

EDITORIAL

**ALL DOLLARS AND NO SENSE: CRITIQUE OF DR. DAVID PIMENTEL'S
ESTIMATED ECONOMIC IMPACT OF DOMESTIC CAT PREDATION**

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I. INTRODUCTION

There is a concerted effort on the part of some conservation organizations in the U.S. to vilify cats as having a major impact on wild bird populations. Several organizations in particular have targeted feral cats for extermination based on the notion that any bird depredation rate by cats is unacceptable simply because they are an introduced species to the United States. Ecologists that share this view have worked to project (and publish) ever higher rates of cat predation in the guise of “real science” to provide shock value for media-making headlines.¹ The American Bird Conservancy, the National Audubon Society, the Smithsonian Migratory Bird Center and The Wildlife Society actively and vociferously campaign to support all feral cat “removal” from the environment. One line of attack has been to use an economic “cost” assigned to the supposed impacts of free-roaming and feral cats.

Ecologists at Cornell University, led by Dr. David Pimentel, authored several papers in an attempt to quantify the environmental impact of non-native species in the United States.² The papers include an economic cost assigned to the domestic cat based on the notion of environmental damage as the result of wild bird depredation. However, there is no strong research to support the position that free roaming cats are a serious threat to birds or other wildlife (except where there are fragile prey populations in isolated or fragmented ecosystems), and the inclusion of the domestic cat as

¹ Scott R. Loss et al., *The Impact of free-ranging domestic cats on wildlife in the United States*, 4 NATURE COMMUNICATIONS 1396 (January 29, 2013); Peter J. Wolf, *Garbage In, Garbage Out*, VOX FELINA (February 1, 2013) <http://www.voxfelina.com/2013/02/garbage-in-garbage-out/>.

² David Pimentel et al., *Environmental and Economic Costs of Nonindigenous Species in the United States*, 50 BIOSCIENCE 1, 53-65 (2000); David Pimentel et al., *Update on the Environmental and Economic Costs Associated with Alien-Invasive Species in the United States*, 52 ECOLOGICAL ECON. 1, 273-88 (2005); David Pimentel, *Environmental and Economic Costs of Vertebrate Species Invasions Into the United States*, in MANAGING VERTEBRATE INVASIVE SPECIES: PROC. OF AN INT’L SYMP. (Gary W. Witmer et al. eds., 2007).

an environmental liability across the continental U.S. is specious. The domestic cat may be an introduced species to the North American continent,³ but as they were “working” companions of European traders and settlers, it is generally believed the domestic cat arrived in the company of British colonists as early as 1614.⁴ After four centuries, our wild domestic cats now live in a complex ecological web. The diet and predation habits of cats vary in each environment, and their eradication in some areas endangered the very species their removal attempted to protect.⁵

Further, the method Pimentel used to develop the valuation did not employ rigorous science or sound economic principles. The calculation is based on extremely simplistic estimates of total annual bird losses attributed to cat predation, multiplied by an arbitrary value assigned to individual wild birds. This “per bird” number is a “symbolic valuation” that “lacks any discernible scientific analysis.”⁶ As such, it is an economically irrational estimate. Pimentel’s valuation of the cost of the domestic cat is not just meaningless from an environmental policy perspective, its inclusion is potentially harmful to native wild birds as well as domestic cats that do not need to be “removed” from the environment, and could contribute to redirection of scarce public funds.

The impact of the domestic cat in our environment and strategies for feral cat management are hotly debated, but few dispute the fact that companion animals, including cats, have a significant place in our hearts, our homes, and our economy. One does not need to seek benefit solely in the intangible aspects of companion animal ownership or the human health benefits of owning a companion animal that have been so well documented.⁷

³ *Global Invasive Species Database*, INVASIVE SPECIES SPECIALIST GROUP, <http://www.issg.org/database/welcome/aboutGISD.asp> (last visited Nov. 17, 2013).

⁴ Joseph C. Mitchell & Raymond A. Beck, *Free-Ranging Domestic Cat Predation on Native Vertebrates in Rural and Urban Virginia*, 43 VA. J. SCI. 1B, 197-207 (1992).

⁵ *Conservation Cock Up Devastates Macquarie Island - £10 Million to Fix*, WILDLIFEEXTRA.COM, <http://www.wildlifeextra.com/go/news/macquarie-island.html#cr> (last visited Nov. 15, 2013).

⁶ Walter Lamb, *Commentary on Economic Valuations of Biodiversity*, 89 ECOLOGICAL ECON. 1, 170-73 (2013).

⁷ Jennifer Viegas, *The Truth About Cats: They're Good for Us*, DISCOVERY NEWS, (Aug. 21, 2012), <http://news.discovery.com/human/health/cats-health-humans-120821.htm>.

The economic contribution of the cat and other pets is very real and tangible.

II. PIMENTEL'S INCLUSION OF THE DOMESTIC CAT IN VALUING THE IMPACT OF NON-NATIVE SPECIES IN THE U.S. DOES NOT EMPLOY SOUND SCIENCE

Pimentel ultimately published three papers valuing the environmental and economic cost of non-indigenous species in the U.S. The papers have been criticized for inadequate research, lack of ecological understanding, and improper application of economic methods.⁸ Investigation into the method used by Pimentel to estimate the economic impact of domestic cats confirms the above assessments. The valuation is based on a calculation of wild bird losses via cat predation. But the basic premise that predation equates to harmful ecological impact is unfounded. The serious lack of research by Pimentel and his team results in the adoption of inaccurate assumptions to estimate annual bird deaths attributed to domestic cats. Additionally, the sections on cat predation in the published papers were replete with errors.

A. Cat Predation of Birds Does Not Imply Harmful Ecological Impact

Birds are sensitive indicators of the health of our environment. Birds not only play a vital role in our ecosystem, they contribute to the richness of life and beauty everyone recognizes and enjoys. While birds have direct ecological and economic functions and hold intangible cultural value, claiming to have valued their loss via depredation by the domestic cat is not scientifically sound for the simple reason that it is unclear the domestic cat even has an impact on their population. In a review of 61 cat predation studies, Michael Fitzgerald⁹ and Dennis Turner¹⁰ conclude that there is not enough

⁸ Porter Hoagland & Di Jin, *Science and Economics in the Management of an Invasive Species*, 56 BIOSCIENCE 11, 931-35 (2006).

⁹ B. Michael Fitzgerald was former Ecologist at the Ecological Research Associates of New Zealand.

¹⁰ Dennis C. Turner is Director of the Institute for Applied Ethology and Animal Psychology in Switzerland. He has published extensively on domestic cats and is also well known for his affiliation with international organizations concerning human-animal relationships, animal-assisted therapy and animal welfare.

information to attempt to estimate, on average, how many birds cats kill each year. Their work also indicates that there are “few, if any” studies (apart from island ones) that actually demonstrate cats have reduced bird populations.¹¹ Cat predation study authors themselves note that cat predation figures do not equate to an assessment of the impact of cats on wildlife populations.¹² Despite the growing body of cat predation studies and continental-level bird depredation projections, population-level impacts on bird populations in continental environments remain poorly documented and have not been demonstrated. The focus of studies tends to be merely determining predation rates, not the actual impact of cats on prey populations. According to Roland Kays and Amielle DeWan,

[T]he ecological impact of a cat population is a difficult metric to quantify, yet probably the most important when evaluating the conservation risks associated with their management. While a number of researchers have extrapolated kill rates from a few cats into huge estimates of prey killed by cats over large areas...these are rarely contrasted with similar estimates of potential prey populations over the same scales. Unfortunately, biologists have rarely sampled both cat and prey populations in such a way that direct effects on prey populations can be shown.¹³

The work of Kays and DeWan, a study that attempted to measure the impact of cat predation on prey populations, found no relationship between the number of cats detected in an area and the local small mammal abundance or rodent seed predation rates.¹⁴ In fact, densities of feral cats are highest in urban areas¹⁵ where many

¹¹ B. Michael Fitzgerald & Dennis C. Turner, *Hunting Behavior of Domestic Cats and Their Impact on Prey Populations*, in *THE DOMESTIC CAT: THE BIOLOGY OF ITS BEHAVIOR*, 151-75 (Paul P.G. Bateson & Dennis C. Turner eds., 2000).

¹² Michael Woods et al., *Predation of Wildlife by Domestic Cats Felis catus in Great Britain*, 33 *MAMMAL REV.* 2, 174-88 (2003); Roland W. Kays & Amielle A. DeWan, *Ecological Impact of Inside/Outside House Cats Around a Suburban Nature Preserve*, 7 *ANIMAL CONSERVATION* 1, 1-11 (2004); Fitzgerald & Turner, *supra* note 11.

¹³ Kays & DeWan, *supra* note 12.

¹⁴ *Id.*

¹⁵ Philip J. Baker et al., *Cats About Town: Is Predation by Free-Ranging Pet Cats Felis catus Likely to Affect Urban Bird Populations?* 150 *IBIS Supp.* 1, 86-

birds are thriving. North American birds did not evolve in the absence of predators; they have obviously adapted to the presence of domestic cats given the *State of the Birds'* urban/suburban indicator (that tracks 114 native bird species) shows "a steady, strong increase during the past 40 years."¹⁶

B. Inaccurate Assumptions

Cat predation is not a simple metric to measure. There is a wide range of potential problems in studies of cat predation that include the following factors: small sample sizes, method of study recruitment, data gathering techniques, time frames encompassed by the studies, methods applied in statistical analysis of the data gathered, assumptions used in "adjusting" the data, the proportion of scavenged animals in prey collection, and an inability to determine the extent to which predation is compensatory (cats preying on birds that would have died before breeding season) versus additive (cats preying on birds that likely would have survived to breeding season).

State and nationwide bird depredation extrapolations have their own host of problems, apart from the fact that they are built on potentially flawed studies of predation rates. These errors include the use of mean numbers instead of median numbers to "scale up" rates of predation, consistent inflation of feral cat population estimates, the number of pet cats allowed to roam, the number of cats that hunt, and the number of hunting cats that hunt birds; assuming that population densities of cats are evenly distributed; and extrapolating predation rates from one habitat into another, e.g., using results from a rural village scaled up to nationwide estimates, assuming the distribution of cats and their hunting behavior is uniform.

Pimentel and his team ignored all of these potential problems in developing their cat predation estimates. This decision resulted in meaningless estimates based on inaccurate assumptions and poor data.

99 (2008); ROGER TABOR, UNDERSTANDING CATS, THEIR HISTORY, NATURE, AND BEHAVIOR 102 (1997).

¹⁶ *The State of the Birds, United States of America 2009*, U.S. COMMITTEE N. AM. BIRD CONSERVATION INITIATIVE (2009), http://www.stateofthebirds.org/2009/pdf_files/State_of_the_Birds_2009.pdf.

1. *Cats Do Not Depredate Only Native Species*

The first inaccurate assumption of the Pimentel valuations and population-level estimates of cat predation is that cats prey only on native birds. According to Pimentel, “Cats prey on native birds, plus small native mammals, amphibians, and reptiles.”¹⁷ But cats do not discriminate between native and non-native birds. Pimentel published that approximately 10% of bird species in the United States are non-native, and assigned an environmental cost of over \$2 billion to just two nuisance species.¹⁸ That 10% is significantly widespread; according to the Center for Human-Wildlife Conflict Resolution at Virginia Tech, “The [European] house sparrow [a non-native invasive species in the U.S.] is the most common songbird in North America and the most widely distributed bird on the planet.”¹⁹ It is common sense that given the prevalence of non-native birds in the U.S. that cats that hunt birds are preying on these nuisance species. This non-native population does not present an environmental cost to our native habitat.

In the U.S., a study conducted in Wichita, Kansas found that house sparrows and starlings, both non-native invasive species in the U.S., represented the highest proportion of depredated birds (26%).²⁰ In fact, a number of studies (conducted mainly in Australia) found cats depredate primarily non-native species of rodents and birds and this, in turn, may have a positive effect on native wildlife.²¹

¹⁷ Pimentel, *supra* note 2.

¹⁸ Pimentel (2007), *supra* note 2.

¹⁹ *Species: Sparrow*, CENTER FOR HUM.-WILDLIFE CONFLICT RESOL. (Oct. 24, 2013), <http://humanwildlife.cmi.vt.edu/Species/Sparrow.htm>.

²⁰ Carol A. Fiore & Karen B. Sullivan, *The Ecological Implications of Urban Domestic Cat (*Felis catus*) Predation on Birds In the City of Wichita, Kansas* (2000) (unpublished M.S. thesis, Wichita State University) (on file with Ablah Library, Wichita State University).

²¹ David G. Barratt, *Predation by House Cats, *Felis catus* (L.), in Canberra, Australia. I. Prey Composition and Preference*, 24 WILDLIFE RES. 3, 263-77 (1998); Chris D. Dickman, *Overview of the impacts of feral cats on Australian native fauna*, AUSTRALIAN NATURE CONSERVATION AGENCY (1996), <http://secure.environment.gov.au/biodiversity/invasive/publications/pubs/impacts-feral-cats.pdf>; Rafael Matias & Paulo Catry, *The Diet of Feral Cats at New Island, Falkland Islands, and Impact on Breeding Seabirds*, 31 POLAR BIOL 1, 609-16 (2008).

2. *Cats are Scavengers: Conventional cat predation studies cannot determine if bird consumption by a cat was additive or compensatory*

Pimentel also makes the assumption, as do most population-level estimates of cat predation, that all birds eaten by cats were alive, hunted, and killed by the cat. But cats are scavengers; they eat carrion and garbage.²² Cat predation studies are primarily conducted by examining cat scat, stomach contents, or surveys of prey returned to pet owners. None of these methods can detect whether the bird was injured, dead, or alive when the cat encountered it, yet these are central considerations in assessing the ecologic role of cats. The number of prey eaten by a predator is not necessarily the same as the number killed by it.²³ In an island study, birds that cats killed represented just 5% of their intake.²⁴

3. *Cats are Opportunistic Feeders: Hunting and scavenging profiles are not uniform across habitats*

Pimentel's valuations and population-level estimates of cat predation also assume that cats in different habitats have uniform hunting profiles. That is not the case: Cats are opportunistic feeders.²⁵ Given that cats are flexible in their dietary habits,

²² ROGER TABOR: THE WILD LIFE OF THE DOMESTIC CAT 98 (1983); Fitzgerald & Turner, *supra* note 11; Susan Hutchings, *The Diet of Feral House Cats (Felis catus) at a Regional Rubbish Tip, Victoria*, 30 WILDLIFE RES. 1, 103-10 (2003).

²³ P.J. Apps, *Aspects of the ecology of feral cats on Dassen Island, South Africa*, 18 S. AFR. J. ZOOLOGY 4, 393-399 (1983).

²⁴ *Id.*

²⁵ Brian J. Coman & Hans Brunner, *Food Habits of the Feral House Cat in Victoria*, 36 J. WILDLIFE MGMT. 3, 848-53 (1972); David C. Paton, *Loss of Wildlife to Domestic Cats*, in THE IMPACT OF CATS ON NATIVE WILDLIFE 64-9 (Catherine Potter ed., 1991); David G. Barratt, *Using Theory and Scientific Experience to Assess the Impact of House-Based Domestic Cats Felis catus (L) on Prey Populations and Prey Community Structure*, URB. ANIMAL MGMT. CONF. PROC. (1994), http://www.ccac.net.au/files/Using_theory_and_scientific_UAM94Barratt.pdf;

Fitzgerald & Turner, *supra* note 11; ELLEN P. BERKELEY, MAVERICK CATS: ENCOUNTERS WITH FERAL CATS 68 (2001); Yolanda van Heezik et al., *Do Domestic Cats Impose an Unsustainable Harvest on Urban Bird Populations?* 143 BIOLOGICAL CONSERVATION 1, 121-30 (2010).

extrapolations of the diet of the cat from one habitat to another are unreasonable given variable prey availability. Varying abundances of birds, rodents, rabbits, other species and garbage between rural and urban areas, even across urban gradients,²⁶ mean that cats in different habitats will have different hunting or scavenging profiles.²⁷

Some studies indicate that urban cats depredate birds at a higher rate than in other habitats.^{28,29} Yet as Roger Tabor, a biologist recognized as one of the world's leading authorities on cats,³⁰ points out, suburban and urban areas support unnaturally high concentrations of birds, consequently an observation of higher bird depredation rates in urban areas is consistent with cats being opportunistic hunters.³¹

4. *Not All Hunting Cats Prey on Birds*

Although Pimentel has based his valuation on the assumption that all feral cats and all cats with outdoor access hunt birds, the literature is quite clear on this point: not all cats hunt, and not all hunting cats prey on birds. In New Zealand, where there are no native terrestrial mammals (other than two species of bat), 17% of cats studied did not hunt or eat birds.³² Even more to the point, a study conducted of the population of feral cats on New Island, Falkland Islands,³³ (an island of just 8.8 square miles, where 39 species of bird regularly breed on the island and more than two million seabirds inhabit its shores and surrounding smaller islands³⁴) found no evidence of birds (or eggs) in 53.4% of scat analyzed over the course of two austral summers.

²⁶ Yolanda van Heezik et al., *Diversity of native and exotic birds across an urban gradient in a New Zealand city*, 87 *LANDSCAPE AND URBAN PLANNING* 223-232 (2008).

²⁷ van Heezik et al., *supra* note 25.

²⁸ Paton, *supra* note 25.

²⁹ van Heezik et al., *supra* note 25.

³⁰ Roger Tabor *CBiol FSB MPhil FCFBA Feline Behaviour Practitioner*, CANINE & FELINE BEHAVIOR ASSOCIATION, <http://www.cfba.co.uk/robertabor.html> (last visited Dec. 26, 2013).

³¹ TAVOR, *supra* note 15.

³² van Heezik et al., *supra* note 25.

³³ Matias & Catry, *supra* note 21.

³⁴ NEW ISLAND CONSERVATION TRUST, <http://www.falklandswildlife.com/> (last visited Nov. 17, 2013).

Table 1: Percent of Hunting Cats that do NOT hunt birds³⁵

Location	Methodology	Year	No. of Cats	% of hunting cats that did NOT hunt birds	Reference
Victoria, Australia	Stomach content analysis	1972	80 feral cats	92.5%	Coman & Brunner (1972)
Southern Sweden (rural)	Scat analysis	1972 – 1977	84 - 121	31%	Liberg (1984)
Adelaide, Australia	Survey of 421 cat owners	1988 – 1989	612	38% of cats without bells 53% of cats with bells	Paton (1991)
Wichita, KS (US)	Collection/owner observation/scat analysis over one year	2000	41	37%	Fiore (2000)
Southeastern Michigan (US)	Survey	2003	NA	53%	Lepczyk (2003)
Various: UK	Survey between April 1 and August 31,	2003	634	20%	Woods (2003)

³⁵ Brian J. Coman & Hans Brunner, *Food Habits of the Feral House Cat in Victoria*, 36 J. WILDLIFE MGMT. 3, 848-53 (1972); Olof Liberg, *Food Habits and Prey Impact by Feral and House-Based Domestic Cats in a Rural Area in Southern Sweden*, 65 J. MAMMALOGY 3, 424-32 (1984); Paton, *supra* note 25; Fiore & Sullivan, *supra* note 20; Christopher A. Lepczyk et al., *Land Owners and Cat Predation Across Rural-to-Urban Landscapes*, 115 BIOLOGICAL CONSERVATION 1, 191-201 (2003); Woods et al., *supra* note 12; Matias & Catry, *supra* note 21; van Heezik et al., *supra* note 26.

New Island, Falkland Islands	Scat analysis	Austral summers of 2004/2005 and 2005/2006		53%	Matias & Catry (2008)
Dunedin, NZ	Collection/owner reporting over one year	2008	96	17%	van Heezik (2010)

These studies not only illustrate the importance of the habitat (and likely the length of time of the studies) in determining cat predation profiles, but the number of hunting cats preying on birds in these studies ranges from just 7.5% up to 83%. Clearly none indicate that all cats hunt birds.

5. *Cat Predation May Be Primarily Compensatory*

One of the most important oversights by Pimentel and continental-level projections of cat predation is the assumption that cats prey only on healthy birds, and therefore all hunting is additive, not compensatory. Predation is generally understood to be an important selective force in evolution, and cat predation of birds is no exception, with research providing evidence of natural selection at work. In a 2005 – 2006 study, Philip Baker analyzed data comprised of a total of 134 birds from 13 species, of which 86 and 48 had been killed by cats and collisions, respectively. The analysis found that birds killed by cats had significantly lower mass, fat scores and pectoral muscle mass scores than bird collisions with buildings, and study authors concluded, “Across species, cat-killed birds were in significantly poorer condition than those killed following collisions; this is consistent with the notion that cat predation represents a compensatory rather than additive form of mortality.”³⁶ Møller and Erritzøe studied 18 species of passerine birds and domestic cat predators. Their work found that avian prey of cats “often have a poor health status.”³⁷ The results of this study “suggested that predators like the domestic cat may select against

³⁶ Baker et al., *supra* note 15.

³⁷ Anders P. Møller & Johannes Erritzøe, *Predation Against Birds with Low Immunocompetence*, 122 *OECOLOGIA* 4, 500-04 (2000).

individuals with a weak immune system, leaving a disproportionate fraction of immunocompetent individuals as survivors.”³⁸

The Royal Society for the Protection of Birds, a UK-based bird conservation society, in direct contrast to the American Bird Conservancy (“ABC Birds”) in the U.S., states that:

[D]espite the large numbers of birds killed, there is no scientific evidence that predation by cats in gardens is having any impact on bird populations UK-wide. This may be surprising, but many millions of birds die naturally every year, mainly through starvation, disease, or other forms of predation. There is evidence that cats tend to take weak or sickly birds. We also know that of the millions of baby birds hatched each year, most will die before they reach breeding age. This is also quite natural, and each pair needs only to rear two young that survive to breeding age to replace themselves and maintain the population. It is likely that most of the birds killed by cats would have died anyway from other causes before the next breeding season, so cats are unlikely to have a major impact on populations.³⁹

Cats preying on weak, sick, or injured birds that would not have survived to breed does not present an environmental cost to our native habitat.

C. Estimating the Percentage of Cats that Roam Outdoors

Pimentel’s paper from 2000 (valuing cat predation at \$17 billion) posits that 65% of pet cats hunt birds.⁴⁰ To estimate the percentage of pet cats that are allowed to roam, Pimentel cites an article by Linda Winter of the American Bird Conservancy (“ABC Birds”) published in the *Earth Island Journal*, where she states, “[a] recent poll shows approximately 35 percent [of pet cats] never go

³⁸ *Id.*

³⁹ *Are cats causing bird declines?* ROYAL SOCIETY FOR PROTECTION BIRDS, <http://www.rspb.org.uk/advice/gardening/unwantedvisitors/cats/birddeclines.aspx> (last visited Nov. 17, 2013).

⁴⁰ Pimentel, *supra* note 2.

outside.”⁴¹ This was ostensibly the result of the 1997 nationwide telephone survey cited by Winter in the article. But the Pimentel team did not go to the source material. This “nationally representative” survey was commissioned by ABC Birds, of which Winter was head of the Cats Indoors! Program at the time.⁴² It indicates that 35% of cats are kept indoors all of the time and that 31% of cat owners “keep them indoors mostly with some outside access.”⁴³ On the basis of the ABC Birds’ commissioned survey cited by Winter, only 34% of pet cats should be considered “free-roaming,” not 65%.

The estimate of 34% of pet cats allowed to roam is in-line with other literature on the subject. A survey published in JAVMA and conducted by Linda Lord, Assistant Professor of Veterinary Preventative Medicine at Ohio State University, indicates that 40% of cat owners allow their pets to roam.⁴⁴ The American Pet Products Association (APPA) 2009-2010 National Pet Owners Survey indicates that 66% of pet cats are kept indoors at night and 64% are kept indoors during the day;⁴⁵ and notably, available for the Pimentel 2005 and 2007 updates,⁴⁶ Elizabeth Clancy found that 60% of cats

⁴¹ Linda Winter, *Cats Indoors!* EARTH ISLAND J. 25-6 (1999), <http://www.highbeam.com/doc/1G1-54451542.html>.

⁴² *Human Attitudes and Behavior Regarding Cats*, AM. BIRD CONSERVANCY, <http://www.abcbirds.org/abcprograms/policy/cats/materials/attitudes.pdf> (last visited Dec. 24, 2013).

⁴³ *Id.*

⁴⁴ Linda K. Lord, *Attitudes Toward and Perceptions of Free-Roaming Cats Among Individuals Living in Ohio*, 232 J. AM. VETERINARY MED. ASS'N 8, 1159-67 (2008).

⁴⁵ *2009-2010 APPA National Pet Owners Survey*, AM. PET PRODUCTS ASS'N (2009), <http://vetnetwork.com/blog/2010/11/pet-spending-trends-in-2010/>.

⁴⁶ In the Pimentel 2005 Update (Pimentel, *supra* note 2), the discussion of the cost of cat predation indicates that free-roaming pet cats were excluded entirely from the valuation. That would have resulted in a \$7.2 billion valuation, rather than the publication error recorded as \$17 billion. In what can only be explained as an extremely bizarre assumption, the 2007 USDA National Wildlife Research Center Symposia piece (Pimentel *supra* note 2) includes indoor-only pet cats as preying on wild birds. Pimentel’s assumption appears to be based on the comment that “in terms of potential predation rate, the urban cat and the feral cat are very close to equivalent” (citing George M. McKay, *Feral cats in Australia: origins and impacts*, in UNWANTED ALIENS: AUSTRALIA’S INTRODUCED ANIMALS 9-15 (2006)). McKay

are kept indoors all the time, and of the 40% allowed outdoors, 29% were outdoors for less than an hour each day.⁴⁷

D. Estimating the Percentage of Pet Cats that Roam Outdoors and Hunt

Importantly, all cat predation research of roaming house cats indicates that not all free-roaming pet cats hunt. Pet cats that are allowed to roam are generally regularly fed by their owners, thus hunting is not primarily food motivated. With access to human-provided food, it should come as no surprise that individual pet cats vary considerably in the degree to which they depredate wild animals (this has also been shown to be an age-related function in most predation studies). Table 2 summarizes study results of pet cat predation (studies of reasonable sample size conducted on continents). There is a very wide range of non-hunting cats: from 8.6% of cats in Peter Churcher and John Lawton's 1987 study⁴⁸ to 74% of cats in Philip Baker's 2005 study.⁴⁹ Study design will impact results, and each methodology (scat analysis, owner observation, prey collection, and owner recollection via survey) has its own potential flaws.

Table 2: Percent of Free-Roaming Pet Cats that do NOT Hunt⁵⁰

should not have needed to clarify that the reference was to pet cats allowed to roam outside, not pet cats kept indoors-only.

⁴⁷ Elizabeth A. Clancy et al., *Evaluation of Cat and Owner Characteristics and Their Relationship to Outdoor Access of Owned Cats*, 222 J. AM. VETERINARY MED. ASS'N 11, 1541-45 (2003).

⁴⁸ Peter B. Churcher & John H. Lawton, *Predation by Domestic Cats in an English Village*, 212 J. ZOOLOGY 3, 439-55 (1987).

⁴⁹ Philip J. Baker et al., *Impact of Predation by Domestic Cats Felis catus in an Urban Area*, 35 MAMMAL REV. 3 & 4, 302-12 (2005).

⁵⁰ Liberg, *supra* note 35; Churcher & Lawton, *supra* note 48; Paton, *supra* note 25; *The Metropolitan Domestic Cat: A Survey of the Population Characteristics and Hunting Behavior of the Domestic Cat in Australia*, PETCARE INFO. & ADVISORY SERVICE (1994), http://www.aiam.com.au/resources/files/proceedings/canberra1994/PU_B_Pro94_JimMillwood_TimHeaton.pdf (last visited Dec. 26, 2013); Gaille Perry, *Cats- Perceptions and Misconceptions: Two Recent Studies About Cats and How People See Them*, URB. ANIMAL MGMT. PROC. (1999), http://www.ccac.net.au/files/Cats_perceptions_and_UAM9%20Perry.pdf;

(Cat Predation Studies Conducted on Continents)

Location	Methodology	No. of Cats	% of house cats that did NOT hunt	Reference
Southern Sweden (Rural)	Scat Analysis 1974-1979	84 - 121	31.0%	Liberg (1984)
English village (Felmersham)	Prey collection Over 12 months	70	8.6%	Churcher and Lawton (1987)
Rural-Suburban Australia	Survey of 421 cat owners	612	27.0%	Paton (1991)
Urban Australia (62% of private dwellings)	Survey of over 4,000 households		56.0%	REARK (1994)
Mt. Isa, Queensland Australia	Survey	1,280	51.0%	Perry (1999)
Wichita, KS USA	Collection/owner observation/scat analysis over one year	41*	37.0%	Fiore (2000)
Various: UK	Survey between April 1 and August 31, 1997	986	8.9%	Woods et al. (2003)
Bristol, UK	Seasonal Survey (40/35/30/39 days in winter/spring/summer/autumn)	131	51% - 74%*	Baker et al. (2005)

Fiore & Sullivan, *supra* note 20; Woods et al., *supra* note 12; Baker, *supra* note 49; van Heezik et al., *supra* note 26.

Dunedin, NZ	Collection/owner reporting over one year	151	33.0%	van Heezik et al. (2010)
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*Only bird depredation was studied.

**The results varied during the four sampling periods.

E. Estimating the Feral Cat Population

There are no scientific estimates of the feral cat population in the United States. There are estimates cited in peer-review work: some are based on phone surveys of people feeding stray cats (Humane Society 1993, 32.7 million feral cat population estimate),⁵¹ most are based on some estimated percentage of the pet cat population, typically 100%, though there is no scientific basis to assume this is the case. None are based on traditional wildlife management population density measurement methods.

The feral cat population estimate closest to something based in science belongs to Merritt Clifton of ANIMAL PEOPLE, who estimates that the winter feral cat population may be as low as 13 million and during the summer peak is probably no more than 24 million.⁵² The estimates were projected from information about the typical numbers of cats found in common habitat types taken from a national survey of cat rescuers, and cross compared with animal shelter intake data.⁵³ The notion that there are fewer feral cats than generally cited in the literature (then and now) is supported by road kill data gathered by ANIMAL PEOPLE from various cities around the country.⁵⁴

F. Contrasting Results of Bird Depredation by Feral Cats versus Roaming Pet Cats

⁵¹ Irene Rochlitz, *Feline Warfare Issues*, in *THE DOMESTIC CAT: THE BIOLOGY OF ITS BEHAVIOUR* 208-26 (Dennis C. Turner & Paul Bateson eds., 2000).

⁵² Merritt Clifton, *Where Cats Belong- and Where They Don't*, ANIMAL PEOPLE (June 2003), <http://www.animalpeoplenews.org/03/6/wherocatsBelong6.03.html>.

⁵³ *Id.*

⁵⁴ Merritt Clifton, *Roadkills of cats fall 90% in 10 years—are feral cats on their way out?* ANIMAL PEOPLE (November 2004), <http://www.animalpeoplenews.org/03/11/roadkills1103.html>.

It is much easier to study the hunting patterns of pet cats than feral cats; consequently, pet cats are usually the object of predation studies. Pimentel and many population-level estimates of cat predation assume that pet and feral cats depredate birds at uniform rates. But studies of feral cats in varying habitats on continents do not bear out this notion.⁵⁵ Feral cats must hunt and scavenge to fulfill their energy requirements: when ready alternatives are available, they appear to optimize these activities given available sources of food. Most cats are not adept bird hunters,⁵⁶ and bird hunting (usually) does not optimize energy for the effort expended.⁵⁷

Olof Liberg's detailed study of cat hunting behavior in southern Sweden (1984) found that feral cats optimized their hunting strategy given prey availability when compared to house cats.⁵⁸ The diet of feral cats was primarily rabbits. He observed that each rabbit took about five times as long to catch as a rodent, but the rabbits caught weighed on average ten times more; therefore rabbit hunting provided double the rewards of rodent hunting.⁵⁹ Table 3 illustrates the lack of bird hunting by the feral cats in Liberg's study, with bird remains in feral cat scats occurring in just four of ten measured periods over a five-year period (1974–1979).⁶⁰

Table 3: Feral Cat vs. House Cat Predation on Birds⁶¹
(Percent Occurrence of Birds in Total Prey)

1974-1976	House Cats	Feral Cats
Jan-Mar	11%	7%
Apr-May	5%	0%
Jun-Sep	11%	0%
Oct-Dec	3%	3%
1977		
Jan-Mar	4%	4%
Apr-May	10%	23%
Jun-Aug	7%	0%
1978		

⁵⁵ Hutchings, *supra* note 22; Liberg, *supra* note 35.

⁵⁶ TABOR, *supra* note 22, at 123.

⁵⁷ Fitzgerald & Turner, *supra* note 11; Liberg, *supra* note 35.

⁵⁸ *Id.*

⁵⁹ *Id.*

⁶⁰ *Id.*

⁶¹ *Id.*

Apr-May	23%	0%
Oct-Dec	3%	0%
1979		
Jan-Mar	9%	0%

During a two year study at a garbage tip (landfill) in Victoria, Australia, surrounded by a variety of birds and where flocks of pied currawongs and ravens fed on refuse, Susan Hutchings found that cats selected mainly meat and chicken scraps from the garbage and vertebrates were “hunted opportunistically.”⁶² Garbage occurred significantly more in the cat scats (81.6%) than any other dietary categories; mammal remains, vegetation, and insects also occurred regularly in the scats, but birds did not.⁶³

G. Estimating “Per Cat” Rates of Bird Depredation:
Using Mean Rates vs. Median Rates Results in
Inflated Estimates

For the purposes of estimating population-level impacts, a measure spreading rates of predation across the population of predators is a normal practice. “Scaling up” is typically done with average predation rates, but as David Barratt points out, when the distribution of predation data is highly positively skewed (only a few cats depredate a large number of prey), mean numbers of prey caught per year deviates significantly from the median.⁶⁴ Using the mean can overestimate projections of predation dramatically. Just as a number of studies indicate that about 30% of house cats do not hunt at all, they also indicate a small percentage of cats can be exceptional predators. In Barratt’s 1998 study, 70% of the 138 cats in the experiment were observed to catch less than 10 prey animals annually (all prey, not just birds), but for 6% of cats, more than 50 prey animals were recorded.⁶⁵ The projected total number of prey caught using the sample median was approximately half the estimate based on the sample mean, therefore when creating population-level

⁶² Hutchings, *supra* note 22.

⁶³ *Id.*

⁶⁴ David G. Barratt, *Predation by house cats, Felis catus (L.), in Canberra, Australia Part II: Factors affecting the amount of prey caught and estimates of the impact of wildlife*, 25 WILDLIFE RESEARCH 475-487 (1998).

⁶⁵ *Id.*

estimates where data results are skewed, Barratt cautions the median, not the mean, should be used.⁶⁶

Unfortunately, most predation studies do not provide enough data to calculate the median predation rate for each species, even though numerous studies indicate the data is highly skewed.⁶⁷ When median rates of predation are provided, they usually refer to total prey taken and median rates of predation on individual species cannot be determined.

Table 4: Cat Predation Studies Conducted on Continents⁶⁸
(Median versus Mean Predation Rates noted where possible)

Location	No. of Cats	Median / Average Annual Predation Rate*	% of Prey that Were Birds	Average Number of Birds per Cat per Year	Reference
English village: Felmersham	70	NA / 14	35.0%	4.9	Churcher and Lawton (1987)
Rural-Sub/Urban Australia	612	NA / 32	25.4%	8.0	Paton (1991)
Urban Australia (62% of private dwellings)		NA / 4.76	21.0%	1.0	REARK (1994)
Canberra Australia†	138	6 / 10.2	27.0%	2.6	Barratt (1998)
Wichita, KS‡ BIRD PREDATION ONLY	41	2 / 4.2‡	NM‡	4.2	Fiore (2000)
Various: UK	986	NA / 11.3	24.0%	4.1	Woods et al. (2003)
Dunedin, NZ§	151	4 / 13.4	37.0%	5.0	van Heezik et al. (2010)

⁶⁶ *Id.*

⁶⁷ Churcher & Lawton, *supra* note 48; Mitchell & Beck, *supra* note 4; Barratt, *supra* note 64; Fiore & Sullivan, *supra* note 20; Woods et al., *supra* note 12; van Heezik et al., *supra* note 26.

⁶⁸ See Table 2 references *supra* 50 and Barratt *supra* note 64.

* All prey: mammals, birds, reptiles, invertebrates, amphibians, except in Fiore 2000.

† Only hunting cats were recruited into the study.

‡ Only bird depredation rates were studied. Using the median, cats depredated just two birds per year.

§ The authors note that New Zealand has no native terrestrial mammals other than two species of bat.

Carol Fiore studied only the predation of cats on birds. Her thesis indicated that the average number of birds killed per year was 4.2 per cat.⁶⁹ Bird kills per cat and scat sampling data were provided: the median number of birds killed per cat was just 2 per cat per year, a rate that is less than half of the sample mean.⁷⁰ This is consistent with Barratt's observation, though in Fiore's study, the sample median was lower than half of the sample mean. This data indicates how the use of average cat kills can result in (potentially significantly) inflated rates of cat predation.

H. Publishing Errors

Each of the Pimentel non-native species papers used the same method to assign value, but the underlying assumptions differed. The 2000 piece valued the cost of cat predation at \$17.0 billion.⁷¹ According to the discussion in the 2005 paper, Pimentel excluded all roaming pet house cats from the population of cats preying on birds.⁷² With this exclusion, the number of cats preying on birds was reduced to 30 million from 71 million, and that should have lowered the estimated economic impact to \$7.2 billion.⁷³ However, it was published with the same \$17.0 billion estimate – a major publishing error and a \$9.8 billion mistake that overstates the cost of the cat by 136%. The 2007 paper, published by David Pimentel for the USDA National Wildlife Research Center Symposia, in *Managing Vertebrate Invasive Species*, estimated the cost of the cat to be \$14.0 billion,⁷⁴ though again there were editing errors. The math, as provided by the assumptions published in the article, resulted in an estimated cost of \$14.6 billion.

⁶⁹ Fiore & Sullivan, *supra* note 20.

⁷⁰ *Id.*

⁷¹ Pimentel (2000), *supra* note 2.

⁷² "This cost does not include the number of birds killed by pet or urban cats . . ." Pimentel (2005), *supra* note 2 at 276.

⁷³ Pimentel (2005), *supra* note 2.

⁷⁴ Pimentel (2007), *supra* note 2.

III. THE ENVIRONMENTAL BENEFIT OF FERAL CATS MAY OUTWEIGH POTENTIAL NEGATIVE IMPACT

It is generally believed that the process of cat domestication was related to the development of human agriculture. Wild cats were likely attracted to farming settlements with a steady supply of rats and mice at grain stores and cats served as pest control agents.⁷⁵ Birds form a major part of feral cats' diets only when birds are available to the cats in very large numbers and mammals in very small numbers.⁷⁶ Cats are rodent specialists,⁷⁷ and it is this specialty that has served an important function in controlling population levels of other non-natives, at times performing an inadvertent role in protecting native species.

The harm caused by introduced species on oceanic islands is widely known.⁷⁸ "Although counter-intuitive, eradication of introduced superpredators, such as feral domestic cats, is not always the best solution to protect endemic prey when introduced mesopredators, such as rats, are also present."⁷⁹ Work conducted on the mesopredator release effect by Meng Fan expands on and supports the earlier work done by Franck Courchamp in *Cats Protecting Birds*.⁸⁰ Fan's research predicts that in a prey-mesopredator-superpredator trophic food web, eradication of introduced "superpredators," or apex predators, such as feral domestic cats, is not always the best solution to protect native species. In fact, the presence of a superpredator may have a beneficial effect in such systems. As described by Fan in *Cats Protecting Birds Revisited*,⁸¹

One typical impact among those resulting from the successful removal of invasive species is the concept

⁷⁵ Monte Morin, *Cat fossils found in China reveal early days of feline domestication*, LOS ANGELES TIMES (Dec. 16, 2013), <http://www.latimes.com/science/la-sci-cats-domesticated-20131217,0,4070198.story#axzz2o3JSH443>.

⁷⁶ Apps, *supra* note 23.

⁷⁷ Fitzgerald & Turner, *supra* note 11.

⁷⁸ Meng Fan et al., *Cats Protecting birds revisited*, 67 BULLETIN OF MATHEMATICAL BIOLOGY 1081-106 (2005).

⁷⁹ Franck Courchamp et al., *Cats protecting birds: modelling the mesopredator release effect*, 68 J. ANIMAL ECOL. 282-292 (1999).

⁸⁰ *Id.*

⁸¹ Fan et al., *supra* note 78.

known to ecologists as *mesopredator release* following superpredator (top predator) control or removal (an example of a top-down trophic cascade), which has been suggested as the cause of decline and extinction of some endemic prey species. For example, it has been shown that the rapid eradication of cats could trigger an explosive increase in the rat population after the removal, and then could lead to a more severe negative impact on the endemic species. Such an expansion of rat population would be more detrimental for endemic small vertebrates... the threat of mesopredator release following superpredator eradication is very real and has been extensively reported.⁸²

Similar effects have also been observed by the eradication of the cat on sub-arctic Macquarie Island, where habitat destruction by introduced rabbits followed,⁸³ and are also reflected in the work of Fitzgerald in New Zealand⁸⁴ and Christopher Tidemann on Christmas Island⁸⁵ where feral cats have been shown to have a beneficial effect on native wildlife populations by stabilizing the numbers of introduced rats, which can have a more serious impact as predators of wildlife.⁸⁶ Although paradoxical, even in isolated or fragmented habitats where threatened and endangered bird species

⁸² *Id*; Kevin R. Crooks and Michael E. Soule, *Mesopredator release and avifaunal extinctions in a fragmented system*, 400 NATURE 563-66 (1999); Christopher M. Rogers and M.J. Caro, *Song sparrows, top carnivores, and nest predation: a test of the mesopredator release hypothesis*, 116 OECOLOGIA 227-233 (1998); Christopher M. Rogers and S.B. Heard, *The mesopredator release hypothesis: integrating landbird management with ecological theory*, 21 STUDIES IN AVIAN BIOLOGY 138-43 (2000); Michael E. Soulé et al., *Reconstructed Dynamics of Rapid Extinctions of Chaparral-Requiring Birds in Urban Habitat Islands*, 2 CONSERVATION BIOLOGY 1 75-92 (1988).

⁸³ WILDLIFEEXTRA.COM, *supra* note 5.

⁸⁴ B. Michael Fitzgerald, *Family Felidae*, in THE HANDBOOK OF NEW ZEALAND MAMMALS, 330-48 (C.M. Kind ed., OXFORD UNIVERSITY PRESS, 1990).

⁸⁵ Christopher R. Tidemann et al., *The diet of cats, Felis catus, on Christmas Island, Indian Ocean*, 21 WILDLIFE RESEARCH 3, 279-86 (1994).

⁸⁶ Ian Athol Edward Atkinson, *The spread of commensal species of Rattus to oceanic islands and their effect on island avifaunas*, in CONSERVATION OF ISLAND BIRDS: CASE STUDIES FOR THE MANAGEMENT OF THREATENED ISLAND SPECIES 35-81 (P.J. Moors ed., 1985).

nest, cats may suppress more dangerous introduced non-natives, and allow a higher density of birds than would otherwise exist.

IV. IRRATIONAL ECONOMIC VALUATION

To calculate the total cost of the domestic cat, Pimentel multiplies the estimated number of wild birds killed each year via feral and free roaming cat predation by a value assigned to each bird. Pimentel values each wild bird at \$30. There is no rational method used to develop this per bird value. Pimentel only provides context via items of no economic relevance:

Although it is not easy to determine the value of each bird killed, a reasonable value might be \$30. This cost is based on the facts that a bird watcher spends \$0.40 per bird observed, a hunter spends \$216 per bird shot, and ornithologists spend \$800 per bird reared for release. Another way to look at the value of each bird is considering that EPA fines polluters \$10 per fish killed, including small, immature fish; a value of \$30 per bird therefore seems roughly equivalent.⁸⁷

“According to [Pimentel’s] bizarre form of accounting, hunters value an individual bird more than 500 times as much as a birdwatcher does – suggesting, it seems, that dead birds are far more valuable than live birds.”⁸⁸ In point of fact, none of these comparisons are relevant. Bird watchers see only a very small percentage of the approximately 10-15 billion wild North American birds in spring and 20-30 billion birds in fall;⁸⁹ only a small percentage of wild birds can

⁸⁷ Pimentel et al. (2000), *supra* note 2 at 56 (citing *1985 Survey of Fishing, Hunting, and Wildlife Associated Recreation*, U.S. FISH & WILDLIFE SERVICE (1988); *The oil drilling prohibitions at the Channel Islands and Pt. Reyes-Fallallon Islands National Marine Sanctuaries: Some Costs and Benefits: Hearing Before the Center for Environmental Education* (1981) (statement of R.T. Tinney); Anthony Greiner & David Pimentel, *Environmental and Socio-Economic Costs of Pesticide Use*, in *TECHNIQUES FOR REDUCING PESTICIDE USE: ECONOMIC AND ENVIRONMENTAL BENEFITS* 51-78 (David Pimentel ed., 1997); Erica H. Dunn & Diane L. Tessaglia, *Predation of Birds at Feeders in Winter*, 65 J. FIELD ORNITHOLOGY 1, 8-16 (1994).

⁸⁸ Peter J. Wolf, *Adult Supervision Required*, VOX FELINA (Dec. 1, 2010), <http://www.voxfelina.com/2010/12/adult-supervision-required/>.

⁸⁹ John L. Trapp, *How Many Birds Are There?* BIRDS ETCETERA (July 23, 2002), <http://birdstuff.blogspot.com/2002/07/how-many-birds-are-there.html>.

be legally hunted under the Migratory Bird Treaty Act,⁹⁰ and the \$800 “bird reared for release” number is misleading. The citation actually refers to the cost of bird recovery efforts in oil spills,⁹¹ a completely inappropriate comparison given the enormous capital costs to support recovery efforts in remote locations. Further, what Pimentel failed to acknowledge is, using his own criteria, the following should be true: if cats are preying on non-native birds, birds that are already dead or would have died anyway and thus could not breed, or birds that would not or could not have been watched or shot, then not only is there no environmental (or financial) loss, but each may be considered a potential ecological (and therefore have an economic) benefit.

These papers are not the first time Pimentel used a subjective, irrational valuation. In a published piece on the environmental and economic costs of pesticides,⁹² Pimentel valued domestic dogs at \$125 per animal, and cats at \$20 per cat: no source or explanation for the dog and cat valuations was provided. The

⁹⁰ *Migratory Bird Program*, U.S. FISH & WILDLIFE SERVICE, <http://www.fws.gov/migratorybirds/RegulationsandPolicies.html> (last visited Dec. 26, 2013).

⁹¹ For the \$800 per bird cost “comparison,” Pimentel et al. cite Richard T. Tinney, *The oil drilling prohibitions at the Channel Islands and Pt. Reyes-Fallallon Islands National Marine Sanctuaries: Some costs and benefits*, CENTER FOR ENVTL. EDUC. (1981) (the Center for Environmental Education changed its name to the Ocean Conservancy in 1997). They have been unable to provide the study. Yet Pimentel in his 2005 piece, *Environmental and economic costs of the application of pesticides primarily in the United States*, 7 ENV'T, DEV. SUSTAINABILITY 1, presents the same \$800 number but cites a different source when the paper states on page 244: “In addition, the estimated cost of replacing a bird of an affected species to the wild, as in the case of the Exxon Valdez oil spill, was \$800 per bird.” See *Resources Damage Assessment of the T/V Puerto-Rican Oil Spill Incident, Report to NOAA Sanctuary Program Division* (1986) (statement of James Dobbins). Neither Dobbins nor Tinney refer to the same recovery efforts; Pimentel confuses his source or there was another editing error that went to print. Two things are clear: 1) neither citation refers to the Exxon Valdez oil spill, as that occurred in Prince William Sound, Alaska, in 1989, and 2) comparing the cost of cleaning up a bird from an oil spill (with enormous capital costs to support recovery efforts in remote locations) to the cost of bird deaths by cat predation is not a reasonable comparison.

⁹² David Pimentel, *Environmental and economic costs of the application of pesticides primarily in the United States*, 7 ENV'T, DEV. SUSTAINABILITY 1.

notes to the valuation table simply state “estimated.”⁹³ To illustrate just how inappropriate and misleading such subjective valuations are, according to the APPA’s most recent report, U.S. citizens spent a total \$1,649 per pet dog and \$1,271 per pet cat in 2012.⁹⁴ The average cost to adopt a rescue dog is \$45 - \$70, and the average cost to adopt a rescue cat is \$40 - \$60.⁹⁵ Pimentel’s dog:cat valuation ratio is 6.25:1. Annual expenditures indicate a ratio of 1.3:1. The low-end adoption cost is 1.13:1, and the high-end adoption cost is 1.17:1. These very simple ratios illustrate the lack of any economic principles applied by Pimentel in developing the published symbolic value(s).

V. MITIGATING FACTORS: THE ECONOMIC CONTRIBUTION OF CATS

A. Consumer Expenditures

The trends in pet-related expenditures have driven impressive growth in the industry and represent significant value to the U.S. economy. While many consumers have had to tighten their belts in the weak economy, pet owners are digging ever deeper into their pockets to pamper their pets. According to the most recent report by the APPA, the 82.5 million homes (68% of U.S. households) that own pets spent a record \$53 billion on their furry family members in 2012, a three-fold increase since the industry group began tracking the data in 1994.⁹⁶

In 2006, Matthew Park, V.P. of Del Monte’s Pet Products Division said, “[t]he humanization of pets is the single biggest trend driving our business.”⁹⁷ He was right: in 2009 an AP-Petside poll indicated that over half (50%) of U.S. companion pet owners considered their pets to be as much a part of the family as any person

⁹³ *Id.* at 233.

⁹⁴ 2013-2014 APPA National Pet Owners Survey, AM. PET PRODUCTS ASS’N (2013), http://www.americanpetproducts.org/press_industrytrends.asp.

⁹⁵ Hazel Baker, *The Average Cost of Pet Adoption*, EHOW, http://www.ehow.com/about_6465144_average-costs-pet-adoption.html.

⁹⁶ APPA, *supra* note 94.

⁹⁷ *A Happy Tail-Wagging Dog is in Your Future...; New Snausages® Fortunes Snookies™ and Pup-Peroni(R) Ribs Offer Fun and Amusement for Dogs and Their Pet Parents*, DEL MONTE FOODS (Sept. 1. 2006), <http://investors.delmonte.com/releasedetail.cfm?ReleaseID=665170>.

in the home.⁹⁸ By 2011, a poll conducted by Harris Interactive found that over nine in ten pet owners (91%) consider their pets to be members of their family.⁹⁹ Spas, boutiques, insurance, lotions, vitamins, dental care products, alternative food and treats, clothing – a multitude of products and services – proliferate, as does the advertising to sell them to pet parents that currently own 95.6 million cats and 83.3 million dogs.¹⁰⁰

Notably, Pimentel's invasive species papers were published in 2000, 2005, and 2007. APPA data, available at these publication dates, indicate that U.S. pet industry expenditures totaled \$23 billion in 1998, \$36.3 billion in 2005, and \$41.2 billion in 2007.¹⁰¹ Also available at the time research was conducted for Pimentel's 2005 Update and 2007 publication, was the 2002 U.S. Economic Census data. This data shows the pet industry (stores, veterinary services, pet care, and pet food) accounted for over 360,000 (direct) jobs and \$7.7 billion in payroll.¹⁰²

B. The Business of Pets Attracts Significant Capital

Pets are big business and represent investment opportunity with what some companies perceive as significant growth or profit potential. For instance, in March 2011, a group led by KKR & Co., formerly known as Kohlberg Kravis Roberts & Co. L.P., completed the acquisition of Del Monte Foods in a deal valued at \$5.3 billion.¹⁰³ Approximately 50% of Del Monte's \$4 billion in sales are in its Pet Products Division (brands include Pounce, Meow Mix, 9 Lives, Nature's Recipe, Milk Bone, Kibbles N Bits, Gravy Train, and others).

⁹⁸ *AP-Petside.com Poll*, GfK ROPER PUBLIC AFF. & MEDIA (June 23, 2009), <http://surveys.ap.org/data/GfK/AP-GfK%20Petside%20Topline%20final%20060309%20Q4%20added.pdf>.

⁹⁹ Regina A. Corso, *The Harris Poll #70*, HARRIS INTERACTIVE (June 10, 2011), <http://www.harrisinteractive.com/NewsRoom/HarrisPolls/tabid/447/ctl/ReadCustom%20Default/mid/1508/ArticleId/814/Default.aspx>.

¹⁰⁰ APPA, *supra* note 94.

¹⁰¹ *Id.*

¹⁰² *2002 Economic Census*, U.S. CENSUS BUREAU, <http://www.census.gov/econ/census02/>.

¹⁰³ *KKR, Vestar and Centerview Enter into Agreement to Acquire Del Monte Foods*, KOHLBERG KRAVIS ROBERTS & CO. L.P. (Nov. 25, 2010), http://media.kkr.com/media/media_releasedetail.cfm?ReleaseID=533192.

This division was valued at 11.0x EBITDA (Earnings Before Interest, Taxes, Depreciation, and Amortization).^{104,105} This multiple of EBITDA represents a premium to the average EBITDA multiple paid in consumer food goods company acquisitions of 9.9x.¹⁰⁶ This premium is an indication of the perceived value of the pet foods business to the private investment group. This was the only private equity deal announced in 2010 that exceeded a \$5 billion valuation, and it is the second largest consumer-focused pet deal on record after Nestle S.A.'s \$12.1 billion acquisition of Ralston Purina in 2001.¹⁰⁷

While many of the pet-related company transactions are private and valuations are not disclosed, it is clearly an area of great economic interest.¹⁰⁸ In the first four months of 2011, four (domestic) pet-related industry deals had already taken place or been announced. In addition to the Del Monte Foods Co. acquisition, MidOcean Partners acquired "a significant equity interest" in Professor Connor's Inc. (d/b/a FreshPet);¹⁰⁹ Wind Point Partners acquired Dorskocil Manufacturing Company, Inc. (d/b/a/Petmate).¹¹⁰ Wind Point Partners subsequently announced the

¹⁰⁴ Del Monte Foods Company DEFM14A Schedule 14A (Rule 14a-101) Proxy Statement (Jan. 12, 2011).

¹⁰⁵ EBITDA is a measure of corporate profitability that is capital structure neutral. It eliminates the distorting effects of interest income, interest expense and taxes, and it eliminates the effects on the income statement of the capital investments of the firm. EBITDA provides a method to evaluate the core profitability of a business prior to management's financial and investment-related decisions, all components that can be altered in a management change.

¹⁰⁶ *Deloitte Industrial 40: The story of 2000-2009 global market multiples*, DELOITTE FINANCE – MEMBER OF DELOITTE TOUCHE TOMAHATSU LTD (Feb. 2011), http://www.deloitte.com/assets/Dcom-France/Local%20Assets/Documents/Vos%20Enjeux/EMF/Deloitte_Industrial_40-2011.pdf.

¹⁰⁷ *Nestlé: Green Light for Ralston Purina Acquisition*, NESTLÉ S.A. (Dec 11, 2001), <http://www.nestle.com/media/pressreleases/allpressreleases/ralstonpurinaacquisition-11dec01>.

¹⁰⁸ PITCHBOOK, <http://pitchbook.com/> (last visited Nov. 15, 2013).

¹⁰⁹ *MidOcean Partners Announces Significant Investment in Freshpet, Private Equity Firm Invests in Leading Marketer and Manufacturer of Fresh Pet Food*, PR NEWSWIRE (Jan. 6, 2011), <http://www.prnewswire.com/news-releases/midocean-partners-announces-significant-investment-in-freshpet-113000534.html>.

¹¹⁰ *Wind Point Partners Acquires Petmate*, WIND POINT PARTNERS (Jan. 24, 2011), <http://www.wppartners.com/overview/petmate-acquisition>.

acquisition of Bamboo (a maker of pet care products) from Munchkin, Inc.¹¹¹ According to the Pitchbook Platform (a private mergers and acquisitions database), 46 investment firms completed investments in 44 pet-related companies over the past five years.¹¹² The business of pets attracts capital and is a dynamic industry with significant investment activity.

VI. CONCLUSION

While assigning economic value to environmental factors is, or can be, a critically important tool in the development of public policy and allocation of resources, pseudoscience undermines legitimate work and does not serve to protect our native wildlife. According to Mark Davis¹¹³ and 18 other ecologists, “Classifying biota according to their adherence to cultural standards of belonging, citizenship, fair play and morality does not advance our understanding of ecology. Over the past few decades, this perspective [the pervasive bias against alien species] has led many conservation and restoration efforts down paths that make little ecological or economic sense.”¹¹⁴ As the USDA Invasive Species Action Committee (ISAC) points out, a non-native species might be considered invasive in one region but not another: “Whether or not a species is considered an *invasive species* depends largely on human values.”¹¹⁵ While the introduction of nonindigenous nuisance species can negatively impact the biodiversity of native habitat and has the potential to cause environmental and economic damage,¹¹⁶ it is imperative that conservation efforts are based on empirical evidence and not unfounded claims of loss. Estimates of such loss, tangible or intangible, are arguably a needed tool for policy makers in order to maximize public resources. But misguided management policies driven by flawed or oversimplified science do not serve the public or

¹¹¹ *Id.*

¹¹² PITCHBOOK, *supra* note 108.

¹¹³ DeWitt Wallace professor of biology at Macalester College, Saint Paul, Minnesota.

¹¹⁴ Mark A. Davis et al., *Don't judge species on their origins*, 474 NATURE 1, 153-154 (June 9, 2011).

¹¹⁵ *Invasive Species Definition Clarification and Guidance White Paper*, NAT'L INVASIVE SPECIES COUNCIL (NISC) DEFINITIONS SUBCOMM. OF THE INVASIVE SPECIES ADVISORY COMM. (ISAC) (Apr. 27, 2006), <http://www.invasivespeciesinfo.gov/docs/council/isacdef.pdf>.

¹¹⁶ Davis et al., *supra* note 114.

our native populations of wildlife. Calls to integrate ecology and economics in order to develop reliable estimates of the cost of non-native species are on the rise. At stake is the foundation on which public policy decisions are made.¹¹⁷

Pimentel's work has been "roundly criticized for ignoring major economic benefits [of non-native plants and animals] and for including the cost of controlling species that may not need controlling, as well as factoring in events of questionable relevance, such as bird deaths caused by domestic cats,"¹¹⁸ and has already led policy makers to misallocate the limited resources available for conservation efforts.¹¹⁹ His specious valuation of the cost of the domestic cat is based on a premise for which there is no empirical data that could be extrapolated to apply to cats across continents. As demonstrated by examples of trophic cascade following feral cat eradication in some island environments, the impact of free-ranging cats must be assessed objectively at each location rather than making generalizations from one location to another. Pimentel's method fails to account for any variables in estimating total bird kills by domestic cats, and then places a symbolic value that employs no economic principles on wild bird deaths. As noted in *Commentary on economic valuations of biodiversity*,

While it would not be realistic to expect the authors to examine every possible area of economic impact, arbitrarily limiting their estimate to a small subset of relevant economic activity without acknowledging this limitation suggests a greater focus on producing a noteworthy result than on the process used to produce the result...

The desire to create favorable economic valuations for things that we know to be ecologically important is understandable, but bypassing accepted scientific and economic principles in order to do so sets a dangerous precedent and risks many unintended consequences.¹²⁰

¹¹⁷ Hoagland & Jin, *supra* note 8.

¹¹⁸ Garry Hamilton, *Welcome Weeds: How alien invasion could save the Earth*; 2795 NEW SCIENTIST 34-37 (2011).

¹¹⁹ Hoagland & Jin, *supra* note 8.

¹²⁰ Lamb, *supra* note 6.

In fact, in the United States, the fate of the feral cat is a battleground. National campaigns are waged to sway state and local policies and laws related to feral cat management.¹²¹ The sides are typically drawn between conservation societies and feral cat welfare advocates. Organizations such as the American Bird Conservancy (ABC Birds), the National Audubon Society, The Smithsonian's Migratory Bird Center, The Wildlife Society, and individuals at the U.S. Fish & Wildlife Service, Division of Migratory Birds¹²² have targeted the feral cat for extermination (in the guise of language that denotes removal with implied euthanization¹²³) despite claims of using "the best available science" on which to base policy decisions.¹²⁴ When Pimentel's \$17 billion [sic] cat predation valuation resurfaced in a University of Nebraska Extension School "literature review" on the topic of how to manage feral cats in

¹²¹ Terry D. Rich et al., *Partners in Flight Bird Conservation Needs Assessment: Results of the 4th International Partners in Flight Conference* (Oct. 2008), <http://www.partnersinflight.org/events/mcallen/PIF%20Bird%20Conservation%20Needs%20Assessment.pdf>; Cats & the Environment Resource Center, ALLEY CAT ALLIES, <http://www.alleycat.org/page.aspx?pid=324> (last visited Dec. 26, 2013).

¹²² *American Bird Conservancy's Resolution on Free-Roaming Cats*, AM. BIRD CONSERVANCY (Sept. 17, 1997), <http://www.abcbirds.org/abcprograms/policy/cats/pdf/Resolution.PDF>; *National Audubon Society Resolution Regarding Control and Management of Feral and Free-Ranging Domestic Cats*, NAT'L AUDUBON SOC'Y (Dec. 7, 1997), <http://web4.audubon.org/local/cn/98march/nasr.html>; *Final Position Statement Feral and Free-Ranging Domestic Cats*, THE WILDLIFE SOC'Y, (Aug. 2011), <http://joomla.wildlife.org/documents/positionstatements/28-Feral%20&%20Free%20Ranging%20Cats.pdf>; *Where We Stand: No National Policy on Feral Cats or Trap-Neuter-Release*, U.S. FISH & WILDLIFE SERVICE, (Nov. 16, 2011), <http://www.fws.gov/news/blog/index.cfm/2011/9/16/where-we-stand-no-national-policy-on-feral-cats-or-trapneuterrelease>.

¹²³ AM. BIRD CONSERVANCY, *supra* note 122.

¹²⁴ *About Us*, AM. BIRD CONSERVANCY, <http://www.abcbirds.org/aboutabc/>; Ted Yarnold, *Audubon and Ted Williams*, AUDUBON MAG. (Mar. 26, 2013), <http://mag.audubon.org/articles/blog/audubon-and-ted-williams>; *Final Position Statement: The Use of Science in Policy and Management Decisions*, THE WILDLIFE SOC'Y, (Oct. 2010), http://joomla.wildlife.org/documents/positionstatements/Use_of_Science.pdf; U.S. FISH & WILDLIFE SERVICE, *supra* note 122; Peter J. Wolf, *Best Available Science?*, VOX FELINA (Mar. 1, 2011), <http://www.voxfelina.com/2011/03/best-available-science/>.

2010,¹²⁵ the estimate drew widespread media attention. The estimate was highlighted in hundreds of mainstream media and conservation website publications, and was touted in an American Bird Conservancy press release, an Audubon Magazine article, and The Wildlife Society's Spring 2011 magazine issue that focused on feral cats.¹²⁶ And yet, using the same science, The Royal Society for the Protection of Birds, a conservation society based in the United Kingdom, draws a completely different conclusion. The critical question to be addressed is whether feline predation, whatever its magnitude, adversely affects native bird or mammal populations at individual locales. Ironically, Pimentel's "symbolic" valuation of the "impact" of the domestic cat contributed nothing of scientific value to the heated debate on feral cat management in the United States; it merely provided headline shock value.

¹²⁵ Aaron Hildreth et al., *Feral Cats and Their Management*, U. NEB. LINCOLN EXTENSION EC1781 (2010), <http://ianrpubs.unl.edu/live/ec1781/build/ec1781.pdf>.

¹²⁶ *New Report Puts Economic Impact of Feral Cat Predation on Birds at \$17 Billion*, AM. BIRD CONSERVANCY (Dec. 8, 2010), <http://www.abcbirds.org/newsandreports/releases/101208.html>; Alisa Opar, *Feral Cat Predation on Birds Costs Billions of Dollars a Year*, AUDUBON MAG. (Dec. 3, 2010), <http://mag.audubon.org/articles/blog/feral-cat-predation-birds-costs-billions-dollars-year?page=show>; Nico Dauphine, *Follow the Money: The Economics of TNR Advocacy*, 5 THE WILDLIFE PROF. 1, 7 (2011). <http://issuu.com/the-wildlife-professional/docs/feralcats>.