife species in question, such as black bears. When the approach is tested in wildlife, it is often field tested, with limited opportunity for thorough evaluation of the treated animals and how their response differs from that of untreated controls. This leaves the agencies involved in making decisions to use fertility control approaches on wildlife species with inadequate information to make responsible decisions.

A minor weakness of this report is that it does not emphasize that the true safety and toxicity of fertility control approaches are usually not known for a wildlife species. This is because wildlife species are often in limited supply for research studies, difficult to manage intensively for direct experimentation, and the studies are cost prohibitive. In addition, virtually no behavioral/ social hierarchy research has been done on the species in question to understand the true impact of the fertility control approach. While speculation may be possible, as is done in this report, without controlled experiments we do not know what social hierarchy effects may result from a treatment. Even with PZP vaccines, which have been research most extensively, social behaviors before and after
treatment have not been researched. If one speculates that behavioral changes may occur as a consequence of a treatment it does not mean they are necessarily bad. All perturbations to an animal population including increased density have some impact. Lethal removal no doubt has an impact on the social hierarchy of those left behind.

Having raised the points in the preceding paragraph, I suggest that the subjective evaluation scores in Table 2 of the report pertaining to Social structure and Effect on individuals may be too speculative to be meaningful, since little or no research supports them. It may be better to list “U” in the columns than imply that it is based on evidence. Likewise, a column for Safety and Efficacy for the animal may be included for speculation. If anything, the point will be made that more research needs to be done in this area so that fertility control approaches used in wildlife in the future will be based on sound foundations and research.

Finally, I believe this is a well written report and I agree with its conclusions. The literature review supports the authors’ conclusion that given the technology currently available, fertility control agents are not recommended to manage growth of black bear populations in New Jersey.

Submitted May 31, 2006

[Signature]
Biographical Sketch

Provide the following information for each key personnel in the order listed on the title page.

DO NOT EXCEED TWO PAGES PER PERSON.

<table>
<thead>
<tr>
<th>NAME</th>
<th>POSITION TITLE</th>
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<tbody>
<tr>
<td>Gary J. Killian,</td>
<td>Distinguished Professor of Reproductive Physiology</td>
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<tr>
<td>Principal Investigator</td>
<td></td>
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<th>EDUCATION/TRAINING</th>
<th>DEGREE (if applicable)</th>
<th>YEAR(s)</th>
<th>FIELD OF STUDY</th>
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<td>Kansas State University</td>
<td>B.S.</td>
<td>1967</td>
<td>Zoology</td>
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<td>Kansas State University</td>
<td>M.S.</td>
<td>1969</td>
<td>Embryology</td>
</tr>
<tr>
<td>Penn State University</td>
<td>Ph.D.</td>
<td>1973</td>
<td>Reproductive Physiology</td>
</tr>
<tr>
<td>Los Alamos National Laboratory</td>
<td>Sabbatical</td>
<td>2001</td>
<td>Flow Cytometry</td>
</tr>
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EMPLOYMENT EXPERIENCE:
Kent State University
Assistant Professor of Biology 1976-1980, Associate Professor of Biology 1980-1984

Penn State University
Assistant Professor of Biology 1973-1974, Research Associate in Dairy Science 1974-1975
Assistant Professor of Dairy Science 1975-76, Associate Professor of Animal Science 1984-1989
Professor of Reproductive Physiology 1989-2000,
Distinguished Professor of Reproductive Physiology 2001-present

Honors and Advisory Committees:

Students Advised: Advised 14 M.S. students, 16 Ph.D. students, 21 post-doctoral students/visiting professors. Currently, advisor to 1 Ph.D. student, 3 veterinarian post-docs and 1 visiting professor.

Relevant Publications from a total of 115 papers and 99 published abstracts: