LIVE OAK ASSOCIATES, INC.
an Ecological Consulting Firm

Ms. Marla Rae
ODFW Commission Chair
c/o ODFW Cougar Plan
Oregon Department of Fish & Wildlife
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Salem, OR 97303
VIA EMAIL: cougar.plan@state.or.us

October 31, 2005

SUBJECT: Comments on the *Draft 2005 Oregon Cougar Management Plan*

Dear Ms. Rae:

Thank you for the opportunity to review and respond to the proposed *Draft 2005 Oregon Cougar Management Plan*. Brooks Fahy of the Oregon based Predator Defense, requested that I review the available information and respond to some of the scientific merits of this plan.

The crux of the debate from my perspective (and professional interest) is the basic foundation that the Oregon Department of Fish and Wildlife (ODFW) places on the assertions that a dramatic reduction of the current state-wide population of cougars will result in a concomitant decline in risk to human life and property. ODFW makes a series of explicit assumptions that they believe provide a causal link with their **perceived** "increasing" cougar populations to conflicts with humans and therefore an increase risk to human safety. My interest in responding to this debate is one of ensuring that the best available science is used to evaluate the ramifications of any decision. My letter should not be misconstrued as support for any position regarding sport-hunting by the state, instead, I explicitly restrict my comments to the underlying science behind the Plan and evaluate whether or not the state relies on the best available science. As part of this analysis I requested that Dr. Barry Noon, a well known and internationally recognized quantitative ecologist (Professor in Department of Fish, Wildlife, and Conservation Biology at Colorado State University) review the Plan paying particular attention to the "model" that serves as the guiding force for so much of the Plan (see attached letter). Dr. Noon intends his comments to be constructive and hopes that they will lead to thoughtful management programs that conserve cougars on the landscape.

My response to this Plan is as wildlife researcher who conducted a 12-year study (1978-1989) on the ecology of the cougar in the Diablo Range just to the east of the Santa Clara Valley in California. Currently, I am a co-founder and Principal of Live Oak Associates, Inc., an ecological consulting firm in California that specializes in endangered species evaluations, wetland analysis, wildlife human conflicts and permit assistance. In addition, I have conducted

several other projects on cougars over the last couple of decades including a statewide track transect for the California Department of Fish and Game (CDFG), a status review on the Yuma cougar (then a candidate species for listing under the Federal Endangered Species Act) for the Bureau of Reclamation, and assisted on a 4-year study on the ecology of the cougar in Guadalupe and Carlsbad National Parks in the mid-1980's for the National Park Service. Therefore, I feel particularly qualified to address the biological issues surrounding this current debate in Oregon.

Not only do I have a significant amount of experience with this large carnivore, but I also reside in a state that arguably has the largest cougar population (California is the 3rd largest state and supports at least 90,000 square miles of cougar habitat, much of it the best in the Nation) and clearly the largest human population (35 million people). If that is not interesting enough, we have not had a sport hunt in this state since 1972 (33 years). Depredation (pet and livestock predation) and public safety concerns result in less than 120 cougars killed each year statewide. Keep in mind, this is a state that supports over five million cattle and one million sheep, nearly five times more cattle and sheep than Oregon.

One of the major concerns is the continued argument by ODFW that cougar populations reached near extinction in the state in 1961 and have been on a steady rise since the early 1960's due in large part to relaxation in the harvest and increase regulations associated with a "managed" sport harvest. This assertion has been supported not by empirical data, but by unrealistic assumptions fed into a population model designed to "1) analyze historical data to help determine status of cougar populations in Oregon and 2) develop a biologically intuitive model that relies on data that are readily available and which can be created and used by mangers." This model is largely tautological (circular in reasoning) in nature and is a poor predictor of historic, current or future populations. At best, it has heuristic value, if improved as Dr. Noon suggests and then used as a hypothesis generating tool and not a tool to speculate on historic trends in statewide cougar numbers.

I find much that is objectionable in this Plan in that it does a relatively poor job of relying on the best available science, but for brevity sake, focus my comments on: 1) the perception that cougar populations are continuingly increasing statewide and in the west, and 2) that an increase in off-take or harvest is necessary to retard the unabated growth of Oregon's cougar population for the expressed purpose of reducing the risk of an attack by cougars on humans. My greatest concern is that this Plan is focused almost entirely on the reduction of cougars to reduce "perceived" conflicts with humans and almost no effort is expended in developing a conservation strategy that ensures this species will be retained as an important part of the landscape. The Plan simply assumes that it will, but provides no real measures to ensure that the better quality habitats will continue to be preserved or that critical landscape linkages critical will be identified and preserved. Conservation is simply left out of the equation as this becomes a document focused on off-take.

The Ever Increasing Cougar Numbers

The general "truth" that has evolved with some wildlife professionals (and perpetuated in popular press) is that cougar populations have increased over the last 3 to 4 decades throughout

the west. While we would like to believe that this "truth" is the outcome of empirically derived data, what we find to be the case is that almost no empirical evidence exists to support this speculation. While numbers of cougars may have increased in portions of their range over the last 3 to 4 decades, the general perception that cougars are more abundant in the western U.S. is based not on empirical data, but one based more on oral traditions, untested word models, or unrealistic and unvalidated models as largely used in Oregon. This "myth" is usually grounded in the belief that cougar populations declined in most if not all of western states in the 1960's to such low numbers so as to be on the verge of extinction or at the very least on the precipice for much of their remaining range. Some wildlife professionals have now codified this myth to the point that few evaluate the assumptions on which this word model is based. In fact, relatively simple efforts are all that is necessary to invalidate many of the early non-scientific assertions and assumptions. A reliance on unsubstantiated population estimates, however, still exists in Oregon.

Have cougar populations increased in Oregon (or any other western state) the last 3 to 4 decades? It is important to understand and accept the fact that wildlife populations normally fluctuate. In other words, it is unrealistic to believe that wildlife populations remain static for long periods of time and just as unrealistic to believe we can (or should) manage for stasis. In addition, it is just as equally important to understand that large geographic regions such as states do not support a single population of a species like the cougar, but instead they support many populations. Thus, these individual populations of cougars do not react in concert over an entire geographic region and increase or decrease simultaneously.

Recent studies conducted to experimentally measure population response to increased mortality or perturbations (e.g., sport harvest) confirm that it would be remarkable for anyone to seriously argue that a population of cougars would or could simply increase for 30 to 40 years.

One of the great failings in wildlife ecology is the reliance on unsubstantiated and undocumented historical information that describe population trends. Since the 1960's, cougar numbers have probably fluctuated (as all wildlife populations do) statewide in Oregon. At any given moment, a population somewhere in the state of Oregon may be exhibiting a positive growth rate. Conversely, another population may be exhibiting a negative growth rate while populations in other portions of the state are likely static. While this word model is no more "factual" than the "depressed" cougar model, it certainly conforms better to those empirical data that do exist and is far more consistent with ecological principles.

A simple review of the data presented in the Plan provides amble evidence that ODFW is using similar data differently. A cursory review of Table 1 provides evidence that the last three year average of off-take (all human caused known mortality – hunting, depredation, human/pets and other) is 35% greater than the highest three-year average during the bounty (1928-1930) and that the current level of off-take is over 200% of many other 3-yr combinations. This is true even if the analysis is restricted to years prior to 1942. Many individuals have assumed and argued that Measure 18 that eliminated the use of hounds in the harvest of cougars, was largely responsible for a surge in cougar numbers because for three years after the passage of Measure 18 cougar harvest numbers dropped. From 1995 to 1997 the three-year average for cougar off-take (includes harvest, depredation, human/pet, and other) by humans was 149 cougars/year. A

review of Table 1 finds that there are relatively few 3-yr combinations (even if the analysis were restricted to years prior to 1953) that are significantly different than the 1995-97 period. So why do similar numbers of off-take during the bounty represent a decline population while the same number during the 1990's represent a population that is released and therefore growing. Keep in mind that the average off-take preceding this 1995-1997 period was not at all dissimilar to the highest years of the bounty (1928 to 1930 representing the highest three-year average of 293 cougars/year vs. 231 cougars/year from 1992-1994). After 1930, the next highest three-year average would have been equivalent to the 1992-1994 average. Interestingly, the three-year average after 1997 was substantially higher than any similar period during the bounty. I find it odd, that ODFW speculates that the substantially higher off-take of the last few years when compared to the bounty period is evidence the population is currently increasing. Conversely they argue in the same breath that smaller off-take during the bounty period represents a substantial influence on the various cougar populations in the state, so much so that the populations all declined to near zero. All of this based not on empirical evidence, but on the presumption that declining off-take during the bounty was biologically relevant (i.e., an true index of changes in the various cougar populations that exist statewide). It apparently never dawned on them, that index type data are remarkably unreliable as has been noted in the recently published Cougar Management Guidelines.

For reasons discussed in Dr. Noon's letter and general failure of ODFW to rely on verifiable assumptions, the reliance of the Plan on the historical speculation renders much of their approach moot.

Lions, Tigers and Bears. Oh My.

Are cougars a real threat to the rural citizens of Oregon (or any other state or Canadian Province where cougars exist) or those citizens that choose to recreate in cougar country? I think a rational and reasonable person has to simply conclude (based on empirical evidence and not arguments based on instilling fear) that ***quite clearly cougars represent almost no threat to humans.*** In all of North America over the last 112 years (according to the most extensive analysis on cougar attacks by Dr. Paul Beier) there are only about 100 documented cases (16 fatal attacks with 17 individuals dying of injuries inflicted by a cougar).

While a disproportionate number of these attacks have occurred over the last 30 years, this is most likely due to the substantial increase in the human population. Since 1990 (13 years), Oregon's neighbor to the north, Washington, has recorded 8 attacks (seven of those 13 years there were no attacks) and its southern neighbor (the much larger California) has recorded seven attacks (eight of the 13 years there were no attacks). Most of these attacks occurred in open space areas such as State and National Parks, National Forest (or other federal lands) with only a couple occurring near homes or RV's; and these occurred in very rural counties with rather low human populations. During this same 13-year period no verified attacks were documented in Oregon.

Hundreds of millions of recreational visitor days are logged each year in Washington, Oregon, and California and yet only 1.15 attacks have been recorded per year since 1990 in these three states (and none in Oregon) combined. This should in no way be interpreted that there will

never be an attack in Oregon, simply to demonstrate that the occurrence is rare and with most rare (in this case extremely rare events) events it is impossible to predict when and where the next attack will occur.

How rare are attacks? We are able to infer from empirical studies of cougars, that people unknowingly come in close contact (within 100 to 200 meters) with cougars tens of thousands of times a year, and yet they are not attacked. The cougar simply remains hidden or quietly moves on. Large cats in other parts of the world attack humans far more frequently than does the cougar. The most reasonable explanation is that the American lion is simply not an overly aggressive predator toward humans and they rarely view us as a threat or potential prey. Based on the amount of time that people spend in cougar country, the risk of an attack is probably on the order of 1: 100 million or more.

It is amazing that ODFW feel compelled to concern themselves with cougar/human incidents that affect two to three people per year (one or two children at most) in all of North America.

The belief that managers have professed to, that increase harvest or off-take of cougars will reduce the risk of an attack, is simply not based on any scientific analysis and is logically deficient. To illustrate this point, how do you measure success of reducing an already rare event (on the order of 100 million or more to one) in a measurable way? If you reduced the cougar population in the state by 10% and assumed this meant your risk improved by 10%, you have simply shifted the odds from 1:100 million to 1:110 million. In other words, it is simply immeasurable; you would have no way to know that you had any effect. The only way to ensure there is never again an attack is to either eradicate the cougar from the landscape entirely or forbid people from living and/or recreating in cougar country: two completely untenable proposals.

ODFW chooses to use an index of risk, which has not been shown to measure risk and has been argued by cougar biologists as being unreliable. ODFW collects unverified sightings and risk data and somehow believes that managing toward some arbitrary number of unverified sightings/incidents will result in a sound program. The key problem with this perception is that no evidence exists to demonstrate that changes in sighting/incident data results in risks to humans. A commitment by ODFW to collect more valid information and manage the perception issues of the public will have a more profound affect on reduce sighting/incident data then reducing cougar numbers. So if the true desire is to reduce sighting/incident data, educate ODFW (see California Department of Fish and Game efforts) on how to collect more useful data and initiate a series of public service announcements which accurately reflects the low risks cougars pose. This is a more intellectually honest approach.

An extensive analysis of attack statistics across North America have caused me to conclude that the intensity of sport-hunting is not at all correlated with a concomitant change in the risk to humans. Simply put, sport-hunting is irrelevant with questions related to human safety threats. As a good example, when attacks on humans are standardized (e.g., it would be equivalent to making comparisons across states based on fatalities per number of miles driven and not on absolute number of road fatalities) by the number of people occurring (or recreating) in cougar habitat, we find that California which should rank first because it has more people per square

mile of cougar habitat (and just happens to actually have more cougar habitat) than any other state, but California actually ranks 11th out of 15 states and Canadian Provinces. In addition, it should be noted that all of the states in this comparison have fairly aggressive sport-hunting programs, with the exception of California which has not had a hunting season for 33 years. So California has more people, more cougars and no sport-hunting season for 33 years and yet ranks near the bottom of "risk" rate. Several other states and Canadian Provinces such as British Columbia, Vancouver Island, Washington, Arizona, Colorado, Texas, Idaho, Wyoming, and Montana to name a few all have sport-hunting programs and yet have higher attack rates.

The best advice is do not try to micro-manage cougar populations to reduce rare events; there is simply no science to support it.

"Sightings" of Cougars

The Plan not only hinges on flawed population model, but also assumes that sightings represent risk (as noted above). There have been a number of attempts to use index type data such as sightings of cougars by the public as a measure of population change. These types of analyses are fraught with a number of pitfalls; many assumptions are invariably violated by them, not the least of which is that ***the majority of the sightings may well be false.*** While the Oregon Department of Fish and Wildlife have maintained a database of sightings, there is almost no attempt to verify these sightings. Thus, changes in "sighting data" is more a measure of changes in peoples' attitudes or anxieties related to the cougar and has almost no relevance for evaluating changes in cougar populations.

It is not uncommon for people to report sightings of cougars in the west, particularly in urban/rural areas. Many of these sightings are simply false and others are reports of cougars living in cougar country. Dr. Beier studied a population of cougars in Southern California, one of the most heavily developed areas in the state (2000 plus people/square mile). *He determined that **70-90% of reports of cougars along the urban/rural interface were false sightings.***

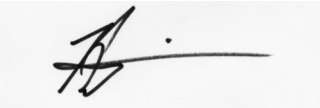
Dramatic increases in the human population in the western U.S. and the subsequent changes in development patterns have resulted in an increased edge of rural/urban development than existed just a decade ago. The human population in Oregon has increased nearly 25% in the last decade. The human population in California has increased 70% since 1970 to its present population of 35 million people. In the last decade, homebuilders have responded to the interest of the public to live in more rural settings by offering more products along the urban/rural interface. This has had the effect of dramatically increasing the boundary between development and natural areas. This yearning to get back to nature has inadvertently created an increased anxiety between people and the very nature they want to experience.

In reality, the Plan as proposed would not reduce the risk of being attacked in Oregon, as the current risk is so small as not to be reasonably measured. Those Oregonians (and tourists) that live or recreate in cougar country expose themselves daily to many more risky activities and yet they never consider nor concern themselves with the true risk these activities pose. I encourage ODFW to step back, recast this Plan to truly reflect the best available science, incorporating the comments of both Cougar Management Guidelines (which seemed to be largely ignored by this

current effort) and population ecologists like Dr. Barry Noon. I also encourage ODFW to focus more on conservation of the species (e.g., focusing on a landscape based approach) in the state and less so on the level of off-take. Off-take should be conservatively set until empirically derived data are collected that allow for increases, but still preserves the cougar role as an important component of the landscape. The objective of the hunt should not be cast as "management" as no current science exists to support those arguments. If ODFW wishes to generate a priori hypotheses and test different levels of off-take for the purposes of determining whether or not there are treatment affects, then I encourage them to frame the harvest within an experimental context. Identify control areas, areas of differing treatment levels, use metrics that make sense (verified metrics not unverified sightings or depredations), and more importantly rely not explicit assumptions that are not easily disproved or speculation about historical changes in the population that are questionable and not necessarily relevant.

Thank you again for the opportunity to comment and I hope you find these comments constructive.

Sincerely,



Rick A. Hopkins, Ph.D.,
Principal and Senior Wildlife Ecologist

Attachment: Dr. Noon's comments

October 31, 2005

Comments on: **Draft 2005 Oregon Cougar Management Plan**

Comments submitted by: **Dr. Barry R. Noon, Professor, Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, CO 80523**

Strengths of the Plan:

The Plan clearly states its objectives and appears (to the best of my knowledge) to be based on a thorough review of the relevant literature. I found the discussion of adaptive cougar management indicators, their target values, and criteria for management intervention to be particularly valuable. The inclusion of decision metrics based on cougar population size, extent of human-cougar interactions, and ungulate population recruitment seem appropriate and comprehensive. However, in some sense, the strengths of the Plan are also its weaknesses. That is, it is my opinion that the critical values of the indicator variables are associated with a much greater degree of uncertainty than is admitted to in the Plan. I will elaborate on my concerns below. However, I think that a clear acknowledgment of the uncertainty associated with allowable levels of cougar harvest and cougar effects on ungulate populations can be very useful to the establishment of research and management priorities. This is particularly true for adaptive management programs where management is viewed as an experimental means to accelerate learning about the dynamics of managed populations.

Plan Weaknesses:

A. The population model developed by Keister and Van Dyke (2002; A predictive population model for cougars in Oregon. Northwest Science 76:15-25) is a logical start to the development of a population model to estimate population size and population trends. However, it is my opinion that in its current form the population model is inadequate to meet the needs of a reliable management tool. My concerns include:

1) Model parameterization: the model is parameterized from a broad collection of studies done at different times and conducted on different cougar populations (see Table 1 in Keister and Van Dyke [2002]). This fails to recognize the correlation structure (i.e., covariance among birth and survival rate) that exists among demographic rates within a given population. A diverse collection of parameter estimates from multiple populations over varying time periods may generate dynamics that are not applicable to any real population.
2) Parameter uncertainty: all the key parameters in the Keister and Van Dyke model are estimated with uncertainty and subject to estimation error. Even if the parameters were estimated perfectly, in reality birth and survival rates are appropriately characterized by probability distributions that vary in space and time. Recognizing this fact limits the utility of deterministic projections.

3) Model uncertainty: all models are characterized by uncertainty that arises from simplifying assumptions about model structure and the fact that parameters such as survival rates are estimated with error. As a result, it is imperative that the uncertainty associated with model projections be part of the model output. However, the model developed by Keister and Van Dyke and used in the Plan is a deterministic model that makes no attempt to evaluate the uncertainty in projections of population size (see Figure 4, p. 26 in the Plan). This gives the impression that more is known about the "true" population size in Oregon than is in fact the case. All projections of population size and zonal population estimates should be accompanied by confidence intervals.
4) Density dependence: the population model assumes density dependence to act at approximately 75% of model estimated carrying capacity. Density dependence is certainly a reasonable assumption. However, the form of density dependence and when its first affects the populations and in what fashion is largely unknown. This process needs further investigation and may require experimental approaches.
5) Model validation: the population model used in the Plan has not been validated which further suggests that one should be skeptical about putting too much faith into model projections. Admittedly, validation is difficult for species as difficult to survey and study as cougars but the need for a validate model remains. Viewing information derived from the harvest data as model predictions may be a start towards validation.
6) Model inference: each of the zone-specific adaptive management guidelines includes a cougar indicator criterion based on an estimated population size. These estimates are based on the Keister and Van Dyke model, and in my opinion, should not be used as "hard and fast" decision points because of the great uncertainty that should accompany realistic model predictions.

Recommendation: My key recommendation is that an explicit attempt be made to estimate the uncertainty in the model-based estimates of population size and population trend. This could be done, for example, by making the Keister and Van Dyke model fully stochastic. One way to do this is to characterize the birth and survival rates as distributions based on the observed range of values of populations studied in the western U.S. in similar habitats. Also, the expected values of these distributions should incorporate some degree of year-to-year variation to simulate the environmental component of demographic variation.

It is my belief that when uncertainty in the demographic rates and annual variation in the rates are incorporated into the model projections that a great deal of uncertainty in population size and trend will be revealed. This does not mean that anything was done incorrectly. Rather, it is just an honest recognition that the true status of the population is poorly known.

B. The decision criteria used to conclude that a cougar population is being over-harvested and is currently below population size targets are based, in part, on indices of sex and age composition in the harvest. According to the Plan, interpretation of the 3+ year-old female component of the harvest are based on a recent publication by Anderson and Lindzey (2005; Experimental evaluation of population trend and harvest composition in a Wyoming cougar population. Wildlife Society Bulletin 33:179-188). My concerns include:

1) The inherent limitations of index-based methods: the index proposed by Anderson and Lindzey (the proportion of adult females in the harvest) seems to be a reasonable starting

point for a monitoring program. However, similar to the population model discussed above, the interpretation of the index is based on the assumption that the specific age or sex class in the harvest reflects their relative abundance in the population. This assumption, in turn, is based on the further assumption that cougars are differentially susceptible to harvest because of inherent and predictable differences in movement and behavior (based on an unpublished thesis from Utah State University in 1986). The validity and consistency of these assumptions may be context specific and their application to a given population at a specific point in time should be treated cautiously.

2) Too much reliability of the sex-age index value: the Plan states (p. 47 and elsewhere) an objective of 25-45% adult (≥ 3 yr) females in the harvest for up to 5 years. In my opinion, this is a very liberal interpretation of the results of Anderson and Lindzey (2005:187) who caution that their estimate (25%) "…came from a single experiment and should be used with caution in other programs…" Further, their publication, in my opinion, does not lead one to conclude that a harvest of adult females in excess of 25% for more than one year is an appropriate strategy to insure minimum population size targets.

Recommendation: I recommend that the age-sex proportions in the harvest be interpreted more cautiously and in full recognition that they are interim guidelines subject to change as more is learned about cougar harvest limitations. The assumption of differential age-sex vulnerability to harvest needs to be evaluated more thoroughly. Also, it is important to acknowledge that the age-sex proportions in the harvest represent a sample from the population and are subject to sampling and estimation error.

C. The recruitment criterion for elk (30-40 calves/100 cows) seems to be based on limited information. This is not an area in which I conduct research so I was interested in the literature referenced in the Plan. However, most of the publications referenced are not in the peer reviewed scientific literature and therefore not readily available. It appears to me that the evidence in support of the hypothesis that cougar predation is regulating ungulate populations in Oregon is not very strong and should be an active area of research. Additional concerns include:

1) Cougars as limiting factors to deer and elk populations: I believe that it is appropriate to have "trigger" points associated with elk recruitment, but declines in recruitment should not automatically be attributed to cougar predation. Many other factors in addition to, or acting synergistically with, cougar predation can affect elk recruitment. I believe it is possible that cougar predation may act as a proximate cause of deer and elk decline but suspect that it is seldom the ultimate cause except under condition of small ungulate population size.
2) References to cougar effects on bighorn sheep: discussion of the effects of cougar predation on bighorn sheep populations in the Plan may be misleading and not very relevant to possible predation effects on deer and elk populations in Oregon. I think it is most likely that bighorn reintroduction failures are largely a consequence of the reintroduction of small, novel prey populations into areas with predator populations supported by alternative prey species. Predator escape requires some threshold population size for reintroductions to be successful.
3) Elk calf survival and the cougar abundance index: As discussed previously, I am skeptical of most indexes used in wildlife management and this is true of the cougar

abundance index used in Figure 2 (p. 13). I did not find the regression relationship shown in this figure to be very convincing. It certainty is a useful exercise but should be as a hypothesis generating exercise and not a confirmatory analysis. In fact there are statistical issues in the regression onto a dependent variable that is measured with error, particular when the independent variable is an uncalibrated index.

4) Errors in inference: If declines in deer or elk recruitment is automatically attributed to increasing levels of cougar predation there is a danger that other factors that may be more relevant to ungulate population dynamics may be missed.

Recommendation: My primary recommendation is the role of cougar predation as a limiting factor in ungulate recruitment be treated as a hypothesis in need of additional testing. It appears that this is an ODFW research priority and has been initially addressed by the MS thesis of Rearden (2005). This research, when completed, should be subject to external peer review and submitted to a scientific journal.