



## The Grizzly Bear Recovery Project

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### **Effects of the Proposed Black Ram Project on Yaak Grizzly Bears** **Comments on the Black Ram Environmental Assessment**

The assessment of prospective effects of the Black Ram Project on grizzly bears in the Environmental Assessment (EA) is premised on several critical assumptions. First, status of the Cabinet-Yaak grizzly bear population is assumed to have improved since 2012. Second, and related, the EA assumes that some erosion of security for grizzly bears is therefore permissible, conditioned on a related assumption that security and road access standards employed by the Kootenai National Forest (NF) are sufficient for recovery of grizzly bears in this ecosystem. Third, the EA assumes that abundance of huckleberries are demographically limiting for grizzly bears in this region. And, fourth, the EA further assumes that Project treatments will substantially enhance abundance of huckleberries to an extent sufficient to offset any losses of habitat security.

All of these assumptions are unwarranted and, as a result, the conclusions reached in the EA about Project effects on grizzly bears are likewise unwarranted. More problematic yet, all of the conclusions of relevance to grizzly bears likely under-estimate negative impacts and over-estimate prospective benefits. Briefly:

- The weight of available evidence does not support concluding that population status has improved. For one, the methods used to estimate trend and current population size are beset with a host of problems. For another, the information able to be distilled from demographic data suggests that any improvement has stalled since 2014.
- Variations in population size and trajectory between 1999 and 2010 are more likely attributable to variations in abundance of natural foods—berries in particular—that affect exposure of bears to humans rather than to any increased mitigations. During years of scant berries, bears likely forage more widely and more often end up in conflict situations or exposed to malicious killing.
- The population of grizzly bears in the Yaak/Yahk is far smaller than even the smallest size posited to be viable by any researcher. Related, the population remains acutely vulnerable to even the smallest increases in bear mortality that are predictably more likely to occur with any increase in road access and associated human activity.

- Malicious and other unjustified killing by humans remains the dominant cause of death for grizzly bears in the Cabinet-Yaak Ecosystem. These kinds of killings are predictably associated with roads. As a result, levels of road access need to be substantially reduced and related levels of habitat security substantially increased rather than the opposite, as is being proposed for the Black Ram Project.
- Road density and habitat security standards used by the Kootenai NF are patently deficient, partly because they are based on research that conflates behavioral phenomena such as avoidance and displacement with demographic phenomena, notably survival. The scale is wrong as well, given that exposure to mortality hazards logically accrues over years as a consequence of cumulative annual movements of bears vis-à-vis hazardous environs. As a corollary, the fact that standards on the Kootenai NF are more lax than standards on the Flathead NF is self-evidently nonsensical given that grizzly bears in the Cabinet-Yaak Ecosystem remain in a much more precarious status compared to grizzly bears in the Northern Continental Divide Ecosystem.
- There is little or no evidence that food abundance is a significantly limiting factor for grizzly bears in the Cabinet-Yaak Ecosystem—especially as manifest in reproduction. On the other hand, there is ample evidence that human-caused mortality had governed and continues to govern the fate of this population, with food effects manifest primarily in the extent to which grizzly bears are exposed to human-related hazards during years when berries are in shorter supply.
- There is essentially no prospect of any increased berry production attributable to Project treatments offsetting increases in hazards associated with increased human access and activity. Moreover, enhancement of huckleberry production is more likely to occur as a result of wildfire rather than as a result of timber harvest. Given that the Davis fire recently burned substantial acreages in habitat conducive to huckleberry production, any need for ostensible berry-enhancing treatments has already been met naturally—and in an area that is likely to be more secure from humans.
- Compounding prospective problems with the Black Ram Project, proposed activities are concentrated in an area that is vital for facilitating movement of grizzly bears west-east between core habitats. Project activities will diminish rather than enhance security needed not only to facilitate transit of bears, but also increase odds that exposed bears will survive.

In short, the Black Ram Project promises to harm grizzly bears in the Cabinet-Yaak Ecosystem. In what follows, I elaborate on most of the points outlined above, and substantiate my conclusion.

## **A. Weight of Evidence Does Not Support Concluding that Status of the Cabinet-Yaak Population has Improved Since 2012**

### **A.1. The 2.1% Per Annum Growth Rate for the Cabinet-Yaak Population is Not Justified or Applicable**

Use of a 2.1% per annum growth rate to project total size of the Cabinet-Yaak population from the Kendall et al. (2016) 2012 point estimate, as was done by Kasworm et al (2018), is not defensible. Such use is, moreover, guaranteed to produce spurious results that cannot legitimately be used to reach conclusions of management relevance. There are several unambiguous reasons.

#### ***A.1.a. The growth rate is not representative of the total population***

First, the estimated 2.1% per annum growth rate only applies to an unknown fraction of the total Cabinet-Yaak grizzly bear population. Vital rates used to estimate this growth rate were based solely on “native” or “natural” research-trapped bears, and expressly excluded bears captured because of conflicts or part of the augmentation program (Kasworm et al. 2018: 10). The growth rate, moreover, applies almost exclusively to the Yaak portion of the population given that 95% of the data used to estimate survival rates and 85% of the data used to estimate reproductive rates came from this subpopulation (ibid: 36)—protestations by the authors notwithstanding (ibid: 36). On top of this, the 2.1% per annum rate was estimated only for the female portion of this high-grade (ibid: 10), which is of consequence even though female survival is disproportionately important in determining growth rate, as such.

In other words, the 2.1% per annum growth rate can only be legitimately applied to females residing in the Yaak subpopulation that were not trapped and marked as a result of conflicts nor part of the augmentation program. Put another way, management-trapped bears, augmentation bears, and males would need to be represented in a modeling framework if any estimated population growth rate were to be *prima facie* representative of the total population. Moreover, if the fates of all such bears were to be considered, estimated population growth rate would almost certainly be lower given that survival rates of males, augmentation bears, and management bears are substantially less than survival rates of the females used to estimate the 2.1% per annum growth rate (ibid: 33-35).

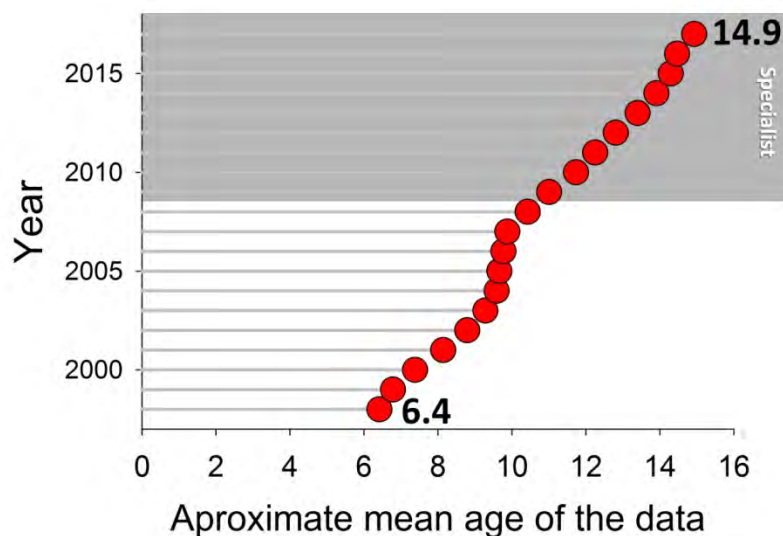
If a growth rate were to be used to project a *total* population estimate, comparable to the Kendall et al. 2012 point estimate of 49 bears (95% CI = 44-62), then such a growth rate would need to represent birth and death rates of the *total* population, and apply specifically to the period of interest (e.g., 2012-2017) rather than a longer period of time that masks the relevant trajectory (see my point below).

#### ***A.1.b. The growth rate does not represent 2012-2017***

The 2.1% per annum growth rate used by Kasworm et al to project 2017 population size was calculated using data that span 1983-2017 and so, therefore, axiomatically represent a generalized growth rate for Yaak females during this lengthy 35-year period. Put another way, the 2.1% per annum growth *is not* an estimate of growth for the period 2012-2017. For it to be so, the rate would have necessarily been estimated only using data from the approximate 2012-2017 period.

More to the point, estimates of growth for the Yaak female population are increasing back-weighted by inclusion of data that are, on average, increasingly old. Figure 1 (herein) shows the approximate average age of data used to calculate vital rates with the passage of time (from *ibid*: Table 17, 40-42). Notice that average age has increased from around 6-7 years in 1998 to nearer 15 years in 2017. In other words, with the progression of time estimates of population growth for the female segment of the Yaak population have become increasingly irrelevant to judging current population trajectory.

The Government retort to these contentions would probably be that the data from such a short period of time would be so sparse as to preclude a usefully accurate estimate. That is almost certainly the case, and a commentary in its own right on the profound limitations imposed by intrinsically small sample sizes. Nonetheless, this does not negate the point that the 2.1% per annum growth rate for 1983-2017 is spurious when applied to the 2012-2017 period. As Figure 11 clearly suggests (*ibid*: 37), population growth rate has almost certainly varied over time, albeit in largely indeterminate ways (see my following point).



**Figure 1.** Trend in mean age of data used to calculate vital rates of Cabinet-Yaak grizzly bears with passage of years from 1998 to 2017. Mean age has more than doubled, with trend towards increased aging accelerating since deployment of a conflict management specialist in the ecosystem. Increasing age renders estimated vital rates increasingly irrelevant to current conditions.

#### ***A.1.c. Uncertainty of the growth rate as currently (or even ideally) calculated debars use***

Small sample sizes impose very real constraints on the precision and accuracy of all demographic rates being used by Cabinet-Yaak researchers and managers. These constraints follow ineluctably from the small size of the Cabinet-Yaak grizzly bear population, which is a non-negotiable feature of this ecosystem.

As a practical upshot, all of the population growth rates calculated to date have uncertainty intervals (e.g., 95% confidence intervals) that not only substantially overlap zero (i.e., no growth) but also, over time, each other. More specifically, despite purporting to show trend in cumulative growth rate over time, the confidence intervals shown in Figure 10 (ibid: 37) all overlap—most almost completely (see also Figure 2A herein). Because of this, there is little or no basis for concluding that growth rate has varied with time. Likewise, taking a *precautionary* approach, there is little or no justifiable basis for concluding that growth rate is currently positive, despite statements in Kasworm et al. such as “The probability that the population was stable or increasing was 73%” (ibid: 36), especially in light of the fact that the point estimate of 2.1% per annum is a *cumulative rate* spanning 1983-2016 with little or no known relationship to *current rate* of population increase or decline.

Moreover, when the totality of point estimates and uncertainty is taken into consideration for the period 1998-2017, there is a cumulative 62% probability that the population was *declining* during these 19 years, consistent with the 2017 estimate of population size for Yaak females still being around 52% less than the estimate of population size for 1998 (Figure 2A and 2B herein).

The implications of uncertainty are thrown into relief by examining the specifics of projecting population size forward in time from 1983 to 2017 using the 1.021 (95% CI = 0.949-1.087) growth rate, noting up front that uncertainty in annual growth rate magnifies exponentially over time when manifest in population size. For example, after back-casting to obtain a plausible 1983 population starting point, deterministic projections of population size using the upper and lower confidence intervals of growth allow for a current population (2017) of anywhere between 3 and 256. Stochastic projections, e.g., using the software RISKMAN, generate a similar and not particularly useful range of 4 to 154 individuals.

The point here is that the raw cumulative uncertainty is huge, especially when dealing with a time period as long as 1983-2017. It is also important to note that this exercise takes the 1.021 estimate of lambda at face value, which, as per my previous points, is unwarranted.

Related to this last point, the current basis for modeling population growth rate using Booter (ibid: 10-11) is egregiously simplistic given the self-evident structural complexity of grizzly bear population demography in the Cabinet-Yaak Ecosystem. For any estimate of growth rate to be realistic, explanatory, relevant, and accurate, all of the main structure needs to be accommodated. More specifically, a relevant demographic model would ideally include source-sink structures accounting for management-trapped versus research-trapped bears, bears in the Yaak area versus the Cabinet Mountains, augmentation bears versus in situ bears—in addition to accounting for the male segment as well as inter-annual variation attributable to variation in key food resources (see later). The model described in Kasworm et al. does none of this.

Again, the probable retort would be that sample sizes are too small to support estimating the many rates required for such a model. But that is, indeed, the point. And no amount of hand-waving or protest will make it otherwise nor redeem the deficiencies in current estimates of demographic rates. The uncertainty is real and unavoidable, and should be acknowledged in management decision-making.

### A.2. Even taking estimated growth rate at face value, current population status is problematic

Even taking the population growth rate estimated by Kasworm et al. at face value, the most defensible conclusions would be, first, that status of the population has worsened during 2014-2017 compared to 2006-2013, and, second, that numbers are still substantially less than the presumed peak reached around 1998. These conclusions are based on trend in *population growth rate* over time (as per *ibid*: 37), and trend in *population size* estimated by projections using year-specific cumulative population growth rates (e.g., projecting population size for 1998 using the 1983-1998 growth rate estimate, and then doing the same for each successive year, with 1983 the starting year throughout).

Figure 2 (herein) shows seminal results. In Figure 2A I've identified three periods typified by trends in *population growth*: rapid decline of 2% per annum during 1998-2006, coincident with the berry famine (see below); a nearly as rapid 1.1% rate of improvement during 2006-2014; followed by stalling in the rate of improvement to around 0.2% per annum since 2014—an 82% decline in rate of change—coincident with population growth rate finally reaching positive territory. Importantly, this refers to the *per annum rate of deterioration or improvement in population trajectory*, which is perhaps the most relevant information to be gleaned from the estimates of population growth rate presented by Kasworm et al.

Finally, Figure 2B (herein) shows trend in estimated *size* of the Yaak female population, both as a central tendency (dark green line) as well as bounding uncertainty (light green band, based on projections using the upper and lower confidence intervals for each cumulative estimate of growth rate). Parenthetically, I transformed the values to a natural log scale in Figure 2B to visually emphasize trends given that the bounds of uncertainty explode with projections increasingly farther forward in time. The take-away point is that, according to these values, population size peaked during 1998, reached a nadir during the height of the berry famine in 2006, increased through 2014, and then stalled during 2015-2017 at a size that was still around 52% less than peak numbers reached during 1998.

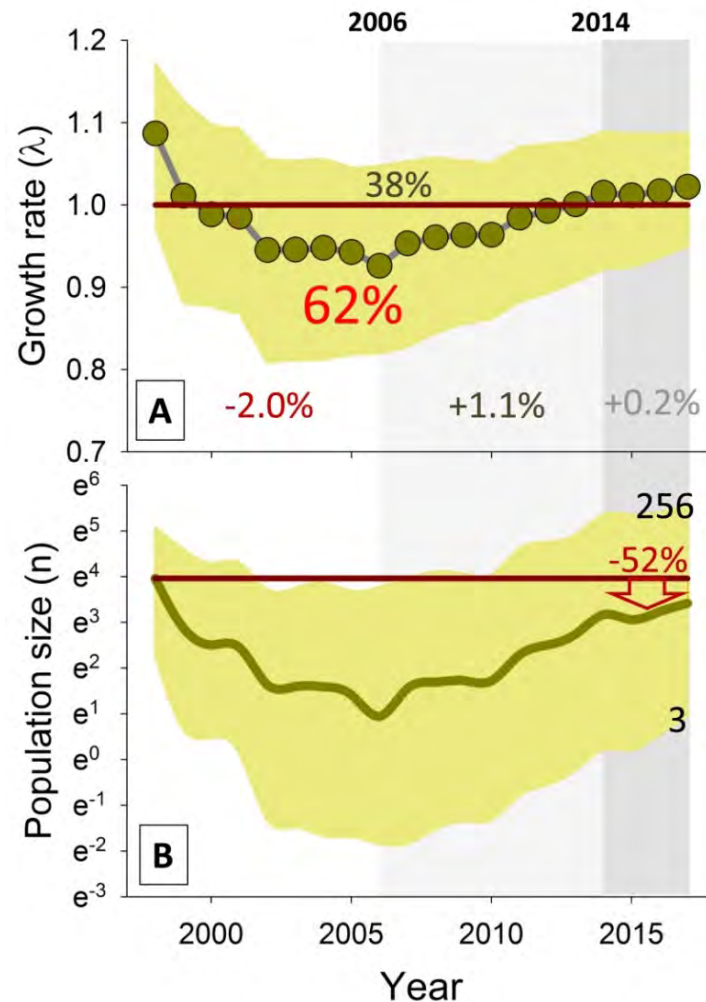
The key points here are that improvement in status of the female segment of the Yaak population *stalled* beginning in 2014 at numbers that were still approximately 52% less than the peak reached during 1998. Having said this, both of these conclusions remain severely compromised by the intrinsic uncertainties, lack of relevance, and bias of methods used by Kasworm et al.

### A.3. Conclusion

The upshot of all this is that there is *no legitimate basis* for estimating current population size (e.g., 55-60) by applying a biased 1983-2017 growth rate—based on high-graded data representing only a fraction of the population—to a point population estimate made during 2012. Moreover, even taken at face value, the current cumulative population growth rate shows stalled improvement in population status and a population still substantially less than peak numbers reached during 1998.

The best that can be perhaps be invoked is a contrast between the presumed minimum estimate of 35 bears during 2014-2017 (*ibid*: 27) and the 2012 estimate of 49 (44-62) bears reported by Kendall et al.

(2016). The estimate of 35 for 2014-2016 is self-evidently less than the lower bound of the 2012 confidence interval, more consistent with a *static or even declining population* than with an increasing one. Of greater relevance to the draft EIS, this general conclusion also holds for comparisons specific to the Cabinet population (a current minimum of 13 bears compared to lower confidence intervals of around 20 reported by Kendall et al. for 2012).



**Figure 2.** Trend in estimated population growth rate (A) and related estimated total population size (B) for Cabinet-Yaak grizzly bears, with the notable proviso that both sets of estimates are based almost wholly on data obtained from female grizzly bears in the Yaak population. Dark green dots or lines denote central tendencies, large green bands bounds of uncertainty. The horizontal dark red line in (A) denotes no growth, with any values above leading to increase and any values below leading to decline. The red line in (B) corresponds with estimated population size in 1998. In (A) I also show the cumulative weight of evidence for population declines versus increases for 1998-2017 along with average annual rates of change in lambda during three periods characterized by non-stationary shifts in dynamics. The numbers at right in (B) correspond to the range in estimated population size given uncertainties in growth rate (3-256), as well as the deviance in current estimated population size from the 1998 benchmark.

## **B. Comparison of Pooled Survival Rates in Kasworm et al. (2018) is Not Legitimate**

As ancillary support for the proposition that size of the Cabinet-Yaak population has increased between 1999-2006 and 2007-2017, Kasworm et al state that “Grizzly bear survival of all sex and age classes decreased from 0.899 during 1983–1998 to 0.792 during 1999–2006 and then rose to 0.934” (ibid: 34), and then summarize these same numbers in Table 13 (ibid: 34).

Most of the problems and associated bias noted above applies to this comparison. Note, first, that the 95% confidence intervals reported in Table 13 for pooled estimates from all three time periods overlap, which precludes confidently concluding there is any difference in mean rates. Moreover, note the restriction to “native” bears, which excludes any consideration of conflict-trapped or augmentation bears, which were very much a component of the 2012 point estimate of population size.

The other problematic aspect of this comparison is that data from all bear sex and age-classes were pooled, without any apparent attempt to determine whether this collapse of data preserves representation of the population at large. Are males over- or under-represented?...likewise subadults versus adults? Some sort of weighting scheme reflective of current or even stable population structure could provide some remedy, but without compensating for other biases.

The other interesting aspect of this data-pooling is the extent to which it is at odds with other results and commentary in Kasworm et al. More specifically, this aggregation of data ignores the disproportionate importance of subadult females to population dynamics. This importance is evident in the near 85% variance in estimated population trend attributed to survival of subadult and adult female bears in Booter calculations (but with 60% attributable to subadult female survival, Table 15; ibid: 37), as well as the different contextual emphasis placed by the authors on female survival on Pages 32 (“...it is important to consider the rate of female mortality”) and 37.

The implication of all this is that the comparison of survival rates estimated from pooled data presented by Kasworm et al on Pages 33 and 34 does not mitigate the many fatal problems with their estimates of population growth rate.

## **C. Comparison of Annual Average Deaths in Kasworm et al. (2018) is Uninformative**

Kasworm et al. (2018) present information on grizzly bear deaths in the Cabinet-Yaak Ecosystem in terms of numerous contrasts and adjustments presumably designed to be of relevance to various management deliberations. On pages 15-16 a running average of annual mortalities is related to recovery criteria; on pages 16-18 a full list of deaths with ancillary details is provided; and on pages 31-33 mortality is summarized in multiple ways presumably relative to different management considerations. Throughout, the parsing, categories, and nomenclature are confusing, obfuscated, and confounded. As a result, I needed to reconstruct much of the analysis of mortalities presented by

Kasworm from the raw data on pages 16-18. The contrast among time periods presented in Table 11 (ibid: 33) was a particular focus.

### **C.1. Table 11 in Kasworm et al. (2018) is a Tangled Mess**

The totals in the column farthest right in Table 11 of Kasworm et al. (2018) include all mortalities—human-caused, natural, within 16-km of the Recovery Area boundary, in the US as well as Canada—plus the estimated unrecorded *human-caused* mortalities. For some inexplicable reason, and unlike in the NCDE and GYE, natural mortalities and mortalities of unknown cause were not accounted for in estimations of unrecorded mortalities.

The upshot is that the row totals in Table 11 represent a mishmash of natural, human-caused, and estimated unrecorded human-caused mortalities, without any straight-forward connection to judging overall population status. In fact, the inattention and even outright dismissal in this context of natural mortality as a factor in judging population status is mystifying given that a dead bear, for whatever reasons, matters in assessing the toll taken by mortality.

### **C.2. Comparison of ‘rates’ between 1999-2006 and 2007-2017 is Uninformative**

By contrast, the comparison of annually-averaged human-caused mortality between 1999-2006 and 2007-2017 on Page 32 of Kasworm et al. only considers human-caused mortality, but without including any of the estimated unrecorded human-caused mortality included in Table 11—and without any cogent explanation. The confusion implicit to this inexplicable parsing is compounded by use of the term ‘rate’ in reference to an annual average, in context of ‘rate’ being used elsewhere in reference to survival and reproductive rates referenced to fates of individual bears. On top of this, a typo was made in reference to the 2007-2017 ‘rate,’ which should be 2.2, not 2.1. This error amplified the potential for confusion arising from comparing ‘2.1’ with ‘2.25’ and calling the first value an increase over the second.

Reducing this chaos to something comprehensible: the annually averaged number of known and probable human-caused deaths during 1999-2006 was 2.13. Using all currently available data, for 2007-2018 the average was 2.08. When the estimate of unreported human-caused deaths is included, the average for 1999-2006 was 2.75 (95% CI 1.6-3.9). For 2007-2018 it was 3.2 (95% CI 2.2-4.2). Considering total known-probable mortality plus estimated unreported human-caused mortality—but without any correction for unreported natural deaths—the annual averages for 1999-2006 and 2007-2018 were virtually identical: 3.9 and 3.8.

The important point is, here again, that rote statistical uncertainty debars any conclusion about increase, stasis, or decrease in numbers of human-caused deaths. The confidence intervals of annual averages overlap substantially, which is not surprising given the small sample of years and dead bears. This statistical uncertainty is amplified by uncertainty attached to detecting any bear death other than that of an actively radio-monitored animal. Considering only human-caused deaths, this certainly holds for poached bears, deaths ‘under investigation,’ and deaths from unknown (but human-related) causes. A back-of-the-envelope calculation suggests that such deaths need to be increased by around 70 to 120% in year-end tallies.

In the face of such irrefutable uncertainty, Kasworm et al resort to focusing on and then emphasizing female mortality, which reduces the absolute values of calculated averages even further. When an estimate of unreported human-caused female mortalities is added to known mortalities (using the long-term proportion of F:M deaths=0.4), the result is an annual average of 1.75 (95% CI 0.83-2.67) female deaths for 1999-2006 and 0.80 (95% CI 0.34-1.54) female deaths for 2007-2018. All of the reported differences in mean values are so far within the range of statistical uncertainty as to render these comparisons a bit absurd.

### **C.3. Conclusion**

Again, researchers and managers in this ecosystem might argue that small samples prevent any degree of certainty about conclusions, but this does not obviate the obligation to acknowledge uncertainty. Nor does it eliminate the practical consequences of small sample sizes and the compromising effects of chance processes—highlighted recently by a jump in recorded deaths from 1 in 2017 to 3 in 2018, a tripling in just one year. More certainly, it recommends humility and precaution in the face of such statistical ambiguities.

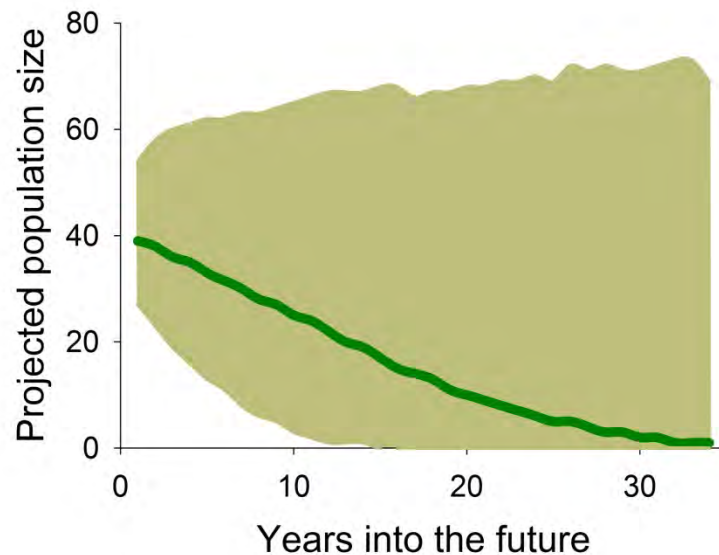
But all of this still leaves open the question of why natural mortalities as well as mortalities that cannot be definitively ascribed to human causes are not accounted for in assessing population status. This question is especially relevant given that Kasworm et al comment in several places on the extent to which variation in abundance of key natural foods likely drives population dynamics, often through the ‘natural’ death of dependent young (see below). Or, even, why, when considering only human-caused mortality, adjustments to account for unrecorded deaths were not included. This is all a bit mystifying as well as *prima facie* unjustified.

### **D. Status of the Cabinet-Yaak Population Remains Highly Precarious**

The current vulnerability of the Cabinet-Yaak population can be illustrated through a simple exercise, even without accounting for spatial structure of the Cabinet and Yaak subpopulations. I input vital rates into a commonly-used risk management program named RISKMAN (currently being proposed for management of grizzly bear mortality in the NCDE). Using the stochastic function, I was able to reconstruct the c. 2.1% growth rate reported by Kasworm et al (2018) for 1983-2017. More specifically, the cumulative geometric mean growth rate ( $\lambda$ ) varied from a maximum of 1.035 to a minimum of 1.008. Accounting for variation in vital rates, the median ending population size at year 34 was 43, although the upper and lower 95% percentiles of simulated trajectories produced ending populations as small as 4 and as large as 154.

I then simulated what would have happened if just one additional female died each year. In this scenario, the geometric cumulative mean growth rate dropped from 0.952 (already much less than 1) to an astounding 0.202 at year 34 of the simulation (Figure 3 herein). Median total population size had reached 0 by year 23, with an upper 95<sup>th</sup> percentile of only 11 animals at the end of simulations. Results were not much improved when an additional 1 female was lost only once every 2 or 3 years. This is not

presented as any definitive modeling result, but rather illustrative of how little the margin of error is, and how vulnerable this population is to even the smallest increased increments of mortality (e.g., Kendall et al. 2016). This point is especially germane given that *one adult female was killed by humans each of the last two years, during 2018 and 2019*. And this does not account for adult females that died and were not documented.



**Figure 3.** Results of RISKMAN projections for the Cabinet-Yaak population using vital rates reported by Kasworm et al. (2018), but introducing the death of an additional female grizzly bear once every 2 years. The thick green line represents the median trend of projections; the dusky green band above and below the variability of projections.

### E. Weight of Available Evidence Emphasizes the Continued Importance of Malicious Killing

The extent to which poaching, malicious killing, or other suspect circumstances are associated with human-caused deaths is also instructive regarding the overall effectiveness of conflict mitigation efforts during 1999-2017 to offset the problematic effects of road-access and poaching. By its nature, malicious killing/poaching is a criminal act undertaken by criminals. Such behavior is rooted in attitudes and outlooks that are notoriously unresponsive to education and ‘outreach’. The phenomenon is about willful malfeasance. As such, limitations on road access coupled with improved law enforcement and successful prosecutions are logically the most appropriate redress—not, for example, conflict mitigation by a specialist who is not tasked primarily with law enforcement.

Before pursuing this any farther, some clarification of obfuscations in the dead bear database is needed. During 1999-2017 a number of deaths were ascribed to ‘Undetermined’ human causes, ‘Poaching’ or listed as ‘Under investigation’. The first and last categories are not explicit, but nonetheless strongly suggestive. Certainly, ‘Under investigation’ suggests that the death occurred under suspicious circumstances warranting investigation—with a strong likelihood of either poaching or other

unwarranted lethal action by the involved people. Such suspicions are rarely definitively resolved. 'Undetermined' is also more suggestive of malfeasance rather than innocence on the part of the involved people. Given the alternatives, such deaths are more defensibly allocated to causes more resistant than not to mitigation.

With all of this as context, there were a total of 7 known-probable deaths during 1999-2006 attributed to either poaching or undetermined causes, representing 58% of total human-caused deaths. During 2007-2018 there were a total of 13 deaths either under investigation or ascribed to poaching, representing a nearly identical 59% of the total known-probable human-caused deaths. These are major fractions in their own right, but leave estimated numbers of unreported deaths unaccounted for. As Kasworm et al make clear (ibid: 33), their estimate of 'unreported' deaths did not apply to bears that were radio-collared or removed by managers, which leaves this unreported estimate levied almost entirely against malicious or otherwise suspect causes. When these unreported estimates are added to the known-probable toll taken by poaching, unknown causes, or suspicious circumstances, the percentage increases to around 70% during 1999-2006 and approximately 77% during 2007-2016.

Taken together, these figures support concluding that (1) malicious or otherwise suspect causes account for a large portion—if not majority—of grizzly bear deaths in the Cabinet-Yaak Ecosystem; (2) the fraction and even total numbers of deaths attributable to such causes did not decrease from 1999-2006 to 2007-2018; and (3) that aggressive limitations to road access by the USFS are needed, especially in areas with concentrations of productive habitat (Proctor et al. 2015, 2017).

## **F. Access Management is Critical to Limiting Malicious & Other Unjustified Killing**

The consensus of relevant research is unambiguous about the link between road access and grizzly bear mortality. The more access, the more dead bears there are, with disproportionate concentrations near roads (Brannon et al. 1988; Benn & Herrero 2002; Nielsen et al. 2004; Wakkinen & Kasworm 2004; Boulanger & Stenhouse 2014; McLellan 2015; Proctor et al. 2017, 2018). Dead bears tend to be concentrated within 100 to 500 m of roads, averaging around 300 m ( $\pm 195$  m) among studies where distance was noted.

Unfortunately, there is a common conflation of the extent to which radio-marked grizzly bears spatially avoid roads with the geospatial configuration of mortality risk and, even more important, decrements in survival and population growth. These parameters are not synonymous. Even though a bear might underuse habitats within a certain distance of roads, this does not translate into a 1:1 correlation with exposure to risk of human-related mortality during a bear's lifetime. Conflation of avoidance with mortality risk has led to the unstated assumption that the former can be used to set standards for the latter. Such is the case for road density and habitat security standards set by the Kootenai National Forest based on the results of Wakkinen & Kasworm (1997).

Taking 300 m as a ballpark figure, road densities of roughly 0.6 km/km<sup>2</sup> translate into areas remote from where human-caused mortality is concentrated that amount to only 84 ha (208 acres), which is trivially

small for a grizzly bear. This sort of geospatial buffer still means that grizzly bears are frequently exposed to hazards of human-caused death to the predictable extent that they must and will move from one presumably secure area to another—even assuming that these bears exhibit “average” avoidance of human features such as roads. In other words, the level of buffering from human-caused mortality offered by road density and related security standards invoked in the Black Ram EA is guaranteed to be inadequate.

The inadequacy and inappropriateness of road density and security standards used by the Kootenai National Forest in application to the Black Ram Project are highlighted in contrast to standards applied in the Northern Continental Divide Ecosystem (NCDE), as well as in contrast to trajectories of populations in the NCDE and Greater Yellowstone Ecosystem. The populations of already relatively numerous grizzly bears in the NCDE and GYE have increased substantially since the early 1990s to 2000s, in contrast to in the Cabinet-Yaak where precariously few bears have fared poorly (see my Points A-D, herein). Tellingly, Wilderness Areas and Inventoried Roadless Areas where road access is not allowed comprise around 56% of the NCDE and GYE. In the Cabinet-Yaak Ecosystem this figure is less than half as much, nearer 21%. This difference alone can explain much of the corresponding difference in fates of grizzly bear populations.

Despite these telling differences in fates and trajectories of grizzly bear populations, the road density and habitat security standards applied by the Kootenai National Forest are more lax, not less, than those applied on the Flathead National Forest. On the Kootenai, areas allowed with  $>1$  mile/mile<sup>2</sup> of roads are 1.7-times greater; areas with  $>2$  miles/mile<sup>2</sup> of roads are 1.4-times greater; and extents of secure habitat nearly 20% less compared to what is ostensibly allowed on the Flathead NF. These disparities are perverse and not able to be explained on the basis of differences in the extent of movements by grizzly bears. If anything, bears range more widely in the Cabinet-Yaak Ecosystem compared to the NCDE (Kasworm et al. 2018).

As a bottom line, existing and proposed access management in the Black Ram Project Areas has jeopardized and will continue to jeopardize grizzly bears.

## **G. More Grizzly Bear Deaths Are Occurring On USFS Jurisdictions Now Compared to During 1999-2006**

The argument for more aggressive management to prevent human-caused grizzly bear mortality on USFS jurisdictions is given greater weight by differences in locations of bear deaths between 1999-2006 and 2007-2018. Data from Kasworm et al. (2018) and Kasworm (2018) show an increase in the proportion of grizzly bear deaths on USFS lands from 25% (95% CI = 0.5-49.5%) during 1999-2006 to 56.5% (36.3-76.8%) during 2007-2018. Although sample sizes are small, confidence intervals large, and overlap of the intervals non-trivial (17%), these results *do not* support concluding that hazards for grizzly bears have remained constant or declined on USFS lands. Rather, by weight of evidence, the better supported conclusion is that hazards have *increased* and, because of that, imperatives to control

mortality on public lands have likewise increased, including on lands part of the proposed Black Ram Project. As per my point F, above, the most efficacious means available to the USFS for addressing this imperative is through providing increased rather than diminished habitat security, axiomatically through *reducing* road access in the Project area.

## H. The Proposed Black Ram Project is Inconsistent with the Best Available Science

Although I could invoke a large corpus of relevant science that has been neglected in the Black Ram EA, I focus here to one piece of research—Proctor et al. (2017). This paper is highly relevant to judging the trade-off between proposed forest treatments and habitat security for grizzlies, especially vis-à-vis any prospective increase in huckleberry production and hazards associated with road access. Some relevant recommendations from Proctor et al. (2017) include:

- That 25% of the landscape, particularly portions with important huckleberry fields, have no roads.
- That 60% of the landscape be >500 m from an open road in patches >5-10 km<sup>2</sup> and those secure habitat patches encompass higher quality habitats.
- That some portion (roughly 25%) of the landscape not have any roads.
- That areas be mapped where wildfires will not be extinguished unless conditions are too risky for private property.

Some of the more germane quotes from Proctor et al. (2017) include:

“While managing the landscape for huckleberry forage is sometimes a medium to long term option, managing for mortality risk through road density has potential to be implemented over shorter time scales.”

“We found that 74% of huckleberry patches were not in cut blocks.”

“We also found that planted cut blocks were less likely to have huckleberry patches. Slash burning didn’t increase the probability of a cut block yielding a huckleberry patch—it was reduced. Fires (not slash burns) were ~3x more likely to yield a huckleberry patch than a cut block.”

The results of Proctor et al. (2017) are consistent with other research showing that naturally-occurring shrub-fields are positively selected by grizzly bears, presumably to consume berries (Waller & Mace 1997, McLellan & Hovey 2001, Apps et al. 2004), whereas recently harvested (<40-years) stands tend to be avoided, partly because of associated human activity (Apps et al. 2004). Parenthetically, descriptions of habitat use given by Kasworm et al. (2018: 48-50) are of limited applicability simply because the analysis did not consider use in relation to availability.

Given all of these considerations, the Davis Fire has almost certainly yielded as many benefits as might be needed for grizzly bears insofar as enhancements of habitats for huckleberry production. No further

forest treatments are likely needed, even of the sort recommended by Proctor et al. (2017). More certainly, any (if any) gains in enhanced huckleberry habitats will almost certainly be negated by maintenance of existing road access, much less any of the local increases proposed under terms of the Black Ram Project.

## **I. Activities of the Black Ram Project Are Problematic in a Larger Geospatial Context**

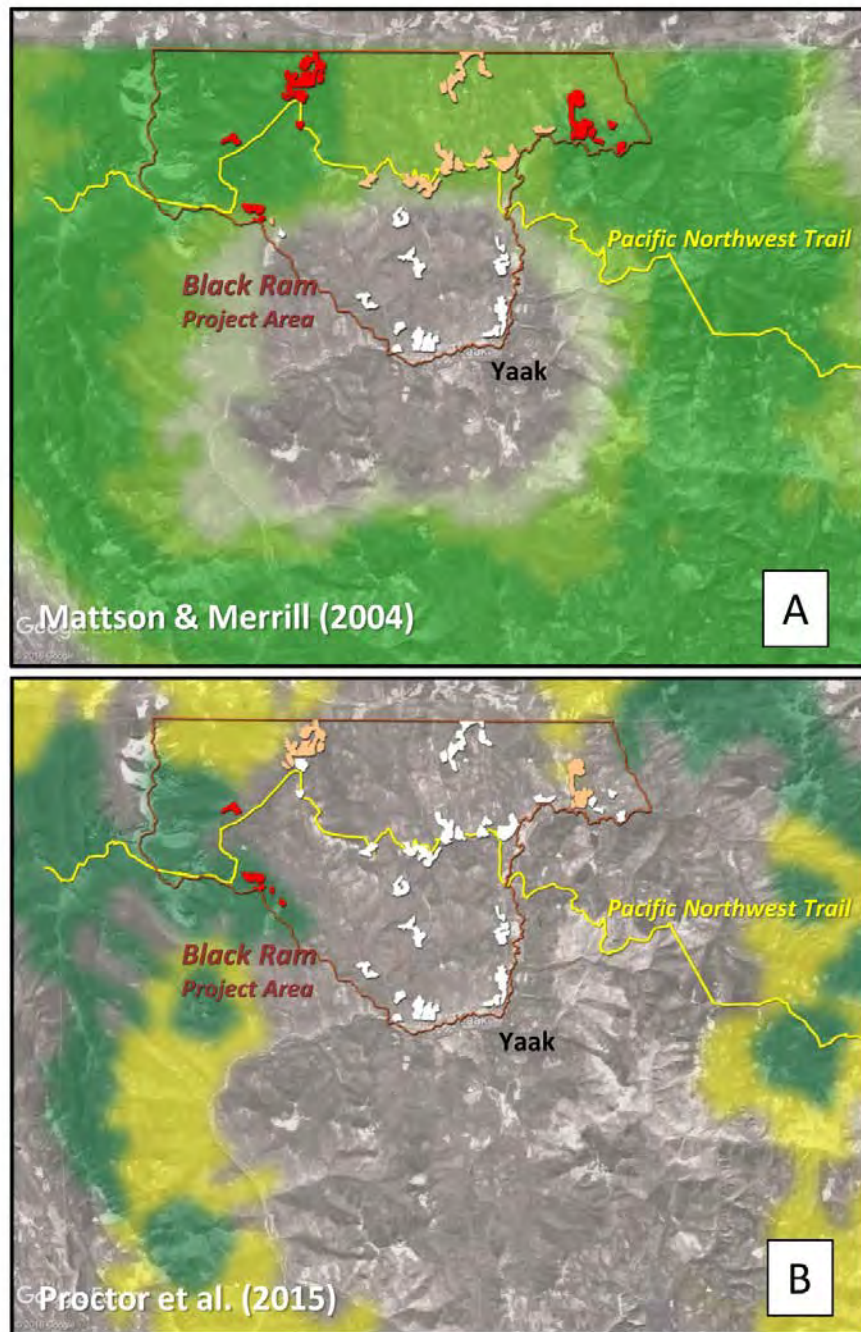
The Black Ram EA failed to evaluate the impacts of proposed activities on grizzly bears in a larger geospatial context. Mattson & Merrill (2004) and Proctor et al. (2015) are perhaps most relevant to such an evaluation. The former research mapped existing core habitat as well as higher-probability source habitats in the Cabinet-Yaak Ecosystem (shades of green; Fig. 4A), whereas the latter mapped core habitat (green) along with prospective corridors (yellow; Fig. 4B). Importantly, Proctor et al. (2015) modeled habitat at a finer grain that approximated daily movements, whereas Mattson & Merrill (2004) modeled habitat at the scale of grizzly bear life ranges, which is more relevant to judging overall odds of survival reckoned over a span of years.

As has been repeatedly emphasized by researchers in the Transboundary region, connectivity is essential to long-term prospects for recovery (Proctor et al. 2012, 2015, 2018; Kasworm et al. 2018). And, as also emphasized by these authors, connectivity is inextricably rooted in habitat security. However, Figure 4 highlights a fundamental problem for grizzly bears residing in the Yaak/Yahk region: core habitat to the west is comparatively isolated from core habitat to the east by a zone that is less secure. Ideally, aggressive restoration efforts would be undertaken in this problematic area to reestablish free exchange of bears likely to survive the transit. Logically, this restoration would emphasize road closure and permanent decommission (as per my points F and H). Instead, the Black Ram Project proposes to not only maintain an extensive road infrastructure in this potential west-east connector, but more egregiously ramp up human activities, with the prospect of both displacing bears and also exposing bears venturing into the Project Area to even greater risk of mortality.

The results of Mattson & Merrill (2004) and Proctor et al. (2015) allow for the identification of proposed Project Activities that are especially problematic and should be cancelled altogether if there is serious intent of meaningfully recovering grizzly bears in the Yaak/Yahk region. As a priority, regeneration and intermediate harvests planned for Units 77-83 should be eliminated from the Project, as should activities proposed for Blocks 1-17, 66-76, and 84. Ideally, activities in Blocks 18-44 would also be removed from the proposal to promote reestablishment of west-east connectivity in an area with broadly the greatest potential.

Adding weight to this recommendation, the under-construction Pacific Northwest Trail is located such that it will amplify the impacts of proposed activities in the Black Ram Project (Fig. 4). Parenthetically, this consideration highlights the additional fact that the Black Ram EA did not consider the prospective cumulative impacts of all on-going, proposed, and foreseeable human activities—including increases in

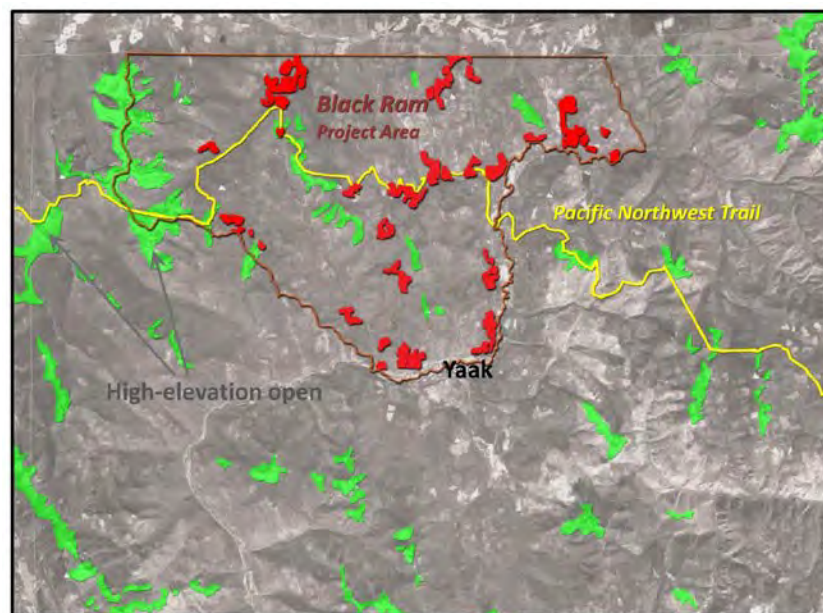
human activity along the Pacific Northwest Trail and foreseeable activities associated with the proposed Rock Creek and Montanore Mines.



**Figure 4.** Maps of (A) potential core and source habitat and (B) cores and corridors for grizzly bears (green and yellow, respectively) in the Yaak region. The boundary of the Black Ram Project Area is shown in burgundy juxtaposed with the Pacific Northwest Trail in yellow. Units proposed for regeneration and intermediate harvest in areas that promise maximum impacts to currently relative secure habitat are shown in red. Units that promise harm in habitats important to connectivity are shown in orange. The remainder of proposed harvest units are shown in white.

## J. Impacts of Black Ram will be Synergistically Amplified by the Pacific Northwest Trail

The Pacific Northwest Trail (PNT), currently under construction, will prospectively introduce an additional 100-150 people into the heart of previously secure habitat in the Yaak region each year, with almost all of that increase during July-September, the critical hyperphagic period for grizzly bears. Importantly, the PNT creates a linear disturbance that is contiguous with and extending beyond disturbances proposed during the Black Ram Project (Fig. 5). This attenuation of disturbances insures that there will be minimal areas free of human impacts anywhere in the Black Ram Project Area. An ample corpus of relevant research unambiguously shows that hikers using a trail such as the PNT will displace grizzly bears, with impacts predictably greatest on reproductive females (Mattson 2019a). Moreover, these impacts will almost certainly be greater in and near the lineated high-elevation habitats in the Yaak (Mattson 2019a), with displaced bears having few places to go that will not also be impacted by human activities associated with the Black Ram Project.



**Figure 5.** Location of the Black Ram Project and associated intermediate and regeneration harvest treatments (in red) juxtaposed with the Pacific Northwest Trail (in yellow) and high-elevation open habitats (in green).

Impacts from the PNT highlight the patent failure of the Black Ram EA to assess the cumulative effects of other current, foreseeable, and proposed human activities. Moreover, with the Cabinet-Yaak Recovery Area as a logical unit of analysis, any assessment of cumulative effects needs to account for other on-going and planned human activities associated with forest treatments and harvest in this Ecosystem, as well as foreseeable impacts associated with the proposed Rock Creek and Montanore Mines; as well as on-going and foreseeable impacts associated with the human transportation infrastructure (e.g., railways and associated highways that already fragment grizzly bear distribution in this Ecosystem, Mattson et al. [2019b]), all with the potential to amplify impacts arising from the Black Ram Project.

## **K. A Devil's Bargain Will Not Rescue This Small Population**

### **K.1. The Yaak Population is Not Viable and Remains Acutely Vulnerable to Increased Mortality**

The Cabinet-Yaak grizzly bear population is smaller than the smallest census population size ever posited as being viable. The Yaak/Yahk subpopulation has limited connectivity with grizzly bear populations elsewhere, and the Cabinet Mountains subpopulation is more isolated yet (Apps et al. 2016; Kendall et al. 2016; Proctor et al. 2012, 2015). Such isolation is well-known to magnify risk. The degree of this risk is evident in the fact that fates of populations as small of that of the Cabinet-Yaak grizzlies can be dictated solely by chance variation in birth and death rates, known as demographic variation. Yet demographic variation is a relatively minor stressor compared to environmental variation, catastrophes, negative deterministic trends, and loss of genetic diversity—all of which are documented or potential factors in the Cabinet-Yaak. The contemporary consensus of researchers is that populations of large mammals such as grizzly bears need to consist of thousands of animals to withstand all of these stochastic and deterministic threats over meaningful periods of time.

More to the point, as I emphasize in Point D, above, the Yaak and Cabinet grizzly bear populations remain acutely vulnerable to even small changes in levels of mortality. Under such circumstances, a precautionary approach to managing spatial hazards and habitat security is not only advisable, but mandatory. Unfortunately, there is no evidence of caution or even meaningful recognition of threats to the Yaak population in the Black Ram EA.

### **K.2. Variation in Population Trajectory Has Likely Been Driven by Exposure to Humans**

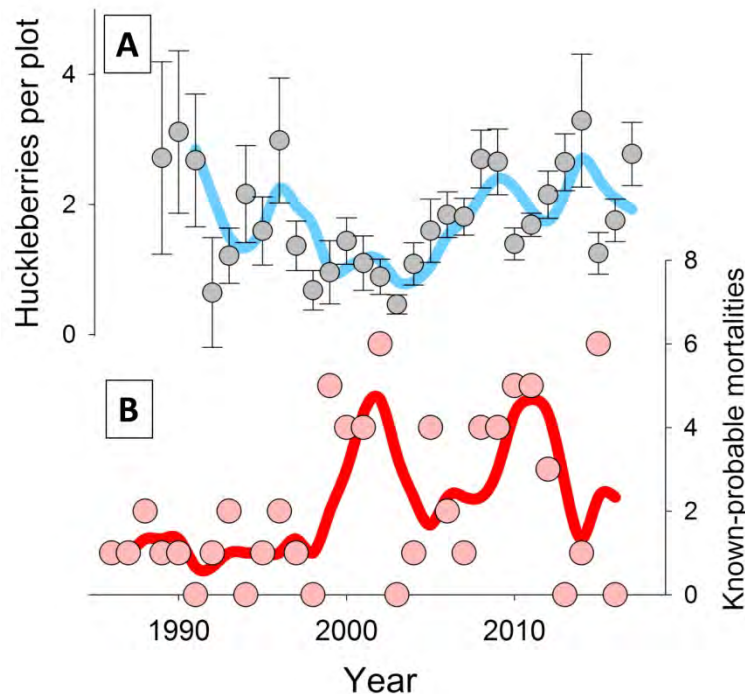
As a hypothetical, it is worth taking claims regarding an improvement in status of the Cabinet-Yaak grizzly bear population between 1999-2006 and 2007-2018 at face value. Again, the emphasis here is on the hypothetical given all of the compromising or even fatal flaws in analyses and conclusions reported in Kasworm et al. More specifically, if an improvement did occur, what was (were) the likely driver(s)?

Causation is notoriously hard to establish with any reliability or confidence. Nonetheless, even taking comments in Kasworm et al (again) at face value, one can establish how these authors ascribed causation based on the balance of their comments. The relevant quotes include:

“The increase in total known mortality beginning in 1999 may be linked to poor food production during 1998-2004 (Fig. 9). Huckleberry production during these years was about half the long term average...Poor nutrition may not allow females to produce cubs in the following year and cause females to travel further for food, exposing young to greater risk of mortality from conflicts with humans, predators, or accidental deaths.” (emphasized in Figure 10; *ibid*: 32; see Fig. 6, herein).

“Some of this decrease [in survival] in the 1999-2006 period could be attributed to an increase in natural mortality probably related to poor berry production during 1998-2004. Mortalities on private lands within the U.S. increased during this period, suggesting that bears were searching more widely for foods to replace the low berry crop.” (*ibid*: 34).

In reference to a probable increase in size of the Cabinet Mountains subpopulation from around <15 (possibly 5-10) in 1988 to around 22-24 in 2012: “These data indicate the Cabinet Mountains population has increased 2-4 times since 1988, but this increase is largely a product of the augmentation effort with reproduction from that segment.” (ibid: 36).



**Figure 6.** Trends in size of huckleberry crops (A) and in numbers of known and probable grizzly bear deaths (B) in the Cabinet-Yaak Ecosystem. Annual data are shown as dots and 3-year moving averages as solid lines. The negative relations between berry crop size and numbers of deaths is clearly evident, largely driven by related variation in exposure to humans.

On balance, Kasworm et al ascribe more weight to variation in natural foods and the augmentation program than to any mitigation measures as drivers of decline for the Cabinet-Yaak grizzly bear population during 1999-2006 and the subsequent presumed improvement in status during 2007-2017. This conclusion is consistent with that reached by McLellan (2015) from research in the nearby North Fork of the Flathead River and by McCall et al. (2013) from the Purcell Mountains showing a major influence of huckleberry fruit crops on demography of the local grizzly and black bear populations.

Importantly, though, Kasworm et al clearly associate the increase of deaths on during 1999-2006 and subsequent decline during 2007-2016 to bears foraging more widely—including into conflict situations—during times of dearth in late-season fruit crops. In other words, variation in population trajectory as a result of variation in size of huckleberry crops is not linked to changes in female reproductive success, but rather to effects on exposure of bears to humans.

### K.3. Any Prospective Increase in Huckleberries Will Not Offset Impaired Habitat Security

The consensus of available research is unequivocal about survival of especially female grizzly bears being more important than any likely increase in reproductive rates, in this case prospectively from enhanced berry production (Eberhardt et al. 1994, Hovey & McLellan 1996, Garshelis et al. 2005, Harris et al. 2006, Mace et al. 2012), especially if huckleberry patches are not meaningfully secured from human access and protected from human harvest (Proctor et al. 2017; see also <https://news.gov.bc.ca/releases/2019FLNR0186-001439>). And, moreover, reiterating my points under H, above, harvest treatments as part of Black Ram will not likely provide substantial increases in huckleberry production, especially relative to the benefits already imparted by the Davis fire. Rather than planning more timber harvest, the Forest Service would provide more certain benefits for grizzly bears by prescribing a more widespread natural fire regime combined with aggressive closure and retirement of roads in portions of the Black Ram Project Area highlighted in Figure 4.

### L. Conclusion

Reiterating my conclusion in the Introduction to these comments, the Black Ram Project as described in the EA promises to harm grizzly bears in the Cabinet-Yaak Ecosystem, with bears occupying the transboundary region of the Yaak bearing the brunt of harm. In contrast to the current proposed actions entailing widespread timber harvest and maintenance and even construction of supporting roads, the Forest Service could unequivocally benefit grizzly bears in this area by instead emphasizing the promotion of natural fire regimes and closure and retirement of roads.

Please contact me at [davidjmattson@gmail.com](mailto:davidjmattson@gmail.com) or 406-222-4702 if you have any questions. My somewhat dated resume is attached, current only up through my retirement shortly after 2011.



David Mattson, PhD

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# The Grizzly Bear Recovery Project

## RESEARCH SCIENTIST RECORD

NAME: **David J. Mattson**

DATE PREPARED: **15 July 2011**

CLASSIFICATION TITLE, SERIES, AND GRADE: **Research Wildlife Biologist, 0486, GS-14**

### (9) EDUCATION

Ph.D., 2000, Fish & Wildlife Resources, *Causes and Consequences of Dietary Differences among Yellowstone Grizzly Bears*, University of Idaho (1993-2000)

M.S., 1984, Forest Ecology, *Classification and Environmental Relationships of Wetland Vegetation in Central Yellowstone National Park*, University of Idaho (1980-1984)

B.S., 1979, Forest Resource Management, University of Idaho (1972-1979)

### (10) TECHNICAL TRAINING RECEIVED

7. *Leadership 201*, 36 hrs, USGS Leadership Training Program, Sheperdstown, WV, 2007 (Action Learning Scenario Team Leader).

6. *Leadership 101*, 36 hrs, USGS Leadership Training Program, Sheperdstown, WV, 2006.

5. *Leadership Intensive*, 16 hours, USGS Leadership Training Program, Seattle, WA, 2005.

4. *Basics of Working with the News Media*, 16 hours, National Conservation Training Center, 2000.

3. Course on principles and use of geographic information systems, 8 hours, Montana State University, 1991.

2. Course on bear trapping and handling, 20 hours, Yellowstone National Park, 1991.

1. *Buck Brannon Horse Training Clinic*, 18 hours, Yellowstone National Park, 1989.

**(11) PROFESSIONAL EXPERIENCE****a. PRESENT ASSIGNMENT**

DATES From: 28 February 1997      To: 30 September 2013

**DESCRIPTION OF POSITION**

The scientist investigates the ecology and conservation of large carnivores and other animals, including diet, habitat use, movements, and range, and relations between these factors and demography, effects of climate change, relations with humans, methods for evaluating habitat, and the nature and effectiveness of large-carnivore and other natural resources management. This research occurs throughout the United States, emphasizing the southwestern states of Arizona, New Mexico, Utah, and Nevada, as well as occupied or potential grizzly bear (*Ursus arctos*) habitat in the Rocky Mountains and cougar (*Puma concolor*) habitat elsewhere. For ecological studies the scientist uses data from radio-marked animals, transect- and point-based studies, and remote imagery, using advanced technology such as GPS-satellite linkages and remote thermally-activated cameras. Analytic methods entail innovations in model-building and related statistical techniques, including development of state-of-the-art geospatial models and agent-based approaches. The scientist also uses grounded theory and methods of the policy sciences to analyze conservation and management policies for natural resources. Current research provides managers with insights into dynamics of natural resources management, crucial to improving the design of related policy- and decision-making processes in service of democratic outcomes; information about key factors limiting large-carnivore and other animal populations, with relevance to instituting management needed to conserve nationally and internationally important populations; information to minimize risks posed to humans by large carnivores in areas of co-habitation, thereby minimizing harm to humans and increasing prospects for coexistence; and information on the extent and location of areas capable of supporting extant or prospectively repatriated populations of large carnivores important to the survival of valued species. The scientist works closely with numerous managers and other stakeholders in natural resources management throughout the United States providing advice and technical input on a multitude of issues germane to maximizing beneficial uses of science in service of durable outcomes.

**DESCRIPTION & TITLES OF PROJECTS**

1. **Cougars of the Colorado Plateau** — 30% of time: This large-scale and logistically and technically complex project addresses the ecology of cougars on and near the southern Colorado Plateau, in northern Arizona, southern Utah, and southeastern Nevada. The project focuses on behaviors of cougars in wild and human-impacted environments, with the goal of generating insight that will allow managers to conserve regional cougar populations and their prey, while providing for human safety. More specifically, the study provides insight into the effects of highways, railroads, urbanized areas, protected areas, and prey concentrations on the behavior and demography of radio-marked cougars, drawing on data from a wide range of biogeophysical conditions. To date, c. 70 cougars have been radio-collared and tracked by GPS locations that are downloaded daily via Argos satellites. Locations are visited soon after to build a detailed record of habitat use and predation, including >900 documented kills so far. Information is incorporated into innovative geospatial

models that explain human and other habitat effects and predict distributions of cougars and related risks to humans. *The scientist is responsible for all facets of this long-term project, which began in 2002.* The project involves many collaborators and has been funded by numerous supporters, including the U.S. National Park Service, U.S. Department of Energy, Grand Canyon National Park Foundation, USGS Southwest Biological Science Center, USGS Fire Program, and several private foundations. Collaborators have included the National Park Service (Grand Canyon, Zion, and Capitol Reef National Parks), USGS Western Ecological Research Center, USDA Wildlife Services, Arizona Game & Fish Department, NSTec, Northern Arizona University, and the Grand Canyon Trust.

**2. Trophic Ecology of Predators and Prey on the Colorado Plateau** — 25% of time: This newly-initiated study entails the analysis of numerous datasets from across the Colorado Plateau to build integrated models of trophic dynamics, involving vegetation, herbivores, and a top predator. The goal is to create state-of-the-art spatial models of time-series data depicting ecosystem dynamics across trophic levels, which will then be coupled to ensembles of downscaled global circulation model (GCM) projections to forecast future conditions on and near the Colorado Plateau. Explanatory and predictive models of vegetation will use cutting-edge analyses of remotely-sensed imagery. Focal animals will include mule deer (*Odocoileus hemionus*), elk (*Cervus elaphus*), desert bighorn sheep (*Ovis canadensis nelsoni*), and cougars. Hierarchical Bayesian methods will be used to estimate parameters and track uncertainty within and among models, including state-space models of animal movements. *The scientist is Principal Investigator and Leader of this project*, which involves investigators from the University of Maryland, The Max Planck Institute, The Smithsonian, Duke University, Utah State University, and the USGS Western Ecological Research Center. Collaborators so far include Colorado Division of Wildlife, Utah Division of Natural Resources, and Arizona Game & Fish Department. Initiation of this project has been supported by a \$2 million grant from the NASA ROSES program, with prospects for leveraging additional funds to support related work.

**3. Natural Resources Policy & Conservation** — 20% of time: This challenging project entails the analysis of natural resources management to foster improved performance of decision-making processes. The scientist has analyzed a number of complex cases throughout the West, including grizzly bear conservation in the Rocky Mountains, cougar management in the Southwest, and management of human-origin waters for wildlife, at scales ranging from specific development proposals to regional social processes. These innovative analyses provide participants and academic observers with critical insights into factors that govern the achievement of policy goals, often by reframing how participants understand their problems, with relevance to improving the design of decision-making processes. Leadership, large-carnivore conservation in North America, and the science-policy-management interface are current foci of attention. The scientist has collaborated with a number of colleagues from Canada and the United States on this program, including internationally-recognized experts in Q-methodology and the policy sciences. *The scientist has held primary responsibility for analysis, for conceptualizing approaches, and for teaching*, including classes at Yale and MIT. The scientist works closely with numerous stakeholders from government, academe, and the private sector to foster high-performance natural resources management. This wide-ranging project was initiated in 1993 and has been funded or otherwise supported by the USGS Southwest Biological Science Center, USGS Forest & Rangeland Ecosystem Science Center, U.S. National Biological Service, Northern Rockies Conservation Cooperative, numerous private foundations, MIT Department of Urban Studies & Planning, and the Yale School of Forestry & Environmental Studies.

**4. Modeling and Projecting Species Ranges** — 10% of time: This thematic project focuses on developing geospatial models of ranges and habitat use by avian, reptile, and amphibian species in the

southwestern United States, to inform mitigation and restoration management at multiple scales. The main part of this work has focused on modeling the current ranges of bird and herp species, and coupling these models with ensembles of downscaled regional GCMs to forecast future distributions under climate change. This forecasting project is unique among others of its type by relying on conceptual models that encapsulate current ecological knowledge of modeled species, incorporation of static geophysical effects such as terrain and solar insolation, assiduous tracking of conceptual and quantitative uncertainties arising from sampling processes and numerous analytic decisions, and involvement of a stakeholder advisory group to inform all aspects of design. *The scientist serves as co-Leader of this project, and has played a major role in its overall conceptualization and design.* A \$2 million grant from the USGS National Climate Change and Wildlife Science Center (NCCWSC) has supported this work. A related project has focused on modeling finer-scale habitat use by yellow-billed cuckoos (*Coccyzus americanus occidentalis*), which are a threatened species being managed for restoration under the Lower Colorado River Multi-Species Conservation Program. *The scientist helped design and manage this project, which is supported by a \$250 thousand grant from the Bureau of Reclamation.*

**5. Ecology of Upland Waters in the Semi-Arid West** — 5% of time: This project addresses the effects of ponded natural and human-origin waters on upland ecosystems of the West. There is a current dearth of information about the ecology of upland waters and the impacts of often dramatically human-altered hydrologic regimes on wildlife in uplands, which this project intends to address. Results of this study will be important to anticipating the consequences of climate change and judging the impacts of water management outside National Parks on Park resources that cross boundaries. Data on water-focused wildlife activity have been collected using state-of-the-art remote cameras as well as sign transects. Wildlife activity is explained in terms of habitat features, activity levels of other species, and availability of water as snow, preformed in vegetation, and in natural or artificial basins. Sub-projects conducted in close collaboration with the National Park Service have focused on natural and artificial water sources paired along boundaries of National Parks in the southern Colorado Plateau, including Walnut Canyon and Wupatki National Monuments. *The scientist supervised all facets of this work beginning in 2003, including a Master's degree project lasting from 2004-2007.* Funding and other support have been provided by the U.S. National Park Service, Western National Parks Association, and the USGS Southwest Biological Science Center.

**6. Modeling Demography and Habitat Suitability for Grizzly Bears** — 5% of time: This project focuses on building robust regional-scale models for assessing the capability of habitat to support large carnivores, with an emphasis on grizzly bears. Such an approach has required coarse filter analysis and the development of metrics that efficiently denote human activity. To provide a frame of reference stable across regions, these metrics have been developed in such a way as to be robust to the vagaries of data specification and resolution. Analyses of grizzly bear habitat capability have been completed for the state of Idaho and for trans-boundary regions including British Columbia, Idaho and Montana. Additional analyses have been undertaken for the Yellowstone-to-Yukon region and for the states of Arizona and New Mexico. Research is currently focused on developing robust measures of habitat productivity and related predictors of bear density that are comparable across regions. *The scientist has been responsible for conceptualizing the approach, statistical analyses, and manuscript preparation.* This project began in 1995 and has been funded or otherwise supported by the U.S. National Biological Service, USGS Forest & Rangeland Ecosystem Science Center, USGS Southwest Biological Science Center, Idaho Cooperative Fish & Wildlife Research Unit, Hornocker Wildlife Institute, Yellowstone-to-Yukon Initiative, The Wilderness Society, and The Wilburforce Foundation.

**7. Diet & Behavior of Grizzly Bears** — 5% of time: This project focuses on explaining diet and habitat use of Yellowstone's grizzly bears to guide conservation of this and other internationally important populations. The scientist elucidates the effects of diet on movements, body size, condition, and fecundity of grizzly bears, with implications for managing to mitigate the impacts of global climate change and invasive non-native species such as blister rust (*Cronartium ribicola*). Data were collected from several-hundred radio-marked animals distributed throughout the Yellowstone ecosystem and during extensive long-duration studies involving transects and random points. Sub-projects have been a basis for models that predict and explain grizzly bear use of individual foods, including spawning cutthroat trout (*Oncorhynchus clarki*), ungulate carrion on winter ranges, whitebark pine (*Pinus albicaulis*) seeds from red squirrel (*Tamiasciurus hudsonicus*) middens, and biscuitroots (*Lomatium cous*). This long-term integrated study, aspects of which began in 1977, has generated a data-set for grizzly bears unparalleled in the world. The project is close to completion, contingent on preparation of several journal manuscripts. *The scientist designed and immediately supervised all facets of ground work for this study beginning in 1984, and was directly involved with data collection, 1979-1992.* Parts of this research constituted three Master's degree projects. Funding has been provided by the U.S. National Park Service, U.S. National Biological Service, USGS Forest & Rangeland Ecosystem Science Center, and USGS Southwest Biological Science Center.

#### NAME AND TITLE OF SUPERVISOR

John Hoffman, Acting Center Director, USGS Southwest Biological Science Center

#### b. PREVIOUS PROFESSIONAL POSITIONS

Wildlife Biologist, 0486, GS-11, U.S. Department of the Interior, Interagency Grizzly Bear Study Team, University of Idaho Cooperative Park Studies Unit, and USGS Forest & Rangeland Ecosystem Science Center

DATES From: 17 May 1992 To: 10 May 1997

*The scientist held primary responsibility for investigating habitat relations of grizzly bears in the Yellowstone ecosystem and investigated grizzly bear demography and conservation.*

Wildlife Biologist, 0486, GS-9, U.S. Department of the Interior, Interagency Grizzly Bear Study Team

DATES From: 1 February 1986 To: 16 May 1992

*The scientist held primary responsibility for investigating habitat relations of grizzly bears in the Yellowstone ecosystem.*

Biological Technician, 0404, GS-7, U.S. Department of the Interior, Interagency Grizzly Bear Study Team

DATES From: 19 May 1984 To: 30 January 1986

*The scientist held primary responsibility for fieldwork related to investigations of grizzly bear habitat relations in the Yellowstone ecosystem and collaborated with other team scientists on analysis and reporting of related scientific results.*

**(12) SIGNIFICANT RESEARCH ACCOMPLISHMENTS****a. & b. RECENT AND OTHER CAREER ACCOMPLISHMENTS**

**A.** The scientist has successfully fostered and led collaboration among cougar researchers and other scientists to address research and management issues that transcend the inferential scope of single study areas or the limited sample sizes of single studies. These issues include functional responses of cougars to the full spectrum of variation in geomorphology, vegetation, prey availabilities, and human impacts; responses to climate; and variation in vital rates with differences in landscape lethality and productivity. The scientist convened and led 6 workshops during the last 8 years expressly designed to foster collaboration and integration among cougar researchers on and near the Colorado Plateau, including a National Park Service-sponsored workshop to synthesize information relevant to human safety management, a workshop that was part of the *10<sup>th</sup> Biennial Conference of Research on the Colorado Plateau* in Flagstaff, AZ, and another as part of the *17<sup>th</sup> Annual Meeting of the Wildlife Society* in Snowbird, UT. These workshops and related efforts have borne considerable fruit. Researchers from the National Park Service and two USGS offices have formally integrated their cougar field studies in northern Arizona and southeastern Nevada as a result of the scientist's efforts. Of greater importance, a team led by the scientist was successful in securing a \$2 million grant from NASA to model trophically-defined dynamics of vegetation, herbivores, and top predators on the Colorado Plateau. This project brings modelers, experts in remote sensing, and field researchers together to geospatially analyze numerous datasets for cougars, mule deer, elk, and bighorn sheep from on and near the Colorado Plateau. One product will be the first-ever spatially-explicit model of cougar survival applicable to the entire intermountain West. This product alone will have considerable management relevance.

**B.** The scientist initiated, designed and found funding for an on-going programmatic study of cougar ecology on the southern Colorado Plateau which has developed into a large-scale regional project. Starting with a widely-recognized but largely unaddressed need to understand the ecology of cougars living near people in predominantly wildlands environments, the scientist has grown a diversely-funded research program that currently encompasses both remote and human-impacted study areas around Flagstaff, AZ, Grand Canyon, Zion, and Capital Reef National Parks, the Arizona Strip, and the Nevada National Security Site and Desert Wildlife Range in southeastern Nevada. Working with Telonics Inc, which billed this project "a guinea pig," the scientist pioneered use of GPS/Argos satellite collars on cougars and parlayed the near real-time data available from satellite transmissions into new insights and new hypotheses regarding predatory behaviors of cougars, which are providing new research directions for this and other projects. Initial products have included pioneering fine-scale maps of predicted seasonal cougar activity for use in managing human impacts and human safety, and, in collaboration with ESRI, a pioneering application of cougar data to development of a software extension to ArcGIS for agent-based modeling. The project has also entailed working with numerous cooperators from the public and private sector. Like virtually all field studies of large mammals, definitive products await completion of this long-term study. Even so, the scientist has so far delivered 48 talks to public, agency, and academic audiences, 38 of which were invited, to increase public awareness and knowledge of cougars and to expedite dissemination of technical information. The scientist has also published four fact sheets, one paper in the *8<sup>th</sup> Mountain Lion Workshop Proceedings*, and a major progress report which provide peer-reviewed updates on research progress and important findings such as unprecedented predation by cougars on coyotes (*Canis latrans*), rare road crossings controlling for effects of other

habitat features, and different life strategies of sex, age, and reproductive classes. The project is viewed as a ground-breaking effort by managers and other researchers, who have used it as a model for subsequent studies in Arizona, Nevada, and Colorado.

**C.** The scientist has emerged as one of the foremost practitioners of the policy sciences analytic framework applied to natural resources cases. The policy sciences offer a conceptually comprehensive set of tools for understanding the behaviors of people and organizations involved in complex management cases. Compared to other analytic approaches, these tools offer a more efficient and functional way to orient to policy problems and, from that, gain useful insights into social- and decision-making processes organized around the development and implementation of natural resources policies. The goal is to upgrade policy processes to better serve widely-recognized social values such as human dignity and democratic principles. The scientist has integrated knowledge from ethics, organizational behavior, science studies, and social-psychology under the policy sciences framework in service of this end, with application to cases as diverse as the Glen Canyon Dam Adaptive Management Program, USGS Biological Resources Discipline, management of anthropogenic waters in the Southwest, and management of cougars in the West and polar bears in the arctic. The scientist's mastery of the policy sciences has been recognized in many ways, including invitations to instruct seven demanding graduate-level classes (four at Yale, four at MIT, and one at Northern Arizona University), election to the Society for Policy Sciences, prestigious academic appointments at the Yale School of Forestry & Environmental Studies, MIT Department of Urban Studies & Planning, and Northern Arizona University Center for Environmental Sciences & Education, and appointment as Western Field Director for the MIT-USGS Science Impact Collaborative (MUSIC). The scientist has given numerous lectures in professional and academic venues demonstrating policy sciences, 70 all told and 60 since 2000, as well as publishing 16 related articles as book chapters or in journals such as *BioScience*, *Policy Sciences*, *Environmental Science & Policy*, and *Journal of Energy, Natural Resources & Environmental Law*.

**D.** The scientist has been a pioneer in developing and applying methods for modeling the geospatial distribution and abundance of a wide range of species, including large carnivores, birds, reptiles, and amphibians. Together with a collaborator, the scientist developed methods for assessing broad-scale habitat suitability and meta-population structure for grizzly bears. The approach emphasized human impacts and the use of coarse-scale qualitative and quantitative information to bring systematic analysis to management-relevant issues. The methods were applied to grizzly bear restoration in Idaho, Montana, and the Southwest, to the appraisal of umbrella effects for carnivores in the Rocky Mountains (as reported on by *Science*), and to the appraisal of unoccupied habitat in the Yellowstone region. This team also investigated historical extirpations of grizzly bears in the contiguous U.S., which was reported in *Conservation Biology* and an associated press release by the journal. This research has had significant effects on the framework for managing grizzly bears throughout their range. More recently, the scientist has played a leadership role in teams modeling habitat use and distributions of avi- and herpeto-fauna, funded by major grants from the USGS National Climate Change and Wildlife Science Center and the Bureau of Reclamation. These projects have focused on projecting future distributions under climate change, but employing uniquely sophisticated approaches that were largely conceptualized by the scientist. The scientist has played a major role in communicating the framework of these projects to stakeholders, including USGS leadership and a project Advisory Team. Results of this body of work have been reported in 11 peer reviewed publications and three technical reports, and were part of 20 presentations in technical or other public venues.

**E.** The scientist has recently developed a research program focused on leadership. This program inquires into the context-specific elements of effective leadership, including the expectations of those being led, and elucidates implications for public order and natural resources governance. This research is relevant

to the development of effective leadership in not only natural resources governance, but also in USGS itself. One major result to date has been the identification of multiple narratives regarding “good” or “effective” leadership that are associated with different expectations regarding leader behaviors. These narratives are associated with personality traits and value orientations. To date, results of this program have been reported in one journal article that studied perspectives of leaders on the challenges of an environmental movement at a key moment in its history (the Yellowstone to Yukon Conservation Initiative), as well as in one conference presentation and four seminars.

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**F.** The scientist developed theoretical models that describe and explain relations among human and biological factors affecting the demography of grizzly bears and other large carnivores, with relevance to conservation of imperiled species and populations throughout the world. These models and related analyses identify factors with primary effects on outcomes of interest to society. This holistic framework thereby provides those interested in large-carnivore management with insights that can improve management and facilitate attainment of policy objectives. This research has been reported in 24 talks to scientific societies or in other scientific venues, 29 talks to university classes and seminars, 17 public or other general informational talks, and 14 papers or chapters published in prestigious journals or books. Much of this work was by invitation of organizations such as the Yale School of Forestry & Environmental Studies, University of Michigan, the International Association for Bear Research and Management, the Society for Conservation Biology, Parks Canada, the Royal Zoological Society, the Denver Zoo Conservation Biology Department, the American Museum of Natural History, and the Smithsonian, and has been reported in journals such as *Conservation Biology*, *International Journal of Wilderness*, *Biological Conservation*, *International Conference on Bear Research & Management*, and books such as *Carnivore Conservation*, *Coexisting with Large Carnivores*, and *Predators and People*.

**G.** Together with a collaborator, the scientist established the importance of behavioral structuring and food availability to explaining death rates of grizzly bears in the Yellowstone region. This was the first time that behavioral differences had been invoked to explain vital rates for bears. This research entailed demographic modeling of messy radio-telemetry data that advanced the state of knowledge and analytical ability in this field. The approach was demonstrated using grizzly bear data, but has application to any species and radio-telemetry data set. The scientist was responsible for a major part of conceptualizing the general approach and applying it to the grizzly bear data set, whereas the collaborator bore equal responsibility for conceptual development and sole responsibility for programming and specifying the mathematical basis of the model. Results of this effort were published in *Ecology*, included in two presentations at scientific meetings, and featured in reports by the Ecological Society of America and *Science*. The scientist has also substantially contributed to conceptualizing a mathematically explicit theory that incorporates the effects of habituation into a birth- and death-process model, reported in a talk to the Annual Meeting of the Animal Behavior Society. Such a model will help scientists to better appreciate the effects of behavior on demography and to better design future demographic research and analysis. The collaborator bore sole responsibility for specifying the mathematics of this model. A co-authored manuscript is in preparation.

**H.** Using data from a long-term integrated study, the scientist described and explained in unprecedented depth and detail the diet, habitat use, and foraging behavior of Yellowstone’s internationally significant grizzly bear population. He also elucidated relations of their diet to diets of other brown bear populations, implications of diet to seasonal foraging strategies, and implications of dietary variation to research and habitat management. Of relevance to long-term conservation of grizzly bear habitats and conservation-relevant mitigation of conflicts with humans, the scientist also documented July-September as a critical foraging period, the major foods consumed during this time, and the relative and absolute importance to bears of whitebark pine seeds, ungulates, and army cutworm moths (*Euxoa auxiliaris*). This information not only strongly influences management of grizzly bears in the Yellowstone area, as evidenced by frequent citation in numerous management documents, but also, through general conclusions regarding variability of diet and habitat use, the design of research and management worldwide. The level of detail and scope of analysis in this research are unprecedented for bears. Moreover, this research was the first to analyze, in detail, bear behaviors such as geophagy, rubbing, and the consumption of

wasps, earthworms, and fungal sporocarps. Results of this research were reported in 19 talks at scientific meetings, in 18 peer-reviewed journal articles, four technical reports, and in more than a dozen invited talks to students, managers, and the interested public.

**I.** The scientist described the effects of humans and human facilities on grizzly bear habitat use and major causes of human-bear conflicts in the Yellowstone ecosystem using a long-term ecosystem data set collected from several-hundred radio-marked bears. He described the degree and nature of impacts, specific to season, type of year, and type of bear. The scientist also addressed, in detail, the roles of whitebark pine seed crop variation, interspecific interactions, and conditioning to humans in human-bear conflicts and related grizzly bear deaths. Information from these papers continues to provide a seminal foundation for managers understanding human-bear conflicts and the effects of humans and their facilities on bear populations, as well as key to appraising management effectiveness and identifying causes amenable to management intervention. This research has had a major effect on the design of grizzly bear management and research in the Yellowstone ecosystem, as evidenced by references in virtually every document germane to establishing management policies and practices for Yellowstone's grizzly bear population. Results of this research have been reported at two scientific meetings, in three peer-reviewed papers, and in more than a dozen talks to students, managers, and the interested public.

**J.** The scientist completed a long-term study, designed and directed with two collaborators, that described relations among fire, whitebark pine, red squirrels, and grizzly bears. Whitebark pine seeds are one of the most important foods of Yellowstone's grizzly bears. Results of this study continue to be a basis for management of habitats on National Park Service and U.S. Forest Service lands where bears feed on pine seeds, primarily through attention to red squirrel requirements for mixed-species old growth stands. Given the potential vulnerability of whitebark pine to global climate change, mountain pine beetles (*Dendroctonus ponderosae*), and white pine blister rust (*Cronartium ribicola*), the results of this study are an important basis for anticipating the effects of these agents of change on grizzly bears. This study also clearly demonstrated the nature and degree of human and fire impacts on grizzly bear use of this food, avoiding several of the biases affecting radio-telemetry data. This study additionally demonstrated the benefits of using transect methods to address more refined hypotheses about bear habitat use. Results pertaining to red squirrels and bears were reported in progress reports and five papers presented at scientific meetings, as well as in three peer-reviewed journal articles, three papers in conference proceedings, and one book chapter. Management implications are summarized in a set of recommendations that were solicited by managers in the Yellowstone ecosystem.

**K.** The scientist and two collaborators completed a long-term study that provided definitive insight into spring availability and bear use of ungulate carcasses on three ungulate winter ranges in Yellowstone National Park. Meat from carrion is the most important spring food of Yellowstone grizzly bears. Winter ranges in this study spanned conditions represented by the Park, and results provided a basis for identifying critical carcass types, foraging times, and foraging areas for bears; for developing explanatory models of carcass use and depletion; and for understanding relations among black bears (*Ursus americanus*), grizzly bears, and humans. This study provided essential information to managers attempting to mitigate for effects on bears of ungulate sport harvests, management of bison for control of brucellosis, and recently reintroduced wolves. This unique study also demonstrated the efficacy of survey-type studies in addressing hypotheses related to bear use of specific foods and habitat complexes. The scientist was fully responsible for design and direction of this study and collaborated on execution, analysis and reporting of this research. Results were presented in progress reports, a workshop proceedings, a technical report related to wolf reintroduction, and a peer-reviewed journal article.

**L.** The scientist and a collaborator completed a long-term pioneering study of grizzly bear use of cutthroat trout spawning streams in Yellowstone National Park. Trout were at one time the most important early-summer food of grizzly bears in southern and central parts of the Yellowstone ecosystem. The parameters of heavily used streams, the extent of stream influence on bear movements, the relative consumption of trout by bears, time periods when spawning streams were heavily used, and inter- and intraspecific interactions among black bears, grizzly bears and humans were described and explained. This information is important to and has shaped the management of Yellowstone's grizzly bears because of the large number of bears potentially fishing at spawning streams and because of the increasing effects of drought and non-native lake trout (*Salvelinus namaycush*) on cutthroat trout in Yellowstone Lake. Predation by lake trout has dramatically reduced numbers of cutthroat trout available to

Yellowstone grizzly bears. This study established a benchmark for more recent studies attempting to judge impacts of these and other changes in fisheries and habitats. Results were presented at a scientific meeting, in progress reports, and in two peer-reviewed journal articles. The scientist was primarily responsible for design, and collaborated on execution, analysis and reporting of this research.

### (13) SCIENTIFIC LEADERSHIP

**A.** The scientist has been invited to take a significant leadership role in setting strategic science direction for the USGS at the national and Center levels. He is viewed as and routinely sought out to be a leader in this regard on numerous issues within the Southwest Biological Science Center (SBSC). At the national level, he was part of the Science Advisory Group for the USGS Science Strategy Team and Team Leader (Large Mammals & Predators) for the USGS Wildlife Program Five-year Strategic Plan. At the Center level, the scientist has twice served as an invited member of the SBSC Strategic Planning Core Team. These seminal planning efforts occurred shortly after creation of the SBSC and during its current fiscal uncertainties, and have been instrumental in setting the Center's scientific and science management direction. The scientist is also routinely consulted on an informal basis about strategic science issues and directions by Center leadership.

**B.** The scientist has exercised considerable initiative and leadership in creating venues to foster exchanges among researchers, managers, and traditionally conflicted stakeholders involved with large-carnivore research and management throughout the West, with a focus on grizzly bears and cougars in the Rocky Mountains. For example, these exchanges have occurred in venues designed by the scientist to integrate regional research efforts for cougars (six different workshops during an 8-year period), foster civil exchanges of information and perspectives about cougar management (a special session of the 7<sup>th</sup> *Biennial Conference of Research on the Colorado Plateau*; resulting in two papers in a book edited by the scientist), increase knowledge among regional managers about managing for human safety around cougars and black bears (the workshop *Large Carnivores on the Plateau*; resulting in a report to regional managers and scientists during the 6<sup>th</sup> *Biennial Conference of Research on the Colorado Plateau*), and foster discovery of common ground among stakeholders in grizzly bear and cougar management in the Northern U.S. Rocky Mountains (the workshop *Perspectives on Large Carnivore Conservation*; resulting in an article in the journal *Environmental Science & Policy*). These venues have served to enhance the role of science in management through fostering the discovery and building of common ground.

**C.** The scientist has demonstrated leadership in pursuing professional directions and undertaking organizational analyses directly relevant to enhancing overall performance of the former USGS Biological Resources Discipline (BRD), typically at his own initiative and often entailing professional risk. For example, the scientist recently used Science Center venues to critique the practice of peer review within USGS, our agency's approach to climate change science, and the maladies of scientific management. He also undertook appraisals of the high-profile Glen Canyon Dam Adaptive Management Program (GCDAMP) and of the BRD at his own initiative. Both appraisals were subsequently well-received by those authoritatively involved in GCDAMP and BRD, with prospects of the scientist's continued engagement with and potential contribution to improving the performance of both institutions. In a similar vein, the scientist has worked toward developing a different paradigm of practice for biological sciences within USGS, involving the critique of *status quo* conventions and the promotion of collaboration among scientists, managers and other stakeholders. The scientist's efforts and innovations have resulted in several internal USGS awards (e.g., the *Paradigm Shifter* and *Exploding Head* awards), as well as appointments with the Yale School of Forestry & Environmental Studies and the MIT-USGS Science Impact Collaborative (MUSIC). The scientist was Western Field Director for MUSIC through

2010, with a focus on fostering integrated collaborative science in the Western Region. These leadership efforts are potentially important to the future direction of USGS, and have required that the scientist operate with sophistication and nuance organizationally, exercise considerable vision, and demonstrate a willingness to take professional risks.

**D.** The scientist has been effective as a leader in developing research programs from scratch on the Colorado Plateau, framed by a “gap analysis” that the scientist undertook soon after his arrival in this region in 1999. This analysis focused on unaddressed research needs and resulted in the development of programs featuring cougar-human relations, cougar-prey relations, and the ecology of upland waters. A seminal aspect of the scientist’s approach has been the rational development of needs-based programs rather than the opportunistic pursuit of funds. This particular demonstration of leadership has required effective communication with DOI clients and state-level and private cooperators, the garnering of funds from diverse sources, and the encouragement and inspiration of collaborators and employees to achieve their creative potential and professional vision. Despite an initial dearth of resources, these research programs have grown, especially the program featuring cougar ecology which, to date, has garnered nearly \$3 million from numerous governmental and private sources. The scientist’s effective internal leadership of science programs was evident in exceptionally high marks received from two “360°” appraisals by peers and employees, one each during 2006 and 2007.

**E.** The scientist has taken a leadership role at the local level as part of the SBSC Colorado Plateau Research Station (CPRS), both by invitation and initiative. Based on demonstrated abilities, the scientist was designated Chair of the Information Resources Management (IRM) Committee at a time when IRM issues and related personality conflicts were particularly contentious. The scientist also took the initiative to develop an alternative management structure for the CPRS at a time of corrosive friction, for which the scientist received a Star Award. Later, the scientist successfully chaired the *Biennial Conference of Research on the Colorado Plateau* at a particularly difficult time when institutional support had waned, and insured that this important regional venue for connecting researchers and managers survived to flourish when institutional support reemerged. The scientist received a Star Award for his efforts with the *Biennial Conference*. In a similar vein, the scientist was able to successfully reenergize Client’s Day for the 5<sup>th</sup> *Biennial Conference of Research on the Colorado Plateau* within a few months of arriving at a new duty station, for which he received a Star Award, and on another occasion took the initiative to act as 3<sup>rd</sup> party to negotiate a settlement for access to sensitive data, for which he received a Special Act Service Award. This history of service to CPRS continued when the scientist took on the duties of Station Leader/Liaison, 2008-2011, during which he dealt with a number of sensitive organizational and personnel issues, including renegotiating a 5-year cooperative agreement with Northern Arizona University. The scientist received two Star Awards for this service as Station Leader.

## (14) SCIENTIFIC AND PUBLIC SERVICE

### a. MEMBERSHIPS IN PROFESSIONAL SOCIETIES

*The American Society of Mammalogists*  
*The Society for Conservation Biology*  
*American Association for the Advancement of Science*  
*The Society for Policy Sciences*  
*Wild Felid Research & Management Association*

**b. TECHNICAL PRESENTATIONS**

not including public, classroom, training or information transfer presentations

151. “Effects of conspecifics on habitat selection by grizzly bears in the southwest Yukon, Canada,” 2<sup>nd</sup> author with R. Maraj, C. Cormack Gates, & R.K. McCann at 20<sup>th</sup> *International Conference on Bear Research & Management*, Ottawa, Canada, July 2011.
150. “Sex matters: Dietary strategies of male and female cougars on the southern Colorado Plateau,” 2<sup>nd</sup> author with B. Holton at 10<sup>th</sup> *WAFWA Mountain Lion Workshop*, Bozeman, MT, June 2011.
149. “The discourses of incidents: Cougars on Mt. Elden and in Sabino Canyon, Arizona,” 1<sup>st</sup> author with S. Clark at 10<sup>th</sup> *WAFWA Mountain Lion Workshop*, Bozeman, MT, June 2011.
148. “An explanation of cougar-related behaviors and behavioral intentions among northern Arizona residents,” 2<sup>nd</sup> author with E.J. Ruther at 10<sup>th</sup> *WAFWA Mountain Lion Workshop*, Bozeman, MT, June 2011.
147. “Two paradigms of climate change science: In service of greenhouse politics and pragmatic adaptation,” at 2010 *USGS Southwest Biological Science Center All Hands Meeting*, Flagstaff, AZ, December 2010. (INVITED)
146. “The many faces of peer review,” at 2010 *USGS Southwest Biological Science Center All Hands Meeting*, Flagstaff, AZ, December 2010. (INVITED)
145. “Leadership as social relationship: Perspectives on good leadership and implications for social order,” 1<sup>st</sup> author with S. Clark at 2010 *Policy Sciences Annual Institute*, Yale University Law School, New Haven, CT, October 2010.
144. “Scale: Refining the concept in policy sciences,” at 2010 *Policy Sciences Annual Institute*, Yale University Law School, New Haven, CT, October 2010.
143. “**WORKSHOP**: Opportunities for collaborative mountain lion research in the interior western United States,” 1<sup>st</sup> organizer with M. Wolfe at 17<sup>th</sup> *Annual Conference of The Wildlife Society*, Snowbird, UT, October 2010.
142. “Grizzly bears and pine seeds: Complexity and contingency,” 1<sup>st</sup> author with D. Reinhart at *High-Five Symposium: The Future of High-Elevation Five-Needle White Pines in Western North America*, Missoula, MT, June 2010. (INVITED)
141. “Restoring an extirpated species: Grizzly bears in the Southwest?,” at 25<sup>th</sup> *Annual Meeting of the Southwest Region Native American Fish & Wildlife Society*, Scottsdale, AZ, July 2010. (INVITED)
140. “The USGS National Climate Change and Wildlife Science Center,” 2<sup>nd</sup> author with K. Kitchell at 25<sup>th</sup> *Annual Meeting of the Southwest Region Native American Fish & Wildlife Society*, Scottsdale, AZ, July 2010. (INVITED)
139. “Development of mountain lion habitat selection models using ArcGIS Model Builder,” 2<sup>nd</sup> author with T.R. Arundel, B. Holton, K. Ironside, & J. Hart on POSTER for 2009 *ESRI International User Conference*, San Diego, CA, June 2010.

**138.** “The status of mountain lion research in the southwestern United States,” 2<sup>nd</sup> author with T.R. Arundel, B. Holton, & K. Ironside on POSTER for 2009 ESRI International User Conference, San Diego, CA, June 2010.

**137.** “Cougar management on the Colorado Plateau,” at *2010 Annual Utah Chapter of the Wildlife Society Meeting*, Moab, UT, March 2010. (INVITED PLENARY)

**136.** “College and university programs as a policy problem: Integrating knowledge, education, and action for a better world,” 4<sup>th</sup> author with S. Clark, M. Auer, & M. Rutherford at *2009 Policy Sciences Annual Institute*, Boulder, CO, October 2009.

**135.** “Roots of cougar-related human behaviors and behavioral intentions,” 1<sup>st</sup> author with L. Ruther at *Carnivores 2009*, Denver, CO, November 2009.

**134.** “The discourse of incidents: Cougars and people on Mt. Elden and in Sabino Canyon,” 1<sup>st</sup> author with S. Clark at *Carnivores 2009*, Denver, CO, November 2009.

**133.** “Factors affecting risk of puma attacks on humans,” 1<sup>st</sup> author with L. Sweanor & K. Logan on POSTER for *Carnivores 2009*, Denver, CO, November 2009.

**132.** “PANEL: Mountain lions, people, and policy: Improving our prospects for effective conservation of a keystone predator,” Panel member with J. Apker, T. Dunbar, R. Hopkins, G. Koehler, & R. Thompson at *Carnivores 2009*, Denver, CO, November 2009.

**131.** “**WORKSHOP:** Opportunities for collaborative mountain lion research on and near the Colorado Plateau,” at *10<sup>th</sup> Biennial Conference of Research on the Colorado Plateau*, Flagstaff, AZ, October 2009.

**130.** “No park is an island: Mountain lions on the southern Colorado Plateau,” 1<sup>st</sup> author with B. Holton at *10<sup>th</sup> Biennial Conference of Research on the Colorado Plateau*, Flagstaff, AZ, October 2009. (INVITED)

**129.** “The social-psychology of dominant frames: ‘Thresholds’ in natural resources management,” at *10<sup>th</sup> Biennial Conference of Research on the Colorado Plateau*, Flagstaff, AZ, October 2009. (INVITED)

**128.** “We talk about science and traditional knowledge, but are we not really talking about human dignity?,” at *10<sup>th</sup> Biennial Conference of Research on the Colorado Plateau*, Flagstaff, AZ, October 2009. (INVITED)

**127.** “Effects of simulated mountain lion caching on prey-like carcasses,” 2<sup>nd</sup> author with Z. Bischoff-Mattson on POSTER for *10<sup>th</sup> Biennial Conference of Research on the Colorado Plateau*, Flagstaff, AZ, October 2009.

**126.** “Roots of cougar-related human behaviors and behavioral intentions,” 1<sup>st</sup> author with L. Ruther on POSTER for *10<sup>th</sup> Biennial Conference of Research on the Colorado Plateau*, Flagstaff, AZ, October 2009.

**125.** “The discourse of incidents: Cougars and people on Mt. Elden and in Sabino Canyon,” 1<sup>st</sup> author with S. Clark on POSTER for *10<sup>th</sup> Biennial Conference of Research on the Colorado Plateau*, Flagstaff,

AZ, October 2009.

124. “Predatory behavior of mountain lions on the southern Colorado Plateau,” 1<sup>st</sup> author with B. Holton at 24<sup>th</sup> *Annual Meeting of the Southwest Region of the Native American Fish & Wildlife Society*, Isleta, NM, July 2009.

123. “‘For the good of the resource’: Nature as a constructed and contested participant” at 2008 *Policy Sciences Annual Institute*, University of Colorado, Boulder, CO, October 2008.

122. “The witch craze: Natural resources parable and policy sciences interpretation” at 2008 *Policy Sciences Annual Institute*, University of Colorado, Boulder, CO, October 2008.

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121. “The virtues of Q methodology in natural resources planning and decision making,” 2<sup>nd</sup> author with N. Sexton, T. Cheng, & J. Clement, at 14<sup>th</sup> *International Symposium on Society & Natural Resources Management*, Burlington, VT, June 2008.

120. “What is the problem?: Some orientation for the Global Climate Change Collaborative (G3C)” at *Inaugural Meeting of the Global Climate Change Collaborative*, Massachusetts Institute of Technology, Cambridge, MA, March 2008.

119. Mattson, D., “Improving professional practice in resource management agencies: Experiences, patterns and possible insights” at 2007 *Policy Sciences Annual Institute*, Claremont-McKenna College, Claremont, CA, October 2007.

118. “Conflict over cougars: A window on natural resources governance” at 2007 *Policy Sciences Annual Institute*, Claremont-McKenna College, Claremont, CA, October 2007.

117. “Managing for human safety in mountain lion range,” 1<sup>st</sup> author with K. Logan & L. Sweanor at 9<sup>th</sup> *Biennial Conference of Research on the Colorado Plateau*, Flagstaff, AZ, October 2007.

116. “PANEL: Future of conservation biology on the Colorado Plateau,” 2<sup>nd</sup> author with E. Grumbine, T. Fleischner, J. Belnap, & E. Aumack, at 9<sup>th</sup> *Biennial Conference of Research on the Colorado Plateau*, Flagstaff, AZ, October 2007.

115. “USGS science and the ‘scientization’ of policy: Thoughts from the East Coast,” at *USGS Southwest Biological Science Center Annual All-Hands Meeting*, Flagstaff, AZ, February 2008.

114. “A model of a behaviorally-structured wildlife population,” 2<sup>nd</sup> author with C. Pease for 44<sup>th</sup> *Annual Meeting of the Animal Behavior Society*, Burlington, VT, July 2007.

113. “USGS BRD: A modern organization in a post-modern world,” for *Seminar series*, USGS Flagstaff Science Center, Flagstaff, AZ, May 2007. (INVITED)

112. “Polar bear conservation policy: Conservation hunting and climate change,” 3<sup>rd</sup> author with D. Clark, D. Lee, S. Clark & M. Freeman for *ArticNet Annual Science Meeting*, Victoria, BC, Canada, December 2006.

111. “Conservation hunting, climate change, and polar bear policy in Nunavut, Canada,” 3<sup>rd</sup> author with D. Clark & D. Lee for 2006 *Policy Science Annual Institute*, sponsored by the Society for Policy Sciences, Yale Law School, New Haven, CT, November 2006.

110. "Knowledge integration: An exploration of psychological frames for understanding personality and perspectives in natural resources cases," for *2006 Policy Science Annual Institute*, sponsored by the Society for Policy Sciences, Yale Law School, New Haven, CT, November 2006.
109. "Whitebark pine, grizzly bears and climate change," 2<sup>nd</sup> author with K. Kendall for *Carnivores 2006*, sponsored by Defenders of Wildlife, St. Petersburg, FL, November 2006. (INVITED)
108. "Upland free water and wildlife: Past, present and future on the Colorado Plateau," 3<sup>rd</sup> author with B. Holton & J. Hart for *33<sup>rd</sup> Natural Areas Conference*, sponsored by the Natural Areas Association, Flagstaff, AZ, September 2006.
107. "Lions on the Plateau: A research program for the Colorado Plateau," 2<sup>nd</sup> author with J. Hart & T. Arundel for *Learning from the Land 2006 Science Symposium*, sponsored by Grand-Staircase Escalante NM, Cedar City, UT, September 2006.
106. "Upland free water: Past, present and future in Grand Staircase-Escalante NM?," 2<sup>nd</sup> author with J. Hart & B. Holton for *Learning from the Land 2006 Science Symposium*, sponsored by Grand-Staircase Escalante NM, Cedar City, UT, September 2006.
105. "Conflict over carnivores: A window on natural resources governance," for Symposium on Integrative Problem Solving, *20<sup>th</sup> Annual Meeting of the Society for Conservation Biology*, San Jose, CA, June 2006. (INVITED)
104. "The importance of gatherings," 1<sup>st</sup> author with M. Johnson for workshop on *Capacity-Building for SCB Chapters in the 21<sup>st</sup> century*, *20<sup>th</sup> Annual Meeting of the Society for Conservation Biology*, San Jose, CA, June 2006. (INVITED)
103. "Science and politics in high stakes natural resource decisions," Plenary for *Multidisciplinary Approaches to Recovering Caribou in Mountain Ecosystems*, sponsored by the Columbia Mountains Institute, Revelstoke, BC, May 2006. (INVITED)
102. "Cougars of the Colorado Plateau: A multi-park investigation," for *1<sup>st</sup> Workshop of the Colorado Plateau Mountain Lion Working Group*, sponsored by USGS Southwest Biological Science Center, Flagstaff, AZ, January 2006.
101. "Cougars of the Flagstaff Uplands: Preliminary results 2003-2005," 1<sup>st</sup> author with J. Hart and T. Arundel for *1<sup>st</sup> Workshop of the Colorado Plateau Mountain Lion Working Group*, sponsored by USGS Southwest Biological Science Center, Flagstaff, AZ, January 2006.
100. "Human dimensions of mountain lion management: Value orientations and policy preferences of northern Arizona residents," 3<sup>rd</sup> author with E.J. Ruther & D.M. Ostergren *8<sup>th</sup> Biennial Conference of Research on the Colorado Plateau*, sponsored by USGS Southwest Biological Science Center, Flagstaff, AZ, November 2005.
99. "Wildlife water developments and the social construction of conservation conflict," 1<sup>st</sup> author with N. Chambers *8<sup>th</sup> Biennial Conference of Research on the Colorado Plateau*, sponsored by USGS Southwest Biological Science Center, Flagstaff, AZ, November 2005.
98. "The ecological effects of artificial water sources in a changing hydrologic regime," 2<sup>nd</sup> author with P.B. Holton for *8<sup>th</sup> Biennial Conference of Research on the Colorado Plateau*, sponsored by USGS Southwest Biological Science Center, Flagstaff, AZ, November 2005.
97. "Predation by cougars in the Flagstaff Uplands 2003-2005," 1<sup>st</sup> author with J. Hart & T. Arundel for *8<sup>th</sup> Biennial Conference of Research on the Colorado Plateau*, sponsored by USGS Southwest Biological Science Center, Flagstaff, AZ, November 2005. .

96. "Conflict over carnivores: A window on natural resources governance," Plenary for conference on *Governance and Decision-Making in Mountain Areas*, sponsored by Parks Canada and The Banff Centre, Banff, AB, Canada, June 2005. (INVITED)
95. "Cougars of the Flagstaff uplands: Cougar-informed spatial frames for analyzing habitat selection," 1<sup>st</sup> author with T. Arundel & J. Hart, POSTER for 8<sup>th</sup> *Mountain Lion Workshop*, sponsored by the Washington Department of Fish & Wildlife, Leavenworth, WA, May 2005. .
94. "Cougars of the Flagstaff uplands: Results of 2003-2004 predation studies," 1<sup>st</sup> author with J. Hart & T. Arundel, for 8<sup>th</sup> *Mountain Lion Workshop*, sponsored by the Washington Department of Fish & Wildlife, Leavenworth, WA, May 2005.
93. "Harvesting lessons of inventorying biological resources: Thoughts on design from the Colorado Plateau," 1<sup>st</sup> author with C. Drost, E. Nowak, T. Persons, M. Johnson, G. Rink, & J. Holmes, for 2005 *George Wright Society Biennial Conference on Parks, Protected Areas and Cultural Sites*, sponsored by the George Wright Society, Philadelphia, PA, March 2005. (INVITED)
92. "A multi-park design for investigating cougar-related risks to humans in the Southwest," 1<sup>st</sup> author with J. Hart, T. Arundel, E. Garding, H.S. Kim, & E. Leslie, for 2005 *George Wright Society Biennial Conference on Parks, Protected Areas and Cultural Sites*, sponsored by the George Wright Society, Philadelphia, PA, March 2005.
91. "The psycho-sociology of integrating conservation science and management," for the conference *A Bright Future for Biodiversity Conservation on the Colorado Plateau*, sponsored by the Colorado Plateau Chapter of the Society for Conservation Biology, Prescott College, Prescott, AZ, March 2005.
90. "Perspectives on wildlife, water, and humans in uplands of the Colorado Plateau," 1<sup>st</sup> author with B. Holton, T. Arundel, & J. Hart, for the *Wildlife Water Development Workshop*, sponsored by the ASU Law School, BLM, US Fish & Wildlife Service, and Arizona Game & Fish Department, Arizona State University Law School, Phoenix, AZ, November 2004.
89. "The right values at the wrong time?: A functional explanation of factors and participant responses," as part of panel on The Yellowstone to Yukon Conservation Initiative, for 2004 *Policy Sciences Annual Institute*, sponsored by Society for Policy Sciences, Yale Law School, New Haven, CT, October 2004.
88. "Implementing impact-assessment models in bear management," for an informal workshop with Japanese bear research and management specialists, sponsored by the Japan Ecosystem Conservation Society, Tokyo, Japan, September 2004. (INVITED)
87. "Using habitat evaluation models for conservation design," Plenary for *The International Symposium on Habitat Evaluation*, sponsored by the Japan Ecosystem Conservation Society, Tokyo, Japan, September 2004. (INVITED)
86. "Seeing the elephant: Holistic intelligence for solving wildlife-related problems," for *Interdisciplinary Research and Management in Mountain Areas* conference, sponsored by Parks Canada and the Banff Centre, Banff, AB, September 2004. (INVITED)
85. "Effects of humans and black bears on the post-Pleistocene invasion of grizzly bears," 1<sup>st</sup> author with S. Herrero for 2004 *Ecological Society of America Annual Meeting*, sponsored by the Ecological Society of America, Portland, OR, August 2004.  
<http://abstracts.co.allenpress.com/pweb/esa2004/document/35283>. (INVITED)
84. "Values, myths and narrative in conservation," for the conference *Views of the Elephant: Lessons Learned from Personal Experiences in Conservation*, sponsored by the Colorado Plateau Chapter for Conservation Biology, Marble Canyon, AZ, April 2004.

83. “Policy-oriented conservation design,” for workshop *Policy-Oriented Conservation Design*, sponsored by the Wilburforce Foundation and Y2Y Conservation Initiative, Pender Island, BC, February 2004. (INVITED)
82. “Consumption of voles and vole food caches by Yellowstone grizzly bears: Exploratory analyses,” POSTER for 15<sup>th</sup> *International Conference of Bear Research and Management*, sponsored by the International Bear Association, San Diego, CA, February 2004.
81. “Consumption of pondweed roots by Yellowstone grizzly bears,” 1<sup>st</sup> author with S. Podruzy & M. Haroldson POSTER for 15<sup>th</sup> *International Conference of Bear Research and Management*, sponsored by the International Bear Association, San Diego, CA, February 2004.
80. “Natural landscape features, human-related attractants, and conflict hotspots: A spatial analysis of human-grizzly bear conflicts,” 3<sup>rd</sup> author with S. Wilson, M.J. Madel, J.M. Graham, J.A. Burchfield, & J.M. Belsky for 15<sup>th</sup> *International Conference of Bear Research and Management*, sponsored by the International Bear Association, San Diego, CA, February 2004.
79. “Are black bears a factor in the restoration of North American grizzly bear populations?,” 1<sup>st</sup> author with S. Herrero & T. Merrill for 15<sup>th</sup> *International Conference of Bear Research and Management*, sponsored by the International Bear Association, San Diego, CA, February 2004.
78. “Spatial analysis of puma (*Puma concolor*) habitat use relative to topographic roughness in northern Arizona,” 3<sup>rd</sup> author with T.R. Arundel, S.T. Arundel & J Hart POSTER for 7<sup>th</sup> *Biennial Conference of Research on the Colorado Plateau*, sponsored by the 7<sup>th</sup> Biennial Conference Committee, Flagstaff, AZ, November 2003.
77. “A conceptual model and appraisal of research related to interactions between humans and pumas,” 1<sup>st</sup> author with J. Hart & P. Beier for 7<sup>th</sup> *Biennial Conference of Research on the Colorado Plateau*, sponsored by the 7<sup>th</sup> Biennial Conference Committee, Flagstaff, AZ, November 2003.
76. “Clarification of perspectives and pursuit of the community interest: Carnivore conservation in the Northern Rockies,” 4<sup>th</sup> author with S.R. Brown, K.L. Byrd, T.W. Clark, & M. Rutherford for 2003 *Policy Sciences Annual Institute*, sponsored by Society for Policy Sciences, Yale Law School, New Haven, CT, October 2003.
75. “Coefficients of productivity for Yellowstone’s grizzly bear habitat,” for *Workshop on evaluating the Yellowstone grizzly bear cumulative effects model*, sponsored USGS Interagency Grizzly Bear Study Team, Bozeman, MT, September 2003. (INVITED)
74. “Grizzly bear use of whitebark pine habitats,” 1<sup>st</sup> author with D. Reinhart for *Whitebark Pine Committee 2003 Workshop*, sponsored by the Greater Yellowstone Coordinating Committee, Lake Village, Yellowstone National Park, WY, June 2003. (INVITED)
73. “A conceptual model and appraisal of existing research related to interactions between humans and pumas,” 1<sup>st</sup> author with J. Hart, P. Beier, & J. Millen-Johnson for 7<sup>th</sup> *Mountain Lion Workshop*, sponsored by Wyoming Game & Fish Department and The Wildlife Society, Jackson, WY, May 2003.
72. “Bridging scales, bridging to conservation practice: Grizzly bear science in Y2Y,” Plenary for *Making Science, Making Change in Y2Y: Four Years of Research and Collaboration on Ecological Connectivity*, sponsored by the Yellowstone-to-Yukon Conservation Initiative and Wilburforce Foundation, Calgary, AB, May 2003. (INVITED)
71. “The Southern Colorado Plateau Network inventory: Where to from here?,” for *Southern Colorado Plateau Network Inventory & Monitoring Workshop*, sponsored by the U.S. National Park Service, Southern Colorado Plateau Network, Farmington, NM, April 2003. (INVITED)

70. “How well do different approaches address rare species, biologically and ecologically?,” as speaker and panel member for *Innovations in Species Conservation Symposium: Integrative Approaches to Address Rarity & Risk*, sponsored by the U.S. Forest Service, USGS, and etc., Portland, OR, April 2003. (INVITED)
69. “Why grizzly bears?,” for *Central Rockies Ecosystem Grizzly Bear Management Workshop*, sponsored by the Central Rockies Ecosystem Interagency Liaison Group, Radium, BC, April 2003. (INVITED)
68. “Promises and pitfalls of models in science and management,” for *Central Rockies Ecosystem Grizzly Bear Management Workshop*, sponsored by the Central Rockies Ecosystem Interagency Liaison Group, Radium, BC, April 2003. (INVITED)
67. “Thoughts on transboundary monitoring and management of grizzly bears,” for *Kluane National Park and Reserve Grizzly Bear Symposium*, sponsored by Parks Canada Yukon Field Unit, Haines Junction, Yukon Territory, March 2003. (INVITED)
66. “A model-based appraisal of grizzly bear habitat conditions in northwestern Montana,” 1<sup>st</sup> author with T. Merrill for the *Border Bears Workshop*, sponsored by the National Wildlife Federation and U.S. Fish and Wildlife Service, Sandpoint, ID, December 2002. (INVITED)
65. “Perspectives in grizzly bear conservation: Representations from newspaper and magazine articles,” 1<sup>st</sup> author with S. Wilson for *Carnivores 2002*, sponsored by Defenders of Wildlife, Monterey, CA, November 2002.
64. “Conditions of grizzly bear policy implementation: An inside view,” 1<sup>st</sup> author with T. Clark for *2002 Policy Sciences Annual Institute*, Yale Law School, New Haven, CT, October 2002.
63. “Umbrella effects,” 2<sup>nd</sup> author with T. Merrill for *CERI Meeting on Conservation Area Design*, sponsored by the Craighead Environmental Research Institute, B-Bar Ranch, MT, September 2002.
62. “Conservation of mountain carnivores: Living with mountain carnivores?,” for *Ecological and Earth Sciences in Mountain Areas* conference, sponsored by Parks Canada and the Banff Centre, Banff, AB, September 2002. (INVITED)
61. “Restoring an extirpated species: Grizzly bears in the Southwest?,” for *Second Annual Meeting of the Southwestern Carnivore Committee*, sponsored by U.S. Fish and Wildlife Service and the Turner Endangered Species Fund, Grand Canyon National Park, AZ, May 2002.
60. “Restoring an extirpated species: Grizzly bears in the Southwest?,” POSTER with T. Merrill for *6<sup>th</sup> Biennial Conference of Research on the Colorado Plateau*, sponsored by USGS Colorado Plateau Field Station, Flagstaff, AZ, November 2001.
59. “Report from a workshop on the biology and management of pumas and black bears in Colorado Plateau National Parks,” 1<sup>st</sup> author with E. Leslie for *6<sup>th</sup> Biennial Conference of Research on the Colorado Plateau*, sponsored by USGS Colorado Plateau Field Station, Flagstaff, AZ, November 2001. (INVITED)
58. “A conceptual framework for large carnivore conservation: The case of Yellowstone’s grizzly bears,” for *First Annual Meeting of the Southwestern Carnivore Committee*, sponsored by the Turner Endangered Species Fund and U.S. Fish and Wildlife Service, Albuquerque, NM, June 2001.
57. “Grizzly bears in the southwest: Some biophysical features of their extirpation and current prospects,” for *First Annual Meeting of the Southwestern Carnivore Committee*, sponsored by the Turner Endangered Species Fund and U.S. Fish and Wildlife Service, Albuquerque, NM, June 2001.

56. "The effects of fragmentation, edges and habitat loss on wildlife: A perspective for mountain environments," for conference on *Human Use Management in Mountain Areas*, sponsored by Parks Canada and The Banff Centre, Banff, AB, June 2001. (INVITED)
55. "Consumption of earthworms by Yellowstone grizzly bears," 1<sup>st</sup> author with M. French & S. French, POSTER for 13<sup>th</sup> *International Conference on Bear Research and Management*, sponsored by the International Association for Bear Research and Management, Jackson, WY, May 2001.
54. "Consumption of fungal sporocarps by Yellowstone grizzly bears," 1<sup>st</sup> author with S. Podrutzny & M. Haroldson, POSTER for 13<sup>th</sup> *International Conference on Bear Research and Management*, sponsored by the International Association for Bear Research and Management, Jackson, WY, May 2001.
53. "Defining habitat suitable for grizzly bears in the Greater Yellowstone Ecosystem," 2<sup>nd</sup> author with T. Merrill for 13<sup>th</sup> *International Conference on Bear Research and Management*, sponsored by the International Association for Bear Research and Management, Jackson, WY, May 2001.
52. "Conservation of grizzly bears in the northern U.S. Rockies: An explanatory hypothesis," 1<sup>st</sup> author with T. Clark for 13<sup>th</sup> *International Conference on Bear Research and Management*, sponsored by the International Association for Bear Research and Management, Jackson, WY, May 2001.
51. "Rationality or rationalization?: Science in the grizzly bear policy arena," for *All Hands Meeting*, sponsored by the U.S.G.S. Forest and Rangeland Ecosystem Science Center, Corbett, OR, January 2001. (INVITED)
50. "Social process mapping for large carnivore conservation," for *Managing Human Activities in Ecosystems in the Face of Large Uncertainties*, sponsored by the Science and Environmental Health Network, Missoula, MT, November 2000. (INVITED)
49. "Comparison of terrestrial and aquatic reserve designs: A northwest Montana pilot study," 3<sup>rd</sup> author with T. Merrill & C. Frissell for *Annual Meeting of the Society for Conservation Biology*, sponsored by the Society for Conservation Biology, Missoula, MT, June 2000.
48. "Access management: Managing people not ecosystems," for *Roads and Zones: Balancing Human Access in Public Lands*, sponsored by the Miistakis Institute for the Rockies, Radium Hot Springs, BC, February 2000.
47. "Use of non-native clover and grass by Yellowstone grizzly bears," 2<sup>nd</sup> author with D.P. Reinhart & K.A. Gunther, POSTER for *Exotic Organisms in Yellowstone: Native Biodiversity Under Siege*, sponsored by Yellowstone National Park, Mammoth, WY, October 1999.
46. "The effect of exotic species on Yellowstone's grizzly bears," 3<sup>rd</sup> author with D.P. Reinhart, M. Haroldson, & K.A. Gunther for *Exotic Organisms in Yellowstone: Native Biodiversity Under Siege*, sponsored by Yellowstone National Park, Mammoth, WY, October 1999.
45. "Comprehensive analysis for successful carnivore conservation: A systematic framework for mapping key variables," 2<sup>nd</sup> author with T. Clark, R. Reading & B. Miller for the *Carnivore Conservation Symposium*, sponsored by the Royal Zoological Society, London, October 1998. (INVITED)
44. "Whitebark pine, red squirrels and grizzly bears," 1<sup>st</sup> author with K. Kendall & D. Reinhart for the symposium *Restoring Whitebark Pine Ecosystems*, sponsored by the U.S. Forest Service, U.S. Park Service, USGS Biological Resources Division and Society of American Foresters, Missoula, MT, September 1998. (INVITED)
43. "Fire, red squirrels, whitebark pine, and Yellowstone grizzly bears," 3<sup>rd</sup> author with S. Podrutzny & D. Reinhart for 11<sup>th</sup> *International Conference on Bear Research and Management*, Gatlinburg, TN, April 1998.
42. "Use of rub trees by Yellowstone grizzly bears," 2<sup>nd</sup> author with G. Green & R. Swalley for 11<sup>th</sup> *International Conference on Bear Research and Management*, Gatlinburg, TN, April 1998.
41. "Geophagy by Yellowstone grizzly bears," 1<sup>st</sup> author with G. Green & R. Swalley, POSTER for 11<sup>th</sup> *International Conference on Bear Research and Management*, Gatlinburg, TN, April 1998.

40. "Landscapes suitable for restoration of grizzly bears in Idaho," for *Annual Meeting of the Idaho Chapter of the Wildlife Society*, Moscow, ID, March 1998. (INVITED)
39. "Grizzly bear conservation in the Greater Yellowstone Ecosystem," for *Workshop on Conservation Problem Solving*, sponsored by the Northern Rockies Conservation Cooperative and U.S. Forest Service, Jackson, WY, September 1997. (INVITED)
38. "Assessing umbrella effects of grizzly bears in Idaho: Applying matrices of habitat sensitivities," 1<sup>st</sup> author with T. Merrill for 7<sup>th</sup> *Annual Gap Analysis Principal Investigators' Meeting*, Reston, VA, August 1997.
37. "Defining suitable landscapes for reintroduction of grizzly bears in Idaho," 1<sup>st</sup> author with T. Merrill for 7<sup>th</sup> *Annual Gap Analysis Principal Investigators' Meeting*, Reston, VA, August 1997.
36. "Are grizzly bears an umbrella species for Idaho?," 1<sup>st</sup> author with T. Merrill, R. Noss, & H. Quigley for *Annual Meeting of the Society for Conservation Biology*, Victoria, BC, June 1997.
35. "Fragmentation and large carnivores: An unconventional view of landscapes," 2<sup>nd</sup> author with T. Merrill & H. Quigley for the workshop *Landscape Alteration Effects on Fauna in the Americas: Establishing a Basis for Analysis Across Biomes*, sponsored by IAI-AMIGO, Maitencillo, Chile, December 1996. (INVITED)
34. "Extirpations of grizzly bear (*Ursus arctos*) populations: An analysis of historical landscape patterns," 2<sup>nd</sup> author with T. Merrill for the *Joint Annual Meetings of the Ecological Society of America and the Society for Conservation Biology*, Providence, RI, August 1996.
33. "The Alsek Pass Assessment" and "Interagency grizzly bear management," for *Kluane National Park and Reserve Grizzly Bear Research Project: Project Review and Workshop*, Vancouver, BC, March 1996. (INVITED)
32. "Impacts of the proposed New World Mine on Yellowstone's threatened grizzly bear population," for the World Heritage Committee hearings *Yellowstone National Park: World Heritage Site in Danger Designation*, Mammoth, WY, September 1995. (INVITED)
31. "Demography and behavior of the Yellowstone grizzly bears", 2<sup>nd</sup> author with C. Pease for *Conference on Greater Yellowstone Predators*, organized by Yellowstone National Park and the Northern Rockies Conservation Cooperative, Mammoth, WY, September 1995.
30. "The strange case of ethics and natural resource agency science," for the Plenary Session *Ethics, Science, and Public Policy*, at the American Institute of Biological Sciences annual meeting, San Diego, CA, August 1995. (INVITED)
29. "Demography and behavior of the Yellowstone grizzly bears," 2<sup>nd</sup> author with C. Pease for *10th International Conference on Bear Research and Management*, Fairbanks, AK, July 1995.
28. "Diet and morphology of northern bears: Some hypotheses," for *10th International Conference on Bear Research and Management*, Fairbanks, AK, July 1995.
27. "Changing mortality of Yellowstone grizzly bears," for *10th International Conference on Bear Research and Management*, Fairbanks, AK, July 1995.
26. "Assessing cumulative effects of human development on grizzly bears," for *Ecological Outlook Project: Cumulative Effects Assessment and Futures Modelling Workshop*, sponsored by the Banff Bow Valley Study Task Force, Banff, AB, June 1995. (INVITED)
25. "The New World Mine and grizzly bears: A window on ecosystem management," for the symposium *National Parks and Public Land Ecosystems: Meeting the Challenge of Common Boundaries and Conflicting Mandates*, sponsored by the College of Law, University of Utah, Snowbird, UT, April 1995. (INVITED)
24. "Kamchatkan brown bears and *Pinus pumila*," for the workshop *Management of Whitebark Pine Ecosystems — An International and Regional Perspective*, sponsored by the Society of American Foresters, Intermountain Research Station, and Gallatin National Forest, Bozeman, MT, April 1993. (INVITED)
23. "Implementing endangered species policy: Lessons from the Yellowstone grizzly bear recovery effort," for the workshop *Implementing Endangered Species Policy* sponsored by the University of Michigan School of Natural Resources and the Environment, Ann Arbor, MI, January 1993. (INVITED)

22. "Use of road density standards for management of Yellowstone grizzly bear habitat," for a meeting on road density and security area standards for grizzly bear management, sponsored by the Grizzly Bear Recovery Coordinator, Missoula, MT, January 25-26, 1993. (INVITED)
21. "Biology of the Yellowstone grizzly bear," for the symposium *Human-Bear Conflicts*, sponsored by the West Yellowstone Chamber of Commerce, West Yellowstone, MT, October 1992. (INVITED)
20. "Grizzly bear-whitebark pine relationships in North America," for *International Workshop on Stone Pines and their Environment*, sponsored by the Swiss Institute of Forest, Snow & Landscape Research, U.S. Forest Service, and University of Munster, Germany, at St. Moritz, Switzerland, September 1992. (INVITED)
19. "Conservation of the Yellowstone grizzly bear," for the seminar series *Conservation Biology and Public Land Management*, at University of Wyoming, AMK Ranch, Grand Teton National Park, August 1992. (INVITED)
18. "Whitebark pine-grizzly bear associations," for *Whitebark Pine Workshop on New Management Perspectives in the Greater Yellowstone Area*, sponsored by the Gallatin National Forest, U.S. Forest Service Intermountain Research Station, and the Eastern Montana Chapter of the Society of American Foresters, Bozeman, MT, January 1992. (INVITED)
17. "The Yellowstone experience: 'Between a rock and a hard place'," for *Grizzly Bear Management Workshop*, sponsored by the Canadian Parks Service and Friends of Revelstoke National Park, Revelstoke, BC, March 1991. (INVITED)
16. "Sensitivity of grizzly bear population indices to long-term change in habitat support capability," for the symposium *Forever Threatened?*, sponsored by the Wyoming Wildlife Federation, Dubois, WY, June 1990.
15. "Grizzly bears, roads, displacement and mortality: What does the research mean?," for *Grizzly/Wolf Technical Workshop*, sponsored by the National Wildlife Federation, Polebridge, MT, July 1989. (INVITED)
14. "Interactions among red squirrels, grizzly bears, and the whitebark pine cone crop," for the workshop *Review of Research on Whitebark Pine Ecosystems*, sponsored by the U.S. Forest Service, Forest Service Fire Lab, Missoula, MT, March 1989. (INVITED)
13. "Stone pines and bears," 1<sup>st</sup> author with C. Jonkel for the symposium *Whitebark Pine Ecosystems — Ecology and Management of a High-Mountain Resource*, sponsored by the U.S. Forest Service, National Park Service, Montana State University, and Society of American Foresters, Bozeman, MT, March 1989. (INVITED)
12. "Whitebark pine on the Mount Washburn massif, Yellowstone National Park," 1<sup>st</sup> author with D. Reinhart for the symposium *Whitebark Pine Ecosystems — Ecology and Management of a High-Mountain Resource*, sponsored by the U.S. Forest Service, National Park Service, Montana State University, and Society of American Foresters, Bozeman, MT, March 1989.
11. "Grizzly bear use of Yellowstone Lake cutthroat trout," 2<sup>nd</sup> author with D. Reinhart for the *8th International Conference on Bear Research and Management*, sponsored by the International Association for Bear Research and Management, Victoria, BC, February 1989.
10. "Human impacts on bear habitat use," Plenary for the *8th International Conference on Bear Research and Management*, sponsored by the International Association for Bear Research and Management, Victoria, BC, February 1989. (INVITED)
9. "Timbering and roading in grizzly habitat," for *Greater Yellowstone Coalition 1988 Annual Meeting and Scientific Conference*, Lake Lodge, Yellowstone National Park, WY, June 1988. (INVITED)
8. "Dynamics of ungulate carcasses and their use by bears on ungulate winter ranges," 1<sup>st</sup> author with G. Green & J. Henry for *First Annual Meeting of Research and Monitoring on Yellowstone's Northern Range*, sponsored by the National Park Service, Mammoth, WY, January 1988.
7. "Evaluation of grizzly bear habitat using standard classification systems," 1<sup>st</sup> author with R. Knight for the symposium *Land Classifications Based on Vegetation — Applications for Resource Management*, sponsored by the University of Idaho, U.S. Forest Service, and State of Idaho, Moscow, ID, February 1987. (INVITED)

6. "Significance of whitebark pine to wildlife," for workshop sponsored by the U.S. Forest Service, Montana State University, Bozeman, MT, February 1987. (INVITED)
5. "Food habits of the Yellowstone grizzly bear," 1<sup>st</sup> author with B. Blanchard & R. Knight for *7th International Conference on Bear Research and Management*, Williamsburg, VA, February 1986.
4. "The effects of developments and primary roads on grizzly bear habitat use in Yellowstone National Park, Wyoming", 1<sup>st</sup> author with B. Blanchard & R. Knight for *7th International Conference on Bear Research and Management*, Williamsburg, VA, February 1986.
3. One part of four part presentation, "A cumulative effects model for grizzly bear management in the Yellowstone ecosystem," for *Grizzly Bear Habitat Symposium*, sponsored by the Interagency Grizzly Bear Committee and University of Montana, Missoula, MT, April-May 1985.
2. "Derivation of habitat component values for the Yellowstone grizzly bear," 1<sup>st</sup> author with R; Knight and B. Blanchard for *Grizzly Bear Habitat Symposium*, sponsored by the Interagency Grizzly Bear Committee and University of Montana, Missoula, MT, April-May 1985.
1. "Classification and environmental relationships of wetland vegetation in Yellowstone National Park, Wyoming," for *55th Annual Meeting of the Northwest Science Association*, Walla Walla College, College Place, WA, March 1982.

### c. RENDERING SCIENTIFIC JUDGMENT

#### *External Scientific Review Panels & Consultation* since 1992

49. Second-level USGS review of BLM Sonoran Desert and Colorado Plateau Rapid Ecoregional Assessment processes, for BLM National Operations Center, Denver, CO, 2010-present; *expert reviewer*.
48. Advice on and review of protocol for managing pocket gophers in grizzly bear habitat, for P. Durkin of SERA Inc., 2010; *topic expert and expert reviewer*.
47. Invited Participant in scoping meeting for USGS response to BLM Rapid Ecological Assessments, Salt Lake City, UT, January 2010; *topic expert*.
46. Invited Participant in *Manhattan Project II Workshop* to scope research needs related to desert bighorn sheep-mountain lion interactions, Armendaris Ranch, Truth or Consequences, NM, April 2010; *topic expert*.
45. Invited Panel Expert for *Human Dimensions of Carnivore Conservation: Experts Workshop* convened to advise the Florida Wildlife Commission and US Fish & Wildlife Service on new approaches to conserving the Florida panther, January 2010; *topic expert*.
44. Invited Participant in problem-solving workshop *Aboriginal People, Polar Bears, and Human Dignity*, Whitehorse, Yukon Territory, January 2009; *topic expert*.
43. Consultant and collaborator on development of ArcGIS Agent Analyst extension with Kevin Johnston, ESRI, 2008-present. This collaboration involved use of cougar data to motivate a seminal application of Agent Analyst used in an instructional book covering this extension: Johnston, K., ed. (2011). *Getting to Know ArcGIS Agent Analyst*. ESRI Press, Redlands, CA. Applications to cougars comprised the bulk of Chapters 5 & 8 entitled *Moving point agents based on multi criteria decision making* and *Adding complexity to moving discrete point agents over continuous surfaces*. The scientist was offered but turned down authorship on these chapters because of complications entailed by the USGS product review process.

42. Review of and reference for research proposal, “Conservation and management of an isolated remnant population of Moroccan Dorcas gazelles north and west of the Atlas Mountains,” to People’s Trust for Endangered Species, London, UK, for M. Znari, 2008; *expert reviewer & consultant*.

41. Invited Applicant for *Endangered Species Management Kenya*, US Department of Interior International Technical Assistance Program, 2008; Canceled because of political problems in host country

40. Review of research/handling protocol “Pilot study: Ecology of mountain lions in the badlands of southwestern North Dakota” for J. Austin, USGS Northern Prairie Wildlife Research Center, March 2008; *expert reviewer*.

39. Advice on structure and design of MUSIC and of associated curricula and programs in the MIT Department of Urban Studies & Planning, Environmental Policy & Planning Group for H. Karl, MIT-USGS Science Impact Collaborative—entailing numerous meetings, conversations, white papers, and memos, 2007-2008; *expert consultant*.

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38. Advice on collaborative approaches to resolving contentious natural resources issues, for Karen Hardigg, Alaska Forest Program Manager, The Wilderness Society, Anchorage, AK, 2007; *expert consultant*.

37. Review of and advice on “Credit trading framework: Conceptual basis for quantifying credits and debits in the sagebrush ecosystem,” for J. Hestbeck, USGS Ft. Collins Science Center, 2007; *expert consultant and reviewer*.

36. Review and other input on proposal to the Natural Resources Conservation Service, Washington Office, regarding “Suggested metric for quantifying a positive zone of influence on grizzly bear habitat from non-lethal deterrent practices” for S. Wilson, Yale School of Forestry & Environmental Studies and Blackfoot Challenge, MT, 2006; *expert consultant*

35. Review of *Cougar Management Guidelines for North America*, for the authors and for Wild Futures, Earth Island Institute, Bainbridge Island, WA, 2004; *expert reviewer*.

34. Review of the *Muskwa-Kechika Wildlife Management Plan* for the Muskwa-Kechika Management Area Advisory Board, Fort St. John, BC, 2004; *expert reviewer*.

33. Review of the draft report *Analysis of Scientific Publications Related to the Florida Panther* for U.S. Fish & Wildlife Service and Florida Fish & Wildlife Commission, 2003; *expert reviewer*.

32. Review of web-served synopses of conservation biology literature and methods for Canadian Information System for the Environment, Environment Canada, 2003; *expert reviewer*.

31. Design and analysis for research program to model distribution of pre-historical Palouse Prairie vegetation in the Hangman Restoration Project area for Coeur d’Alene Tribe, Wildlife Program, Plummer, ID, 2002-present; *scientific advisor*.

30. Design of monitoring program for the U.S. National Park Service, Northern Colorado Plateau Network, Moab, UT, 2002; *scientific advisor*.

29. Methods for biological inventory and monitoring for the U.S. National Park Service, Southern Colorado Plateau Network, Inventory and Monitoring Program, Flagstaff, AZ, 2001-2005; *member of scientific advisory committee*.

28. Evaluation of impacts on large terrestrial vertebrates for alternatives regarding vehicular management in the Salt Creek Drainage of Canyon Lands NP, for U.S. National Park Service, Southeast Utah Group, Moab, UT, 2001; *member of the scientific review panel.*
27. Review of grizzly bear research program in and around Banff NP, for Parks Canada, Banff National Park, Banff, AB, 2001; *evaluated past research and proposed future directions for research and monitoring.*
26. Review of restoration plan for grizzly bear habitat in Jasper National Park (*Jasper National Park Three Valley Confluence Recovery Plan*) for Parks Canada, Jasper, AB, 2001; *expert reviewer.*
25. Review of plan for black bear research in Olympic National Park for USGS Forest & Rangeland Ecosystem Science Center, Corvallis, OR, 2001; *expert reviewer.*
24. Review of final report *A Study of New Mexico Black Bear Ecology with Models for Population Dynamics and Habitat Quality* for the New Mexico Fish & Wildlife Research Unit and New Mexico Department of Game and Fish, Santa Fe, NM, 2001; *expert reviewer.*
23. Review of research proposals for Grand Canyon National Park, Flagstaff, AZ, 2000; *expert reviewer.*
22. Review of *Sky Islands Wildlands Network and Conservation Plan* for The Wildlands Project, Tucson, AZ, 2000; *expert reviewer.*
21. Advice on methods for conservation planning and design for Yellowstone-to-Yukon Conservation Initiative, Canmore, AB, 1999-2005; *member of science advisory committee.*
20. Advice and other input on management standards for whitebark pine and relations among bears, red squirrels and whitebark pine, for U.S. Forest Service and U.S. National Park Service, Yellowstone ecosystem, 1999-present; *member of Yellowstone Ecosystem Whitebark Pine Working Group.*
19. Evaluate strategy for scientific research and conservation planning for Yellowstone-to-Yukon Conservation Initiative, Jasper, AB, 1999; *member of Scientific Advisory Forum.*
18. Provide overview of issues in large carnivore conservation for Canadian Ministry on Canadian Heritage Ecological Integrity Panel, 1999; *invited panel expert for Parks Canada.*
17. Advice on decision process and analysis methods related to conservation planning, for The Wildlife Network and Summerlee Foundation, Bainbridge Island, WA, 1998-present; *member of advisory committee for development of methods for bioregional conservation planning.*
16. Advice on development of an education course for hunters to prevent and respond appropriately to grizzly bear encounters, for Grizzly Bear Education Course Team, Wyoming Outfitters & Guides Association, 1998-2002; *member of steering committee.*
15. Advice on development of models and review of methods and products for World Wildlife Fund Canada and Conservation Biology Institute project: Modeling Carnivore Habitat in the Rocky Mountain Region, 1997-2000; *member of scientific advisory committee.*
14. Advice on development of the cumulative effects analysis process, and revision of methods and update of coefficients for mapped habitat types for Interagency Grizzly Bear Committee, Yellowstone subcommittee, 1997-2001; *member of grizzly bear cumulative effects modeling team for the Yellowstone Ecosystem.*
13. Development and review of grizzly bear research program in Kluane National Park, Yukon, for Canadian Parks Service, Western Region, Winnipeg, MB, 1991-2006; *member of the Kluane Grizzly Bear Study Working Group.*
12. Habitat-based population viability analysis for the East Slopes grizzly bear population in Alberta by the IUCN Conservation Biology Specialists Group (CBSG) and the East Slopes Grizzly Bear Project (ESGBP), University of Calgary, 1999; *scientific expert for the CBSG and ESGBP.*
11. Selection of wildlife projects for funding by Seattle City Light, City of Seattle, WA, 1999; *expert reviewer.*

10. Review of species distribution models for Idaho for the Idaho GAP Analysis project, 1998-1999; *scientific expert*.
9. Evaluation of and advice on methods and interpretation of conservation area design for coastal brown bears in British Columbia, for Round River Conservation Studies, Salt Lake City, UT, 1998; *member of scientific review panel*.
8. Evaluation of Tongass Land Management Plan alternatives for probable impacts on brown bears, for U.S. Forest Service, Tongass National Forest, Juneau, AK, 1996-1997; *member of the Brown Bear Panel*.
7. Advice on methods for impacts assessment and review of Environmental Impact Statement and Biological Assessment for the proposed New World Mine near Cooke City, MT, for U.S. Forest Service, Gallatin National Forest, Gardiner, MT, 1995-1998; *member of the scientific review committee*.
6. Development and review of research on current human impacts in the Bow Valley and participation in a futures modeling exercise for the region, for Secretariat of the Banff Bow Valley Task Force, Banff, AB, 1995-1996; *member of the scientific review committee for the Banff-Bow Valley*.
5. Assessment of the status of the Yellowstone National Park World Heritage Site by the World Heritage Committee, 1995; *expert witness for the US National Park Service*.
4. Assessment of proposed access development along the boundary of Kluane National Park, Yukon, 1994-1995; *scientific advisor for Axys Environmental Consultants and the Canadian Parks Service*.
3. Development of a carnivore conservation strategy for the Canadian and northern United States Rocky Mountains by the World Wildlife Fund, Canada, Toronto, ON, 1993; *scientific advisor*.
2. Assessment of the proposed expansion of the Sunshine Ski area in Banff National Park for Parks Canada, Calgary, AB, 1993; *scientific expert*.
1. Assessment of the proposed Westcastle ski development near Waterton National Park, Canada, for the Natural Resources Conservation Board of Alberta, 1993; *scientific expert for Parks Canada*.

**Review of Journal or Book Manuscripts since 1998:** The scientist reviewed **51 manuscripts** for the following journals since July of 1998. The number of manuscripts reviewed for each venue is given in parentheses in bold.

*Ecology* (4)  
*Ecological Applications* (1)  
*Behaviour* (1)  
*Conservation Biology* (8; 2 as Assigning Editor)  
*Ecography* (1)  
*Biological Conservation* (1)  
*Journal of Mammalogy* (1)  
*Journal of Wildlife Management* (9)  
*Wildlife Society Bulletin* (4)  
*Restoration Ecology* (1)  
*Acta Theriologica* (1)  
*Canadian Journal of Zoology* (4)  
*Ursus* (5)  
*Journal of Forest Ecology & Management* (1)  
*Western North American Naturalist* (2)  
*Northwest Science* (1)  
 USFS General Technical Report Series (1)  
*Proceedings of the 5<sup>th</sup> Biennial Conference of Research on the Colorado Plateau* (1)  
*Proceedings of the 8<sup>th</sup> Biennial Conference of Research on the Colorado Plateau*, University of Arizona Press (2)

*Proceedings of the 9<sup>th</sup> Biennial Conference of Research on the Colorado Plateau*, University of Arizona Press (1)

*Desert Bighorn Council Transactions* (1)

The scientist has also reviewed 5 papers for scientific quality and compliance with USGS Fundamental Science Practices.

#### d. LECTURESHIPS AND OTHER ACADEMIC SERVICE

Since 1992 the scientist has instructed **10 semester-long classes or intensives**, 4 at Yale University, 4 at the Massachusetts Institute of Technology, 1 at Northern Arizona University, and 1 at University of Idaho; and given **95 seminars or lectures** in academic venues, primarily graduate classes, but including departmental seminars and undergraduate classes at Yale University, University of Michigan, University of Idaho, Northern Arizona University, University of Montana, Montana State University, Boise State University, Prescott College, and The Yellowstone Institute.

#### *Semester-Long Seminars & Courses* since 1992

10. Instructor, 11.972, *Elements of Public Interest Leadership*, 24 hrs of class, MIT Department of Urban Studies & Planning, January 2009.

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9. Instructor, 11.941 *Elements of Environmental Leadership*, 24 hrs of class, MIT Department of Urban Studies & Planning, Spring 2008.

8. Co-Instructor, 11.375 *Workshop on Collaborative Adaptive Management*, 40 hrs of class, MIT Department of Urban Studies & Planning, Spring 2008.

7. Co-instructor, *Foundations of Natural Resources Policy* (F&ES 85036), 42 hrs of class, Yale School of Forestry & Environmental Studies, New Haven, CT, January-May 2007

6. Co-instructor, *Society & Natural Resources* (F&ES 83049), 28 hrs of class, Yale School of Forestry & Environmental Studies, New Haven, CT, January-May 2007

5. Co-instructor, *Large Scale Conservation* (F&ES 83037), 42 hrs of class, Yale School of Forestry & Environmental Studies, New Haven, CT, January-May 2007

4. Co-instructor, *Reforming Natural Resources Governance* (IAP 11.959), 40 hrs of class, MIT Department of Urban Studies & Planning, Cambridge, MA, January 2007

3. Instructor, *Interdisciplinary Approaches to Large Carnivore Conservation* (F&ES 30023a), 39 hrs of class, Yale School of Forestry & Environmental Studies, New Haven, CT, September-December 2006

2. Co-Instructor, *The Policy-Science Interface* (ENV 555), 39 hrs of class, Center for Environmental Sciences & Education, Northern Arizona University, Flagstaff, AZ, August-December 2005

1. Instructor, *Senior Seminar: "What role does biology have in natural resources management?"* (WLF495), 13 hrs of class, Department of Fish and Wildlife Resources, University of Idaho, Moscow, August-December 1993

**Lectures** since 1992

95. “The existential roots of human dignity,” *Yale Human Rights and Environment Dialogue*, Yale University, New Haven, CT, January 2011 (INVITED)
94. “Wildlife management in the Southwest: Maladies of scientific management,” *Large Scale Conservation* (F&ES 83037b), Yale School of Forestry & Environmental Studies, New Haven, CT, January 2011 (INVITED)
93. “Existentialism,” *Society & Natural Resources: Environmental Psychology* (F&ES 83049b), Yale School of Forestry & Environmental Studies, New Haven, CT, January 2011 (INVITED)
92. “The social-psychology of professional practice,” *Western Resources Interest Group*, Yale School of Forestry & Environmental Studies, New Haven, CT, January 2011 (INVITED)
91. “Sex matters: The predatory strategies of male and female cougars,” *Brigham Young University, Department of Plant & Wildlife Sciences Seminar*, Provo, UT, October 2010 (INVITED)
90. “Promise and pitfalls of models in science and management,” *Biological Techniques: Species Distribution Modeling* (BIO 680), Department of Biology, Northern Arizona University, Flagstaff, AZ, September 2010 (INVITED)
80. “Sustainability, human dignity, and professionalism,” *Society & Natural Resources* (F&ES 83049b), Yale School of Forestry & Environmental Studies, New Haven, CT, February 2010 (INVITED)
79. “Florida panthers: The social construction of a conservation problem,” *Species & Ecosystem Conservation* (F&ES 33012b), Yale School of Forestry & Environmental Studies, New Haven, CT, February 2010 (INVITED)
78. “Leadership as relation: The led and their theories about good leadership,” *Western Resources Interest Group*, Yale School of Forestry & Environmental Studies, New Haven, CT, February 2010 (INVITED)
77. “Mountain lions in ecosystems: Evidence and speculations about effects,” *Species & Ecosystem Conservation* (F&ES 33012b) Field Trip, Yale School of Forestry & Environmental Studies, Flagstaff, AZ, March 2010 (INVITED)
76. “Psycho-, social, and political dynamics of cougar management,” *Species & Ecosystem Conservation* (F&ES 33012b) Field Trip, Yale School of Forestry & Environmental Studies, Flagstaff, AZ, March 2010 (INVITED)
75. “Psycho-, social, and political dynamics of cougar management,” *Wildlife Management* (BIO478), Northern Arizona University, Flagstaff, AZ, October 2009 (INVITED)
74. “Mountain lions in ecosystems: Evidence and speculations about effects,” *Wildlife Management* (BIO478), Northern Arizona University, Flagstaff, AZ, October 2009 (INVITED)
73. “The Witch Craze: Parable and policy sciences interpretation,” for F&ES seminar *Professionalism & Human Dignity*, Yale School of Forestry & Environmental Studies, New Haven, CT, January 2009 (INVITED)
72. “Personality and perspectives on leadership,” for, *Large Scale Conservation: Integrating Science, Management, and Policy* (F&ES 83037b), Yale School of Forestry & Environmental Studies, New Haven, CT, April 2009 (INVITED)

71. “Sustainability, dignity, and professionalism,” for F&ES seminar *Professionalism & Human Dignity*, Yale School of Forestry & Environmental Studies, New Haven, CT, April 2009 (INVITED)

70. “Sustainability, dignity, and professionalism,” for F&ES seminar *Professionalism & Human Dignity*, Yale School of Forestry & Environmental Studies, New Haven, CT, April 2009 (INVITED)

69. “Professionalism and human dignity: Foundational notions,” to *Seminar on Society & Natural Resources* (F&ES 83049b), Yale School of Forestry and Environmental Studies, New Haven, CT, January 2009 (INVITED)

68. “The Glen Canyon Dam AMP: An appraisal,” to *Large Scale Conservation* (F&ES 83037b), Yale School of Forestry and Environmental Studies, New Haven, CT, January 2009 (INVITED)

67. “Psycho-, social, and political dynamics of cougar management,” to *Foundations of Natural Resources & Management* (F&ES 85036b), Yale School of Forestry and Environmental Studies, New Haven, CT, November 2008 (INVITED)

66. “Psycho-, social, and political dynamics of cougar management,” to *Western Resource Group Luncheon Seminar*, Yale School of Forestry and Environmental Studies, New Haven, CT, November 2008 (INVITED)

65. “The witch craze: Parable and policy sciences interpretation,” to *Foundations of Natural Resources & Management* (F&ES 85036b), Yale School of Forestry and Environmental Studies, New Haven, CT, November 2008 (INVITED)

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64. “Human dignity and natural resources professionalism,” to *Seminar on Human Dignity & Natural Resources Professionalism*, Yale School of Forestry & Environmental Studies, January 2008. (INVITED)

63. “Agitators, Theorists & Y2Y: Potential pitfalls of transformational leadership,” to *Combined MIT and Yale Seminars on Elements of Environmental Leadership*, MIT Department of Urban Studies & Planning, Cambridge, MA, March 2008. (INVITED)

62. “The once and future Yellowstone grizzly bears,” for *Society for Conservation Biology Spring Lecture Series*, Yale School of Forestry and Environmental Studies, New Haven, CT, February 2007 (INVITED)

61. “An introduction to David Mattson,” for *Faculty Lunch Seminar*, Yale School of Forestry & Environmental Studies, New Haven, CT, December 2006 (INVITED)

60. “Y2Y conservation area design,” for *Conservation Biology* (E&EB 315a/515a), Yale Department of Ecology & Evolutionary Biology, New Haven, CT, November 2006 (INVITED)

59. “Living with fierce creatures: Cougars on the southern Colorado Plateau,” for *Environmental Studies Colloquium*, Prescott College, Prescott, AZ, April 2006 (INVITED)

58. “Psycho-sociology of the science-policy interface,” for Joint session of *Natural History and Ecology of the Southwest and Behavior and Conservation of Mammals*, Prescott College, Prescott, AZ, April 2006 (INVITED)

57. “A personal perspective on change-oriented leadership,” for *Large Scale Conservation: Integrating Science, Management & Policy* (F&ES 909), Yale School of Forestry and Environmental Studies, New Haven, CT, April 2006 (INVITED)

56. “Agitators, theorists and Y2Y: Potential pitfalls of transformational leadership,” for *Large Scale Conservation: Integrating Science, Management & Policy* (F&ES 909), Yale School of Forestry and Environmental Studies, New Haven, CT, March 2006 (INVITED)
55. “The grizzly bear policy process: ‘Conservation is like warfare’,” *Species and Ecosystem Conservation* (F&ES 520b), Yale School of Forestry and Environmental Studies, New Haven, CT, October 2005 (INVITED)
54. “Conflict over cougars: A window on the institution of wildlife management,” for *Foundations of Natural Resources and Management* (F&ES 891b), Yale School of Forestry and Environmental Studies, New Haven, CT, October 2005 (INVITED)
53. “Professional practice in natural resources research,” for *Luncheon Seminar of the Western Natural Resources Interest Group*, Yale School of Forestry and Environmental Studies, New Haven, CT, October 2005 (INVITED)
52. “Agitators, theorists and Y2Y: Potential pitfalls of transformational leadership,” for *Large-Scale Conservation: Integrating Science, Management and Policy* (F&ES 909b), Yale School of Forestry and Environmental Studies, New Haven, CT, March 2005 (INVITED)
51. “The dogma of conservation area design,” for *Seminar on Western Natural Resources*, Western Natural Resources Interest Group, Yale School of Forestry and Environmental Studies, New Haven, CT, October 2004 (INVITED)
50. “The grizzly bear policy process: ‘Conservation is like warfare’,” for *Species and Ecosystem Conservation* (F&ES 520a), Yale School of Forestry and Environmental Studies, New Haven, CT, October 2004 (INVITED)
49. “Information ecology in grizzly bear management,” for the *Environmental Sciences and Policy Graduate Seminar*, Center for Environmental Sciences and Education, Northern Arizona University, Flagstaff, AZ, September 2004 (INVITED)
48. “Cougars on the edge...of Flagstaff,” for the *Forestry Seminar Series*, School of Forestry, Northern Arizona University, Flagstaff, AZ, September 2004 (INVITED)
47. “Y2Y and conservation design: Problematic doctrines and an evolving formula,” for the graduate seminar *Large-Scale Conservation: Integrating Science, Management, and Policy* (F&ES 909b), sponsored by the Yale School of Forestry and Environmental Studies, New Haven, CT, February 2004 (INVITED)
46. “Human dimensions of wildlife management,” for undergraduate class *Wildlife Management* (BIO333), Northern Arizona University, Flagstaff, AZ, October 2003 (INVITED)
45. “The practice of grizzly bear conservation,” for the *Western Resources Special Interest Group*, Yale School of Forestry and Environmental Studies, New Haven, CT, February 2003 (INVITED)
44. “Values and perspectives in grizzly bear conservation,” for graduate class *Foundations of Natural Resources Policy and Management* (F&ES 891), Yale School of Forestry & Environmental Studies, New Haven, CT, February 2003 (INVITED)
43. “‘Conservation is like warfare’: Phantom common ground in grizzly bear conservation,” for seminar *Society & Natural Resources: Sustaining the Common Interest* (F&ES 746), Yale School of Forestry & Environmental Studies, New Haven, CT, February 2003 (INVITED)

42. "Conditions of grizzly bear policy implementation," for graduate class *Species and Ecosystem Conservation* (F&ES 520), Yale School of Forestry and Environmental Studies, New Haven, CT, October 2002 (INVITED)
41. "The Yellowstone grizzly bear: prospects for the future," for the *Western Resources Special Interest Group*, Yale School of Forestry and Environmental Studies, New Haven, CT, October 2002 (INVITED)
40. "Conduct, misconduct and the structure of science," for Dr. Charles van Riper III's graduate lab seminar, Department of Biology, Northern Arizona University, Flagstaff, AZ, April 2002 (INVITED)
39. "Decision processes in grizzly bear conservation," for graduate class *Species and Ecosystem Conservation* (F&ES 520), Yale School of Forestry and Environmental Studies, New Haven, CT, October 2001 (INVITED)
38. "Grizzly bear conservation," for the *Western Resources Special Interest Group*, Yale School of Forestry and Environmental Studies, New Haven, CT, October 2001 (INVITED)
37. "Foraging behavior of Yellowstone grizzly bears," for *Biological Sciences Departmental Seminar Program*, Department of Biological Sciences, Northern Arizona University, Flagstaff, AZ, February 2001 (INVITED)
36. "Grizzly bears in Yellowstone," for *Wildlife Management* class, Bozeman High School, Bozeman, MT, October 2000 (INVITED)
35. "Human dimensions of carnivore management," for *Human Dimensions of Wildlife Management* (WLF520), Department of Fish & Wildlife Resources, University of Idaho, Moscow, ID, March 2000 (INVITED)
34. "Decision processes in grizzly bear conservation," for graduate class *Species and Ecosystem Conservation* (F&ES 520), Yale School of Forestry and Environmental Studies, New Haven, CT, October 1999 (INVITED)
33. "Conservation of Yellowstone's grizzly bears," for graduate/undergraduate class *Conservation Biology*, Department of Biology, Boise State University, Boise, ID, May 1999 (INVITED)
32. "Viability analysis and monitoring techniques for grizzly bears," for undergraduate class *Fish & Wildlife Ecology, Management, & Conservation* (WLF 290), Department of Fish & Wildlife Resources, University of Idaho, Moscow, ID, May 1999 (INVITED)
31. "Professional practice in the grizzly bear arena," for undergraduate *Wildlife Seminar* (FISH 495), Department of Fish & Wildlife Resources, University of Idaho, Moscow, ID, March 1999 (INVITED)
30. "Grizzly bear science and management in the Yellowstone ecosystem," for graduate/undergraduate class *Northwest Environmental Issues* (HIST 404/504), Department of History, University of Idaho, Moscow, ID, March 1999 (INVITED)
29. "Conservation of grizzly bears in Idaho," for graduate class *Conservation Biology* (WLF 440), Department of Fish & Wildlife Resources, University of Idaho, Moscow, ID, May 1998 (INVITED)
28. "Policy analysis of grizzly bear conservation," for graduate class *Species and Ecosystem Conservation* (F&ES 520), Yale School of Forestry and Environmental Studies, New Haven, CT, March 1998 (INVITED)
27. "Human dimensions of grizzly bear science and management," for graduate class *Human Dimensions of Wildlife Management* (WLF 520), Department of Fish & Wildlife Resource, University of Idaho, Moscow, ID, March 1998 (INVITED)
26. "Conservation of Yellowstone's grizzly bears," for *Special Topics Senior Honors Seminar* (WLF 404), Department of Fish & Wildlife Resources, University of Idaho, January 1998 (INVITED)
25. "A contextual basis for methods of science," for the *Department of Philosophy Seminar*, sponsored by the University of Idaho Undergraduate Philosophy Organization, Moscow, ID, November 1997 (INVITED)

24. "The behavioral ecology of Yellowstone's grizzly bears," for undergraduate class *Behavioral Ecology* (WLF 441), Department of Fish & Wildlife Resources, University of Idaho, October 1997 (INVITED)
23. "Grizzly bear habitat relations in the Yellowstone ecosystem," for graduate class *Wildlife Habitat Ecology* (WLF 545), Department of Fish & Wildlife Resources, University of Idaho, September 1997 (INVITED)
22. "Use of demographic indices for monitoring wildlife populations: Grizzly bears as an example," for undergraduate class *Wildlife Management* (WLF 442), Department of Fish & Wildlife Resources, University of Idaho, April 1997 (INVITED)
21. "Policy-relevant science: Grizzly bears in Idaho," for workshop *Interdisciplinary Conservation Science*, sponsored by the Yale Student Chapter of the Society for Conservation Biology, New Haven, CT, April 1997 (INVITED)
20. "Professional practice in endangered species conservation," for graduate class *Natural Resource Policy and Management* (F&ES 891), Yale School of Forestry and Environmental Studies, New Haven, CT, April, 1997 (INVITED)
19. "Human dimensions of grizzly bear science and management," for graduate class *Human Dimensions of Wildlife Management* (WLF 520), Department of Fish & Wildlife Resource, University of Idaho, Moscow, ID, March 1997 (INVITED)
18. "Life histories of North American bears," for graduate class *Large Mammal Ecology* (WLF 544), Department of Fish & Wildlife Resources, University of Idaho, March 1997 (INVITED)
17. "Variation and pattern in the behavior of Yellowstone's grizzly bears," for *Department of Fish & Wildlife Resources Seminar*, University of Idaho, Moscow, ID, January 1997 (INVITED)
16. "The pitfalls of applied research," for undergraduate class *Wildlife Management* (WLF 442), Department of Fish and Wildlife Resources, University of Idaho, Moscow, ID, April 1996 (INVITED)
15. "Professional practice in endangered species conservation," for graduate class *Natural Resource Policy and Management* (F&ES 891), Yale School of Forestry and Environmental Studies, New Haven, CT, March 1996 (INVITED)
14. "Grizzly bear conservation," for graduate class *Species and Ecosystem Conservation* (F&ES 520), Yale School of Forestry and Environmental Studies, New Haven, CT, March 1996 (INVITED)
13. "Grizzly bear conservation," for graduate class *Species and Ecosystem Conservation* (F&ES520), Yale School of Forestry and Environmental Studies, New Haven, CT, March 1995 (INVITED)
12. "Professional practice in endangered species research," for graduate seminar *Society and Natural Resources* (F&ES524), Yale School of Forestry and Environmental Studies, New Haven, CT, March 1995 (INVITED)
11. "Sustaining grizzly bears in the Rocky Mountains," for *Departmental Seminar*, Department of Fish and Wildlife Resources, University of Idaho, Moscow, March 1995 (INVITED)
10. "Grizzly/brown bear ecology," for the graduate class *Large Mammal Ecology* (WLF544), Department of Fish and Wildlife Resources, University of Idaho, Moscow, February 1995 (INVITED)
9. "Calculation of sustainable grizzly bear mortality from unduplicated counts of females with cubs-of-the-year," for the graduate class *Fish and Wildlife Population Analysis* (WLF543), Department of Fish and Wildlife Resources, University of Idaho, Moscow, December 1994 (INVITED)
8. "Natural history of northern bears," for the undergraduate class *Natural History of Mammals* (ZOOL483), Department of Biological Sciences, University of Idaho, Moscow, ID, October 1993 (INVITED)
7. "Conservation of Yellowstone's grizzly bears," for *Conservation Biology Seminar*, Division of Biological Sciences, University of Montana, September 28, 1993 (INVITED)
6. "Grizzly bear habitat selection," for the graduate class *Wildlife Habitat Ecology* (WLF545), Department of Fish and Wildlife Resources, University of Idaho, Moscow, ID, September 20, 1993 (INVITED)

5. "Implementation of the endangered species act: Lessons from the Yellowstone grizzly bear population," for *Graduate Seminar*, Yale School of Forestry and Environmental Studies, New Haven, CT, April 8, 1993 (INVITED)
4. "Biology and management of the Yellowstone grizzly bear," for *Wildlife Forum*, sponsored by the Student Chapter of The Wildlife Society, Montana State University, Bozeman, MT, February 7, 1993 (INVITED)
3. "Lessons for improving endangered species conservation: The Yellowstone grizzly bear population," for the graduate seminar *Lessons for Improving Endangered Species Conservation*, and "Conservation and management of the Yellowstone grizzly," for the School of Natural Resources and Environment, University of Michigan, Ann Arbor, MI, November 1992 (INVITED)
2. "Implementation of grizzly bear research results," for the course *Ecology of Greater Yellowstone*, Yellowstone Institute, Yellowstone National Park, WY, July 1992 (INVITED)
1. "Grizzly bear food habits and habitat use," for the course *Bears: Folklore and Biology*, Yellowstone Institute, Yellowstone National Park, WY, June 1992-93 (2 presentations) (INVITED)

**Graduate Student Committees & Interns:** Since 1990 the scientist has been Committee Member, Faculty Advisor or Preceptor for **24 students** pursuing Ph.D. or M.S. degrees, Certificates or Special Credits.

**20.** Co-Committee Chair for Kirsten Ironside, *Movements and habitat selection by cougars on the Colorado Plateau*, Ph.D. Program, Department of Biology, Northern Arizona University, 2009-present.

**19.** Co-Advisor for, Erin Savage, *Mountain lion management in southeastern Arizona: A policy of lethal control*, M.S. Thesis, Yale School of Forestry & Environmental Studies, New Haven, CT, 2008-2010.

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**18.** Advisor for Tanya Rosen, *Social and policy implications of bear reintroductions in Europe: The life and death of brown bear JJ1*, submitted to *Human Dimensions of Wildlife*, Yale School of Forestry & Environmental Studies, New Haven, CT, 2007-2008.

**17.** Reader for Taijs van Maasakkers, *Environmental restoration in the Atchafalaya Basin: Boundaries and interventions*, Masters of Conservation Planning, MIT Department of Urban Studies & Planning, Cambridge, MA, 2008.

**18.** Faculty Advisor for Maria Martin Rodriguez-Ovelleiro, Special Credit Project, Yale School of Forestry & Environmental Studies, New Haven, CT, September-December 2006.

**17.** Faculty Advisor for Avery Anderson, Special Credit Project, Yale School of Forestry & Environmental Studies, New Haven, CT, September-December 2006.

**16.** Faculty Advisor for Rebecca Watters, Special Credit Project, Yale School of Forestry & Environmental Studies, New Haven, CT, September 2005-December 2006.

**15.** Co-Chair for Brandon Holton, *Upland free water availability and wildlife*, M.Sc. Thesis, Northern Arizona University, Flagstaff, AZ, 2004-2007.

**14.** Faculty Advisor for Trevor Streng, *Cougar biology and policy in northern Arizona*, Senior Project, Center for Environmental Sciences and Education, Northern Arizona University, Flagstaff, AZ, 2004-2005.

**13.** Faculty Advisor for Conservation Ecology Graduate Certificate for Sarah Hartwell, *The African bushmeat crisis: A summary of the problem and its causes*, Conservation Ecology Graduate Certificate Program, Northern Arizona University, Flagstaff, AZ, 2004-2005.

12. Preceptor for Winter Study Project for Margaret Carr and David Allen, *Where the wild things are: A study of cougar response to the presence of humans*, Winter Studies Program (SPEC 99), Williams College, Williamstown, MA, 2004.
11. Committee Member for M.S. program for Suzanne Cardinal, *Home range, movement patterns and habitat use of southwestern willow flycatchers at Roosevelt Lake, Arizona*, Department of Biological Sciences, Northern Arizona University, Flagstaff, AZ, 2003-2005.
10. Committee Member for M.S. program for Mark Weissinger, *Striped skunk (Mephitis mephitis) home range, seasonal and daily movements, and denning ecology in Flagstaff's urban environment*, Department of Biological Sciences, Northern Arizona University, Flagstaff, AZ, 2003-2007.
9. Committee Member for Ph.D. program for Ramona Maraj, *Human land use and grizzlies in southwest Yukon*, Faculty of Environmental Design, University of Calgary, Calgary, AB, 2003-2006. *Two co-authored journal articles in preparation.*
8. Faculty Advisor for Conservation Ecology Graduate Certificate for Matt Clark, *Potential effects of gray wolf reintroduction on the carnivore community of the Grand Canyon ecoregion*, Conservation Ecology Graduate Certificate Program, Northern Arizona University, Flagstaff, AZ, 2003-2004.
7. Faculty Advisor for Conservation Ecology Graduate Certificate for Brandon Holton, *Ecological costs and benefits of artificial water sites, with special emphasis on potential prey traps*, Conservation Ecology Graduate Certificate Program, Northern Arizona University, Flagstaff, AZ, 2003.
6. Committee Member for M.S. program for Elizabeth Ruther, *Conflict & co-habitation: a survey of northern Arizona ponderosa pine ecosystem residents assessing nature views and cougar perceptions*, Environmental Science & Policy, Northern Arizona University, Flagstaff, AZ, 2002-2005. *One co-authored journal article in preparation.*
5. Preceptor for Intern Program for Jesse Millen-Johnson involving field work on a Flagstaff area mountain lion project, Bates College, Lewiston, ME, 2003.
4. *Ex officio* Committee Member for Ph.D. program for Seth Wilson, *Landscape features and attractants that predispose grizzly bears to risk of conflict with humans*, University of Montana, Missoula, MT, 1999-2003. *Two co-authored journal articles.*
3. *Ex officio* Committee Member for Ph.D. program for Kerry Murphy, *Ecology of mountain lions in Yellowstone National Park*, University of Idaho, Moscow, ID, 1993-1997.
2. Principal Agency Advisor for M.S. program for Gerald Green, *Use of spring carrion by bears in Yellowstone National Park*, University of Idaho, Moscow, ID, 1987-1994. *One co-authored journal paper.*
1. Principal Agency Advisor for M.S. program for Daniel Reinhart, *Grizzly bear use on cutthroat trout spawning streams in tributaries of Yellowstone Lake*, Montana State University, Bozeman, MT, 1985-1990. *Two co-authored journal papers.*

### Appointments

11. Invited Member of *Large Carnivore Group*, Yale School of Forestry & Environmental Studies, New Haven, CT, 2008-present.
10. Lecturer & Visiting Senior Scientist, *Yale School of Forestry and Environmental Studies*, June 2006-present.
9. Western Field Director, *MIT-USGS Science Impact Collaborative*, Massachusetts Institute of Technology, April 2007-2010.

8. Adjunct Faculty, *Center for Environmental Sciences and Education* and *School of Earth Sciences and Environmental Sustainability*, Northern Arizona University, 2004-present.

7. Federal Agency Representative, Executive Board, *Colorado Plateau Chapter of the Society for Conservation Biology*, 2003-present.

6. Adjunct Faculty, *Department of Biology*, Northern Arizona University, 2002-present.

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5. Scholar-in-residence, *MIT-USGS Science Impact Collaborative*, *MIT Department of Urban Studies and Planning*, June 2007-2008.

4. Associate, *Merriam-Powell Center for Environmental Research*, Northern Arizona University, 2002-present.

3. Steering Committee Member, *Center for Sustainable Environments*, Northern Arizona University, 2002-2004.

2. Co-chair, Arizona Chapter, Southwestern Carnivore Committee, 2002-2004.

1. Faculty Participant, Conservation Ecology Graduate Certificate, Center for Environmental Sciences and Education, Northern Arizona University, 2001-2006.

#### **Conference Planning** since 1992

15. Co-organizer, with M. Wolfe, of workshop, “Opportunities for collaborative mountain lion research in the interior western United States,” *17<sup>th</sup> Annual Conference of The Wildlife Society*, Snowbird, UT, January 2010-October 2010

14. Organizer of workshop, “Opportunities for collaborative mountain lion research on and near the Colorado Plateau,” *10<sup>th</sup> Biennial Conference of Research on the Colorado Plateau*, Flagstaff, AZ, April 2009-October 2009

13. Program Chair and part of core Planning Committee for *10<sup>th</sup> Biennial Conference of Research on the Colorado Plateau*, October 2008-October 2009

12. Member of Planning Committee for workshop, *Improving Prospects for Cougar Conservation: Clarifying Goals, Identifying Problems, Seeking Solutions*, Seattle, WA, August-November 2008

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11. Member of Planning Committee, *Annual Meeting at Marble Canyon*, sponsored by the Colorado Plateau Chapter of the Society for Conservation Biology, Marble Canyon, AZ, April-August 2006.

10. Member of Interagency Committee for workshop on *Water Developments for Wildlife*, Arizona State University, Tempe, AZ, November 2004, sponsored by numerous stakeholder in the issues of water developments, 2004-2005.

9. Member of Advisory Committee for conference *Governance and Decision-Making in Mountain Areas*, June 2005, Banff, AB, sponsored by The Banff Centre and Parks Canada, 2004-2005.

8. Member of Advisory Committee for workshop on *Faunal Populations and Communities*, Northern Arizona University, Flagstaff, AZ, April 2004, sponsored by NPS Southern Colorado Plateau I&M Network, Flagstaff, AZ, 2004.

7. Member of Conference Committee for *Views of the Elephant: Lessons Learned from Personal Experiences in Conservation*, Marble Canyon, AZ, April 2004, sponsored by the Colorado Plateau Chapter for Conservation Biology, 2004.

6. Advisor for workshop *Policy-Oriented Conservation Design*, Pender Island, BC, February 2004, sponsored by the Wilburforce Foundation and Y2Y Conservation Initiative, 2004.

5. Member of Advisory Committee for workshop *Large-Scale Conservation: Exploring Challenges, Perspectives, and Opportunities in the Y2Y Case*, Yale University, New Haven, CT, April 2004, sponsored by Yale School of Forestry & Environmental Studies, New Haven, CT, and Kent State University, Kent, OH, 2003-2004.

4. Member of Scientific Advisory Committee for *Carnivores 2004* conference, Santa Fe, NM, November 2004, for Defenders of Wildlife, Washington, D.C., 2003-2004.

3. Conference Chair, oversaw all aspects of 7<sup>th</sup> *Biennial Conference of Research on the Colorado Plateau*, Flagstaff, AZ, November 2003, 2002-2003.

2. Program Chair, planned and organized program for 6<sup>th</sup> *Biennial Conference of Research on the Colorado Plateau*, Flagstaff, AZ, November 2001, 2000-2001.

1. Client's Day Chair, developed and organized Client's Day for 5<sup>th</sup> *Biennial Conference of Research on the Colorado Plateau*, Flagstaff, AZ, November 1999, 1999.

#### **e. TECHNICAL TRAINING & INFORMATION TRANSFER PROVIDED since 1992**

45. "Project background and context: Or, what we did and why, and how to interpret and use our results," for *NCCWSC Forecasting Climate Impacts on Wildlife in the Arid Southwest*, Advisory Team meeting, Flagstaff, AZ, June 2011.

44. "Selection of species, conceptual models, model complexity, and approaches for spatially displayed uncertainty in model outcomes," for *NCCWSC Forecasting Climate Impacts on Wildlife in the Arid Southwest*, Advisory Team meeting, Flagstaff, AZ, September 2010.

43. WORKSHOP convened and led to develop study plan and proposal (*Source-sink dynamics of arid-land mammals: Desert bighorn sheep and their predators in southeastern Nevada*) in response to DoD SERDP rfp, Henderson, NV, February 2010.

42. WORKSHOP convened and led to scope research related to loss of whitebark pine in the northern Rocky Mountains and modeling changes in grizzly bear density under global change, Denver Zoo, Denver, CO, February 2010.

41. "Predatory behavior of mountain lions on the southern Colorado Plateau," 1<sup>st</sup> author with B. Holton, Staff Briefing for the Coconino National Forest, Peaks RS, Flagstaff, AZ, June 2010. (INVITED)

40. "Climate change effects on plant and animal species in the Southwest," for *Flagstaff Science Center Climate Change Workshop*, USGS Flagstaff Science Center, Flagstaff, AZ, May 2010. (INVITED)

39. "NCCWSC project: Forecasting climate impacts on wildlife in the arid Southwest – Module 3," 1<sup>st</sup> author with et al., for *NCCWSC Forecasting Climate Impacts on Wildlife in the Arid Southwest*, Stakeholder Advisory Group, Phoenix, AZ, April 2010.

38. “Thinking outside the box,” for *Human Dimensions of Carnivore Conservation: Experts Workshop*, Florida Wildlife Commission and Florida Defenders of Wildlife, White Oak Plantation, FL, January 2010. (INVITED)
37. “USGS mountain lion studies in the interior Southwest,” briefing for Sue Hazeltine and Bruce Jones, University of Arizona, Tucson, AZ, December 2009. (INVITED)
36. “NCCWSC project: Forecasting climate impacts on wildlife in the arid Southwest,” 1<sup>st</sup> author with et al., briefing for Sue Hazeltine and Bruce Jones, University of Arizona, Tucson, AZ, December 2009. (INVITED)
35. “Lion research in the Flagstaff area,” for *All Regional Staff Meeting, Region II, Arizona Game & Fish Department*, Flagstaff, AZ, October 2009. (INVITED)
34. “Interdisciplinary problem-solving (IPS) skills-upgrading workshop,” WORKSHOP for Banff National Park Grizzly Bear IPS Group, Banff, Alberta, October 2009. (INVITED)
33. “Forecasting effects of climate change on focal wildlife species within Sonoran desert and Colorado Plateau ecosystems,” for *NCCWSC Forecasting Climate Impacts on Wildlife in the Arid Southwest*, Advisory Team, Flagstaff, AZ, October 2009. (INVITED)
32. “USGS-National Park Service mountain lion studies on the southern Colorado Plateau,” 1<sup>st</sup> author with B. Holton, T. Arundel, K. Ironside, R.V. Ward, & C. Crow, briefing for DOE & USGS Nevada Test Site personnel, Las Vegas, NV, October 2009.
31. “Upland free water on the Colorado Plateau: Past, present, and future?,” for USGS Water Resources Discipline, *National Research Program Research Committee Meeting*, Flagstaff, AZ, May 2009. (INVITED)
30. “Mountain lions of Zion NP: 2006-2008,” 1<sup>st</sup> author with J. Hart, T. Arundel, & B. Holton for Staff of Zion National Park, Springdale, UT, May 2009. (INVITED)
29. “Managing for human safety in mountain lion range,” 1<sup>st</sup> author with K. Logan & L. Sweanor for Staff of Zion National Park, Springdale, UT, May 2009. (INVITED)
28. “Living with large fierce creatures: Cougars and humans on the southern Colorado Plateau,” 3<sup>rd</sup> author with T. Arundel & B. Holton for *2008-2009 Flagstaff Leadership Program*, Flagstaff, AZ, May 2009. (INVITED)
27. “Mountain lions in ecosystems: Evidence and speculations about effects,” 1<sup>st</sup> author with B. Holton for workshop on *Landscape-Scale Management Strategies for Wide-Ranging Mammals*, Grand Canyon NP, AZ, June 2009. (INVITED)

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26. “USGS BRD: A modern organization in a post-modern world,” for *Seminar Series*, USGS Flagstaff Science Center, Flagstaff, AZ, May 2007. (INVITED)
25. “The Glen Canyon Dam Adaptive Management Program: A preliminary appraisal,” briefing for the USGS Southwest Biological Science Center Management Team and Grand Canyon Monitoring & Research Center Program Leaders, Flagstaff, AZ, May 2007. (INVITED)
24. “Why Yale? What at Yale?,” for *Brown Bag Seminar*, USGS Colorado Plateau Research Station, Flagstaff, AZ, April 2007. (INVITED)

23. "Monitoring wildlife in wilderness," INSTRUCTOR for *Class on Natural and Cultural Monitoring in Wilderness*, sponsored by Arthur Carhart National Wilderness Training Center, Las Vegas, NV, March 2006. (INVITED)
22. "Cougars of the Flagstaff Uplands: Preliminary results 2003-2005," 1<sup>st</sup> author with J. Hart & T. Arundel for staff of the Flagstaff Area National Monuments, Flagstaff, AZ, March 2006. (INVITED)
21. "Wildlife, water, and humans in uplands of the Southwest," 1<sup>st</sup> author with M. Miller, briefing for the USGS Western Regional Executives Team, Seattle, WA, February 2006. (INVITED)
20. "Wildlife water developments and the social construction of conservation conflict," for staff of USGS Grand Canyon Monitoring and Research Center, Flagstaff, AZ, February 2006. (INVITED)
19. "Wildlife water developments and the social construction of conservation conflict," 1<sup>st</sup> author with N. Chambers for staff of the BLM State Office and BLM Phoenix Field Office, Phoenix, AZ, January 2006. (INVITED)
18. 1<sup>st</sup> *Workshop of the Colorado Plateau Mountain Lion Working Group*, ORGANIZER and CONVENER, sponsored by USGS Southwest Biological Science Center, Flagstaff, AZ, January 2006.
17. "Cougars of the Colorado Plateau: A multi-park investigation," 1<sup>st</sup> author with J. Hart, T. Arundel, R. Stevens, E. Garding, RV Ward, J. Bradybaugh, & E. Leslie for *USGS Southwest Biological Science Center All Hands Meeting*, Flagstaff, AZ, November 2005. (INVITED)
16. "Safety in Red Rock's lion country," for *Safety Meeting*, USFS Coconino NF, Sedona Ranger District, Sedona, AZ, October 2005. (INVITED)
15. "Perspectives on wildlife water developments: An analysis of documents, quotes, and materials from the November 2004 workshop," for Staff of the BLM Phoenix Field Office, sponsored by the Sonoran Institute and the BLM Phoenix Field Office, Phoenix, AZ, June 2005. (INVITED)
14. "Cougars of the Colorado Plateau: A multi-park investigation, Zion National Park and environs," 1<sup>st</sup> author with J. Hart, T. Arundel, & J. Bradybaugh for Zion NP staff, Zion NP Headquarters, UT, December 2005. (INVITED)
13. "Cougars of the Flagstaff Uplands: An introduction and results of the 2003-2004 field season," 1<sup>st</sup> author with J. Hart & T. Arundel for *August Staff Meeting, Region 2 Arizona Game & Fish Department*, sponsored by Region 2, Arizona Game & Fish Department, August 2004. (INVITED)
12. "Foraging behavior of Yellowstone's grizzly bears: Consumption of whitebark pine seeds and ungulates," for *2004 State Meeting of the Arizona Wildlife Services Program*, sponsored by USDA Wildlife Services, Hawley Lake, AZ, July 2004. (INVITED)
11. "Cougars of the Flagstaff Uplands: An introduction and results of the 2003-2004 field season," 2<sup>nd</sup> author with J. Hart & T. Arundel for *2004 State Meeting of the Arizona Wildlife Services Program*, sponsored by USDA Wildlife Services, Hawley Lake, AZ, July 2004. (INVITED)
10. "Y2Y conservation design: A framework for judging the sufficiency of Y2Y science," for *Y2Y Conservation Science and Planning Meeting*, sponsored by the Yellowstone-to-Yukon Conservation Science and Planning Program, Canmore, AB, January 2002. (INVITED)
9. "People, bear science and decision making," for *Grizzly Bear Research and Monitoring in Banff and Other Mountain National Parks: Where Do We Go From Here?*, sponsored by Parks Canada, Banff, AB, March 2001. (INVITED)
8. "Large Carnivores on the Plateau: a Workshop on the Biology and Management of Pumas and Black Bears in Colorado Plateau National Parks," ORGANIZER and CONVENER with E. Leslie for Utah,

New Mexico, and Arizona state game and fish agencies and U.S. National Park Service, sponsored by the U.S. National Park Service and USGS, Flagstaff, AZ, March 2001.

7. "Modeling regional habitat suitability for large carnivores," for *Yellowstone-to-Yukon Council Meeting*, sponsored by Y2Y Council, Helena, MT, April 1998. (INVITED)

6. "Cumulative effects model: History, interpretation and future," for Interagency Grizzly Bear Committee Yellowstone Cumulative Effects Modeling Team, Mammoth, WY, June 1997. (INVITED)

5. "Suitability of habitat in the Bitterroot Recovery Area," for *Workshop and Briefing on Grizzly Bear Habitat in the Bitterroot Recovery Area*, sponsored by the Idaho Department of Fish & Wildlife, Boise, ID, May 1997. (INVITED)

4. "Grizzly bear use of ungulates and whitebark pine middens," for *Grizzly Bear Seminar for Yellowstone National Park Staff*, Center for Resources, Mammoth, WY, June 1996. (INVITED)

3. "Grizzly bear science," as part of panel *Journey to Recovery*, for *Summer Meeting of the Interagency Grizzly Bear Committee*, Gardiner, MT, June 1996. (INVITED)

2. "Cumulative effects analysis for the Yellowstone grizzly bear population," for *Cumulative Effects Workshop*, sponsored by Canadian Parks Service, Energy Resources Conservation Board, Natural Resources Conservation Board, Shell Canada Ltd., Alberta Resource Planning Branch, and Environment Council of Alberta, Calgary, AB, March 1993. (INVITED)

1. "Experiences of Yellowstone in Ecosystem Management," for *Kananaskis Workshop for the Ecosystem Management Task Force*, sponsored by Canadian Parks Service, Kananaskis, AB, February 1992. (INVITED)

#### **f. SPECIAL ASSIGNMENTS**

15. Member of the *USGS Southwest Biological Science Center Strategic Planning Core Team*, June 2011-present.

14. Chair of *Hiring Committee for GS-13 Landscape Ecologist*, USGS Southwest Biological Science Center, September-November 2010.

13. Member of *USGS Research Grade Evaluation Panels*, Milwaukee, WI, 2010, and for Sasha Reed, USGS Southwest Biological Science Center, February-March 2010.

12. Principal USGS Agent for renewal of 5-year *Memorandum of Understanding and Cooperative Agreement* between USGS and Northern Arizona University governing operations of the Colorado Plateau Research Station at Northern Arizona University, 2008-2009.

11. Station Leader/Liaison for USGS Colorado Plateau Research Station, Southwest Biological Science Center, Flagstaff, AZ, 2009-2011.

10. Acting Center Director for USGS Southwest Biological Science Center, Flagstaff, AZ, as requested, 2003-present; *performed routine duties of Center Director in the absence of official Director*.

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9. Member of Steering Committee, *Global Climate Change Collaborative (G3C)*, MIT-USGS Science Impact Collaborative, Cambridge, MA, 2007-2008.

8. Member of the *Science Advisory Group* for the *USGS Science Strategy Team*, February-June 2006.

7. Member of *USGS Research Grade Evaluation Panels*, Reno, NV, 2001, and Columbus, OH, 2006.
6. Member of the *USGS Southwest Biological Science Center Strategic Planning Core Team*, November 2005-February 2006.
5. Reporter for *Workforce Planning Break-Out Group 4, USGS Southwest Biological Science Center All Hands Meeting*, Flagstaff, AZ, November 2005.
4. Team Leader for *Large Mammals and Predators, USGS Wildlife Program Five Year Strategic Plan*, August 2004-January 2005.
3. Acting Station Leader for USGS Colorado Plateau Research Station, Flagstaff, AZ, as needed 2000-2008; *performed routine duties of Field Station Leader in the absence of official Leader*.
2. Committee Chair, USGS Colorado Plateau Field Station Information Resources Management Committee, 2000-2004; *provided oversight for resolution of IRM issues at the Field Station*.
1. Special Project, Interagency Grizzly Bear Study Team, Bozeman, MT, 1982-1983; *developed procedures for and mapped habitat and cover types on 300,000 acres of National Forest lands delineated by the scientist in core grizzly bear range*.

**g. OTHER TECHNICAL ACTIVITIES** since 1998, but earlier accomplishments where appropriate

**A.** By invitation, the scientist advised nationally important programs, reviewed nationally important projects, or participated in advanced disciplinary workshops. He was among a few nationally recognized bear scientists to serve on a review panel for the controversial *Tongass National Forest Land Management Plan*. The scientist was also one of three internationally recognized grizzly bear scientists invited by the IUCN Conservation Biology Specialists Group to serve as an advisor and technical specialist for a population viability workshop in Canada. Also of relevance to Canada, the scientist was engaged to review the controversial and potentially influential *Muskwa-Kechika Wildlife Management Plan*. He was invited as one of the foremost conservation biologists in North America to attend a workshop that reviewed and advanced concepts of regional conservation design and contributed to two chapters of a book that reported the results of this endeavor. The scientist was similarly invited as one of the nation's foremost carnivore researchers and conservation biologists to participate in a workshop and serve on an advisory committee for development of a national bioregional conservation planning process. More recently the scientist has been recognized as an authority in the field of cougar research and management, most notably by his engagement to review the authoritative *Cougar Management Guidelines for North America* and the high-profile *Analysis of Scientific Publications for the Florida Panther*, as well as to advise the Florida Panther Recovery Team on methods for public engagement. The scientist has also advised key BLM personnel on BLM's recently constituted Rapid Ecoregional Assessment (REA) program, including reviews of two seminal planning documents for the Colorado Plateau and Sonoran Desert REAs.

**B.** On the basis of specific requests, 1986-present, the scientist provided substantial technical assistance to numerous Master's and Doctoral-level graduate students in domestic academic institutions such as Yale University, Massachusetts Institute of Technology, Brown University, Northern Arizona University, University of New Mexico, Tufts University, the University of Utah, University of Nevada-Reno, and the University of Georgia, (and more) as well as international universities such as the University of Calgary, Wilfrid Laurier University and the University of Waterloo in Canada, Sinchu University in Japan, the University of León in Spain, and the University of Helsinki in Finland. This assistance was primarily in the form of advice on project design and methods, as well as information about policy analysis and bear and cougar ecology. The assistance served to enhance the quality of

academic research programs, built good will between the USGS and academic institutions, and contributed to durable professional relations. This technical assistance was based on the scientist's general knowledge and personal research.

**C.** On the basis of specific requests, 1992-present, the scientist provided substantial technical assistance to Parks Canada regarding management of grizzly bears in Canada. Some of these grizzly bear populations are of potentially great importance to the future conservation of grizzly bears in the adjacent U.S. This assistance pertained to specific management plans or issues (*e.g.*, proposed expansion of the Westcastle development north of Waterton National Park, expansion of the Sunshine Ski Area west of the Townsite of Banff, and construction of roads near Kluane National Park) and to general management issues such as the implementation of ecosystem management or the assessment of current and foreseeable human impacts on large carnivores in the Bow River Valley of Banff National Park and the Greater Kluane ecoregion in the Yukon. Recently this assistance took the form of leading a skills-enhancement workshop during 2009 for a multi-stakeholder Interdisciplinary Problem-Solving (IPS) group involved in management of grizzly bears in Banff National Park. This technical assistance was based on the scientist's general knowledge and personal research.

**D.** On the basis of specific requests, the scientist provided substantial technical assistance to educational media and organizations, including *National Geographic*, *National Geographic Television*, *Audubon* magazine, *Encarta Encyclopedia*, *Earth Notes* radio program, the Canadian Broadcasting Corporation, the British Broadcasting Corporation, Public Broadcasting System, National Public Radio, the Center for Image Processing in Education, ABC, CNN, and the Center for International Environmental Law. This assistance took the form of in-depth interviews, fact checking, verification of bear identification in photos, information on bear and cougar ecology, and provision of data or other teaching aids. The scientist's assistance contributed to enhancing the quality of information about bears and cougars reaching the general public through these educational venues. This assistance was based on the scientist's personal research.

**E.** On the basis of specific requests, 1985-present, the scientist advised and educated numerous private individuals and organizations on the ecology of grizzly bears. This advice was to organizations with commodity interests (*e.g.*, the Targhee Timber Association), organizations with environmental interests (*e.g.*, the Greater Yellowstone Coalition, Western Wildlands, Natural Resources Defense Council), non-partisan groups (*e.g.*, the Henry's Fork Watershed Council), and industry (*e.g.*, Crown Butte Mines). This technical assistance has helped benefit private efforts to conserve bears and cougars or helped to minimize the adverse impacts of human activities on private lands. More importantly, this technical assistance has helped increase the level of scientific knowledge among those in non-governmental capacities who are playing a major role in shaping grizzly bear and cougar management. This technical assistance was based on the scientist's personal research.

**F.** The scientist closely worked with National Park Service biologists, managers, and planners, as needed, 1999-2009, especially on design, execution and appraisal of the National Inventory and Monitoring (I&M) Program. He was intensively involved with the Northern and Southern Colorado Plateau and Mohave Networks. Advice, at times as invited technical papers, pertained to topics ranging from overall strategic direction and philosophy to details of statistical design. The scientist was co-author of an Inventory Plan that was rated by the NPS National I&M Office as 2<sup>nd</sup>-best for the entire country and contributed to the Plan rated 1<sup>st</sup>. The scientist was also involved in appraisal of I&M efforts, including a talk at the George Wright Society Meeting and plans for peer-reviewed journal papers. In 2000 the scientist also provided expert opinion to managers of Canyonlands National Park regarding the impacts of a controversial road. This technical assistance was based on the scientist's general knowledge and personal research.

**G.** The scientist closely worked with US National Park Service and US Forest Service biologists, managers, and planners, as needed, 1985-2008, on issues related to grizzly bear conservation and ecology. The scientist was engaged in development and review of specific plans pertaining to grizzly bear ecology primarily in the Yellowstone ecosystem (e.g., planning and review of Bear Management Areas, Lake Development Concept Plan, Fishing Bridge Campsite Replacement Plan, various plans for road reconstruction, and others). He frequently participated in training programs and advised individual District and Sub-district personnel on grizzly bear ecology and management (e.g., regarding specific Bear Management Areas, or bear use of locally important foods such as ungulate carrion). He also assisted in the design of Park Service-sponsored grizzly bear research or monitoring (e.g., as along cutthroat trout spawning streams, on ungulate winter ranges, or of whitebark pine cone production) and, up until 2008, was part of the Yellowstone Ecosystem Whitebark Pine Working Group. This technical assistance was based on the scientist's personal research.

**H.** On the basis of specific requests, 1986-2008, the scientist provided substantial technical advice to those involved with management and research of brown bears worldwide. This involved the review of research and the revision of manuscripts concerning brown bear conservation in Norway for Dr. Kåre Elgmork, the development of a research program regarding the monitoring of brown bear populations in Kamchatka for Igor Revenko, the development of a program to reintroduce brown bears into two areas of France, for the French Bear Group and Dr. Pascal Wick, the development of research in Kluane National Park, Yukon, for Parks Canada, the status of grizzly bears in Yellowstone National Park for the World Heritage Committee, advice to the Japan Ecosystem Conservation Society on restoration of black and brown bear in the Japan, the development of community-based grizzly bear conservation for Steve Primm and Dr. Tim Clark of the Northern Rockies Conservation Cooperative, the development of a conservation plan for black and grizzly bears in the Yukon for Dr. Brian Horejsi, the development, implementation and reporting of habitat research for scientists on the Interagency Grizzly Bear Study Team, the status of grizzly bear habitat in Idaho for the Idaho Department of Fish and Game, and the development of approaches to planning and implementing bear conservation for teams working with the IUCN. The scientist's assistance has enhanced the prestige of U.S. Department of Interior research programs and has aided the general cause of brown bear conservation. This technical assistance was based on the scientist's general knowledge and personal research.

### Reports since 1992

- 21. Mattson, D.** (2011). *Research needs and opportunities related to cougars and their prey on Grand Staircase-Escalante NM (GSENM) and the BLM Kanab District. Parts 1 & 2.* USGS Southwest Biological Science Center, Flagstaff, AZ. 10 pp.
- 20. Mattson, D.** (2011). *Comments on BLM Colorado Plateau Rapid Ecoregional Assessment Final Workplan 1-4-a.* USGS Southwest Biological Science Center, Flagstaff, AZ. 5 pp. (**INVITED** technical report)
- 19. Johnson, M.J., J.R. Hatten, J.A. Holmes, & D.J. Mattson.** (2011). *Development of a GIS-based Model of Yellow-Billed Cuckoo Breeding Habitat with the Lower Colorado River Multi-Species Conservation Area, San Pedro River and Verde River, AZ: Project Update.* USGS Southwest Biological Science Center, Flagstaff, AZ.
- 18. Mattson, D., M.J. Matthew, J.R. Hatten, J.A. Holmes, & T. Arundel.** (2010). *Development of a GIS-based Model of Yellow-Billed Cuckoo Breeding Habitat with the Lower Colorado River Multi-Species Conservation Area, San Pedro River and Verde River, AZ: Project Update.* USGS Southwest Biological Science Center, Flagstaff, AZ.
- 17. Mattson, D.** (2010). *Comments on the BLM Colorado Plateau and Sonoran Desert REA Identification of Conservation Elements, Change Agents, and Management Questions.* USGS Southwest Biological Science Center, Flagstaff, AZ. 5 pp. (**INVITED** technical report)

**16. Mattson, D.J.** (2010). *Cougars of Zion and Capitol Reef: 2006-2008 project update*. USGS Southwest Biological Science Center, Flagstaff, AZ. 19 pp.

**15. Mattson, D., & L. Sweanor.** (2009). *Report on the workshop: Opportunities for collaborative mountain lion research on and near the Colorado Plateau*. Wild Felid Association, Montrose, CO, and USGS Southwest Biological Science Center, Flagstaff, AZ. 5 pp.

**14. Mattson, D.** (2008). *Parting thoughts about MUSIC's approach to learning*. MIT-USGS Science Impact Collaborative, Cambridge, MA. 3 pp.

**13. Mattson, D.** (2008). *MUSIC as a boundary-spanning and social movement organization*. MIT-USGS Science Impact Collaborative, Cambridge, MA. 3 pp.

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12. Johnson, M., J. Holmes, **D. Mattson**, L. Thomas, & N. Tancreto. (2004). *Summary of faunal populations and communities workshop April 6-7, 2004, Northern Arizona University, Flagstaff, Arizona NPS, Southern Colorado Plateau I&M Network*. U.S. National Park Service, Southern Colorado Plateau I&M Network, Flagstaff, AZ. 10pp. (INVITED technical white paper)

11. **Mattson, D.J.** (2004). *Some thoughts on evaluating the Yellowstone grizzly bear cumulative effects model*. For USGS Interagency Grizzly Bear Study Team, Bozeman, MT. USGS Southwest Biological Science Center, Flagstaff, AZ. 3pp. (INVITED technical white paper)

10. **Mattson, D.J.** (2003). *Thoughts on designing a monitoring program for the Southern Colorado Plateau Network (SCPN) National Park units*. For US National Park Service Southern Colorado Plateau Network, Flagstaff, AZ. USGS Southwest Biological Science Center, Flagstaff, AZ. 4pp. (INVITED technical white paper)

9. **Mattson, D.J.** (2003). *"Conservation is like warfare:" Phantom common ground in the grizzly bear case*. For Yale School of Forestry & Environmental Studies, Seminar on Society & Natural Resources (F&ES 746). 7pp. (INVITED seminar paper)

8. **Mattson, D.J.** (2002). *An approach to selecting vital signs for the Colorado Plateau National Park Service inventory and monitoring program*. For US National Park Service Northern Colorado Plateau Network, Moab, UT. USGS Forest & Rangeland Ecosystem Science Center, Colorado Plateau Field Station. 7pp. (INVITED technical white paper)

7. **Mattson, D.J.** (2001). *Comments on ecological effects of the four-wheel-drive route in Salt Creek, Canyonlands National Park, Utah*. For Southeast Utah Group National Parks & Monuments, Moab, UT. USGS Forest & Rangeland Ecosystem Science Center, Colorado Plateau Field Station. 14pp. (INVITED technical report)

6. **Mattson, D.J.** (2000). *Managing whitebark pine for grizzly bears: Preliminary recommendations*. For Interagency Grizzly Bear Study Team, Bozeman, MT. USGS Forest & Rangeland Ecosystem Science Center, Colorado Plateau Field Station. 3pp. (INVITED technical report)

5. Drost, C., **D.J. Mattson**, M.J. Johnson, A. Cully, M. Bogan, E. Nowak, T. Persons, J. Spence, K. Thomas, & M. Stuart (2000). *Biological inventory of National Park areas on the southern Colorado Plateau*. For US National Park Service Southern Colorado Plateau Network. Colorado Plateau Cooperative Ecosystem Studies Unit and USGS Colorado Plateau Field Station, Flagstaff, AZ. 209pp. (INVITED technical plan; rated second-best inventory plan nationwide).

4. **Mattson, D.J.** (1998). *Coefficients of productivity for Yellowstone's grizzly bear habitat*. USGS Forest & Rangeland Ecosystem Science Center, Corvallis, OR. 85pp. (Technical report).
3. **Mattson, D.J.** (1998). *Research problem analysis: Yellowstone's grizzly bear research program*. For Interagency Grizzly Bear Study Team, Bozeman, MT. USGS Biological Resources Division, Forest & Rangeland Ecosystem Science Center. 10pp. (INVITED technical paper).
2. **Mattson, D.J.** (1993). *Background and Proposed Standards for Managing Grizzly Bear Habitat Security in the Yellowstone Ecosystem*. U.S. National Biological Survey, University of Idaho Cooperative Park Studies Unit, Moscow. 17pp. (Technical report)
1. Reinhart, D.P. & **D.J. Mattson** (1992). *Grizzly Bear and Black Bear Habitat Use in the Cooke City, Montana, Area, 1990-1991*. U.S. National Park Service, Interagency Grizzly Bear Study Team, Bozeman, MT. 31pp. (Technical report)

**Other Significant Technical Assistance since 1998:** The scientist provided significant technical assistance to individuals on **more than 80 occasions** since 1998, including individuals from Spain, Greece, Italy, Russia, Japan and Canada, pertaining to a wide range of topics, including the design and execution of research, design of conservation efforts, and review of research or management efforts. These instances of technical assistance involved either (i) substantial written or verbal correspondence [generally >3 lengthy e-mail messages or a total of >1-2 hrs of conversation], (ii) significant (several pages) of written products by the scientist, (iii) hands-on analysis of data, (iv) the conveyance of substantive technical products, or (v) otherwise substantively important technical input. The scientist provided lesser technical assistance on many other occasions. Individuals receiving significant technical assistance were from the following organizations (more than one instance is indicated by a trailing bolded number in parentheses):

Yale School of Forestry & Environmental Studies, New Haven, CT (**10**)  
 Massachusetts Institute of Technology (**5**)  
 University of Calgary, Calgary, AB (**4**)  
*National Geographic*, Washington, D.C. (**3**)  
 USGS Colorado Plateau Field Station, Flagstaff, AZ (**3**)  
 Interagency Grizzly Bear Study Team, Bozeman, MT (**2**)  
 Tigress Productions, Bristol, UK (**3**)  
 Brown University  
 Oregon State University, Corvallis, OR  
*Nature Conservancy* magazine  
*Audubon* magazine  
*Encarta Encyclopedia*  
 Canadian Broadcasting Corporation, Toronto, ON  
 Earth Notes Radio Program, Flagstaff, AZ  
 Universidad de León, León, Spain  
 Shinshu University, Matsumoto, Japan  
 University of Helsinki, Helsinki, Finland  
 University of Waterloo, Ontario, Canada  
 Wilfrid Laurier University, Waterloo, ON  
 Yale School of Management, New Haven, CT  
 New Mexico State University, Las Cruces, NM  
 University of Utah, Salt Lake City, UT  
 Washington State University, Pullman, WA  
 Kent State University, Kent, OH

Marquette University, Milwaukee, WI  
 Tufts University, Boston, MA  
 Montana State University, Bozeman, MT  
 University of Georgia, Athens, GA  
 University of New Mexico, Albuquerque, NM  
 Parks Canada, Banff National Park  
 Grand Canyon National Park  
 Yellowstone National Park  
 US National Park Service, Great Basin National Park and Mojave Network, Ely, NV  
 US National Park Service, Northern Colorado Plateau Network, Moab, UT  
 USGS Grand Canyon Monitoring & Research Center, Flagstaff, AZ  
 USFS Targhee National Forest, St. Anthony, ID  
 USFS Gallatin National Forest, Gardiner, MT  
 USGS Western Ecological Research Center, Sausalito, CA  
 U.S. Fish and Wildlife Service, Helena, MT  
 Idaho Fish & Game Department, Boise, ID  
 Blackfoot Challenge, Missoula, MT  
 The Banff Centre, Banff, AB  
 American Museum of Natural History, New York, NY  
 Denver Zoo, Conservation Biology Department, Denver, CO  
 Royal Society, Biological Sciences, London, U.K.  
 Y2Y Conservation Initiative, Canmore, AB  
 The Grand Canyon Trust, Flagstaff, AZ  
 Turner Endangered Species Fund, Bozeman, MT  
 Sinapu, Boulder, CO  
 WildFutures / Earth Island Institute  
 San Juan Citizen's Alliance  
 Colorado Grizzly Project  
 Sierra Club Grizzly Bear Ecosystems Project, Bozeman, MT  
 The Wilderness Society, Anchorage, AK  
 World Wildlife Fund & Northern Rockies Conservation Cooperative, Ennis, MT  
 Round River Conservation Studies, Salt Lake City, UT  
 Center for Image Processing in Education, Tucson, AZ  
 Center for Environmental Law, Washington, D.C.  
 Western Wildlife Environments Consulting, Alberta, AB  
 Great Divide Nature Interpretation, Lake Louise, AB

## (15) OUTREACH AND INFORMATION TRANSFER AND DISSEMINATION

### **Technical Information Bulletins or Fact Sheets** since 1998

4. **Mattson, D.**, J. Hart & T. Arundel (2005). *Kills by cougars in the Flagstaff uplands of northern Arizona, July 2003-February 2005*. USGS Southwest Biological Science Center, Flagstaff, AZ. 1 pp. (Fact sheet/Research Briefing)

3. **Mattson, D.**, T. Arundel, & J. Hart (2005). *Preliminary analysis of habitat selection by cougars in the Flagstaff uplands of northern Arizona*. USGS Southwest Biological Science Center, Flagstaff, AZ. 1 pp. (Fact sheet/Research Briefing)

2. **Mattson, D.J.**, J. Hart & T. Arundel (2004). *Kills by cougars in the Flagstaff Uplands of northern Arizona July 2003-May 2004*. USGS Southwest Biological Science Center, Flagstaff, AZ. 1 pp. (Fact sheet/Research Briefing)

1. **Mattson, D.J.**, J. Hart & T. Arundel (2002). *Cougars of the Flagstaff uplands*. USGS Southwest Biological Science Center, Flagstaff, AZ. 2 pp. (Fact sheet/Research Briefing)

#### Web Sites since 1998

2. White, L., & **D.J. Mattson** (2001). *Grizzly Bears*.  
[http://sbsc.wr.usgs.gov/cprs/research/projects/grizzly/grizzly\\_bears.asp](http://sbsc.wr.usgs.gov/cprs/research/projects/grizzly/grizzly_bears.asp)

1. **Mattson, D.J.**, & L. White (2001). *Grizzly Bears in North America*.  
[http://sbsc.wr.usgs.gov/cprs/research/projects/grizzly/grizzly\\_na.asp](http://sbsc.wr.usgs.gov/cprs/research/projects/grizzly/grizzly_na.asp)

#### Invited Public Presentations since 1998

37. "Brother bear, sister bear: Connections between people and bruins," *Lunch Lecture Series*, Arizona State Parks, Riordan Mansion State Park, Flagstaff, AZ, June 2010. (INVITED)

36. "Brother bear, sister bear: Cosmic connections between people and bruins," for *2009 Flagstaff Festival of Science*, Flagstaff, AZ, October 2009. (INVITED)

35. "Psycho-, social, and political dynamics of cougar management," for *Montana Mountain Lion Workshop*, sponsored by WildEarth Guardians, Bozeman, MT, April 2009. (INVITED)

34. "A little about lions and lion habitat in Montana," for *Montana Mountain Lion Workshop*, sponsored by WildEarth Guardians, Bozeman, MT, April 2009. (INVITED)

33. "Improving prospects for conserving cougars," for *Workshop on Cougar Conservation*, Dumas Bay Centre, Tacoma, WA, November 2008. (INVITED)

32. "Mountain lions of the Flagstaff Uplands," booth for *Science in the Park*, Flagstaff Festival of Science, Flagstaff, AZ, September 2008. (INVITED)

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31. "State-level wildlife management: With dignity for all," for *2007 Animal Grantmakers' Conference*, Napa, CA, November 2007. (INVITED)

30. "Bears in the backyard: Coexistence and the nature of bruins," for public event sponsored by Jackson Hole Wildlife Foundation and Patagonia, Teton Science School, Jackson, WY, July 2007. (INVITED)

29. "Lions in the mountains: Coexistence and the nature of pumas," for *Summer Speakers Series*, Willow Bend Environmental Center, Flagstaff, AZ, July 2006. (INVITED)

28. "Lions in the mountains: Co-existence and the nature of pumas," for *Summer Speakers Series*, sponsored by Red Rock State Park, Sedona, AZ, June 2006. (INVITED)

27. "Living with large fierce creatures: Cougars and humans on the Southern Colorado Plateau," for *Flagstaff Leadership Program*, sponsored by USGS Flagstaff Science Center, Flagstaff, AZ, May 2006. (INVITED)

26. "Living with fierce creatures: Cougars on the southern Colorado Plateau," for *Environmental Studies Colloquium*, Prescott College, Prescott, AZ, April 2006. (INVITED)

25. "Cougars of the Colorado Plateau: A multi-park investigation, Zion National Park and environs," 1<sup>st</sup> author with J. Hart, T. Arundel, and J. Bradybaugh for informational public presentation sponsored by Zion NP, Springdale, UT, December 2005. (INVITED)
24. "Cougars of the Flagstaff Uplands," for *Flagstaff Festival of Science, Speakers Series*, Flagstaff, AZ, October 2005. (INVITED)
23. "Cougars of the Flagstaff Uplands," 2<sup>nd</sup> author with J. Hart for *Community Forest Forum*, sponsored by the Greater Flagstaff Forest Partnership, Flagstaff, AZ, October 2004. (INVITED)
22. "Tools for understanding the dynamics and outcomes of complex conservation cases," for the staff of the Japan Ecosystem Conservation Society, sponsored by the Japan Ecosystem Conservation Society, Tokyo, Japan, September 2004. (INVITED)
21. "Cougars of the Flagstaff Uplands," 2<sup>nd</sup> author with J. Hart for *Science in the Park*, sponsored by Flagstaff Festival of Science, Flagstaff, AZ, September 2004. (INVITED)
20. "Cougars of the Flagstaff Uplands: An introduction and results of the 2003-2004 field season," 1<sup>st</sup> author with J. Hart & T. Arundel for *2004 Flagstaff Field Center Open House*, sponsored by the USGS Flagstaff Field Center, July 2004. (INVITED)
19. "From bugs to bison: A grizzly bear's view of the Greater Yellowstone," for the *2004 Yellowstone Grizzly Bear Writer's Workshop*, sponsored by the Natural Resources Defense Council, B-Bar Ranch, MT, May 2004. (INVITED)
18. "Rationality and information psycho-sociology in conservation," for the *Grand Canyon Trust Luncheon Seminar Series*, sponsored by the Grand Canyon Trust, Flagstaff, AZ, March 2004. (INVITED)
17. "Conservation of Yellowstone grizzly bears," for *Rocky Mountain College Annual Speaker Series*, sponsored by Rocky Mountain College, Billings, MT, January 2004. (INVITED)
16. "Cougars of the Flagstaff Uplands," 2<sup>nd</sup> author with J. Hart for *Science in the Park*, sponsored by Flagstaff Festival of Science, Flagstaff, AZ, September 2003. (INVITED)
15. "Grizzly bears of Greater Yellowstone," for *Greater Yellowstone Coalition 20<sup>th</sup> Anniversary Annual Meeting*, sponsored by the Greater Yellowstone Coalition, West Yellowstone, MT, June 2003. (INVITED)
14. "Connecting the dots: Bears, numbers, habitat & humans," for the *Natural Resources Defense Council, Grizzly Bear Writer's Workshop*, B-Bar Ranch, MT, May 2003. (INVITED)
13. "Thoughts on transboundary monitoring and management of grizzly bears," for evening public presentation in conjunction with *Kluane National Park and Reserve Grizzly Bear Symposium*, sponsored by Parks Canada, Haines Junction, Yukon Territory, March 2003. (INVITED)
12. "Monitoring cougar movements near the Flagstaff urban interface," POSTER and presentation as 2<sup>nd</sup> author with J. Hart for *Cougars and Human Safety Trailhead Workshop*, sponsored by the US Forest Service and Arizona Department of Game & Fish, Flagstaff, AZ, December 2002. (INVITED)
11. "Methods for monitoring grizzly bears," for the *Sierra Club Grizzly Bear Ecosystems Project Writer's Workshop*, B-Bar Ranch, MT, May 2002. (INVITED)
10. "Ecology and management of Yellowstone's grizzly bears," for the *Sierra Club Grizzly Bear Ecosystems Project Writer's Workshop*, B-Bar Ranch, MT, May 2002. (INVITED)

9. “From bugs to bison: A grizzly’s view of the Greater Yellowstone,” for *Jackson Hole Chapter of the Sierra Club Speaker Series*, sponsored by the Jackson Hole Chapter of the Sierra Club, Jackson, WY, May 2001. (INVITED)
8. “Grizzly bears and the beauty of complexity,” for the *Predators, People and Places: Finding a Balance*, sponsored by the Predator Conservation Alliance, Mammoth, WY, October 2000. (INVITED)
7. “From bugs to bison: A grizzly’s view of the Greater Yellowstone,” for the *Mountains and Minds Lecture Series*, sponsored by the Montana State University Big Sky Institute for Science and Natural History, Big Sky, MT, October 2000. (INVITED)
6. “From bugs to bison: A grizzly’s view of the Greater Yellowstone,” for the *American Museum of Natural History Speaker’s Series*, New York, NY, April 2000. (INVITED)
5. “The Conservation of Yellowstone’s grizzly bears,” for the *Environmental Science and Research Foundation Annual Meeting*, sponsored by the Environmental Science and Research Foundation, Idaho Falls, ID, February 2000. (INVITED)
4. “Yellowstone’s grizzly bears,” for the *Greater Yellowstone Coalition Annual Meeting*, West Yellowstone, MT, June 1999. (INVITED)
3. “From bugs to bison: A grizzly’s view of the Greater Yellowstone,” for the *Denver Museum of Natural History Lecture Series*, sponsored by the Denver Zoo and the Sierra Club, Denver, CO, April 1999. (INVITED)
2. “From bugs to bison: A grizzly’s view of the Greater Yellowstone,” for the *National Zoo Speakers Series*, sponsored by The Smithsonian and the Sierra Club, Washington, D.C., April 1999. (INVITED)
1. “Grizzly bear conservation in the Yellowstone ecosystem,” for *Luncheon Seminar*, sponsored by the Endangered Species Coalition and Defender’s of Wildlife, Washington, D.C., April 1999. (INVITED)

**Media interviews since 1998:** Interest in and impact of the scientist’s work is indicated by high levels of national and even international media attention. Since July of 1998 the scientist was interviewed on **79 occasions** by journalists representing 54 media venues. Venues are listed below, with numbers in parentheses denoting the number of substantive interviews by each:

*Science* magazine (3)

- by Bee Wuerthrich, 2000; *umbrella effects*; “When protecting one species hurts another.” *Science* 289: 383, 385.
- by Jocelyn Kaiser, 1999; *research reported in an article on grizzly bear demography published by Ecology*.
- by Bernice Wuerthrich, 1998; *results of an article in Biological Conservation and status of Yellowstone grizzly bear population*.

Ecological Society of America (1)

- news release on co-authored article about grizzly bear demography in Ecology*.

*Environmental Review* newsletter (1)

- by Douglas Taylor, 1999; *ecology and management of Yellowstone grizzly bears; featured interview in the August 1999 (Volume 6[8]) issue*.

*Science Times of the New York Times* (3)

*New York Times* (1)

*Los Angeles Times* (5)

*Toronto Globe & Mail* (1)

*Washington Post* (1)

*The Denver Post* (2)

*Salt Lake City Tribune* (1)

*Associated Press* (1)

*USA Today* (2)

*High Country News* (2)

*ABC News* (2)

CNN (1)  
*National Geographic Television* (3)  
 British Broadcasting Corporation, Natural History Unit (2)  
 Public Broadcasting Corporation, *Nature* (1)  
 Canadian Broadcasting Corporation (1)  
 Public Broadcasting System, *Focus West* (1)  
*Economist* magazine (1)  
*Time* magazine (2)  
*National Geographic* magazine (1)  
*Audubon* magazine (2)  
*Backpacker* magazine (2)  
*Outdoor Life* magazine (1)  
*Billings Gazette*, Billings, MT (4)  
*Casper Star Tribune*, Casper, WY (1)  
*Idaho State Journal*, Pocatello, ID (1)  
*Arizona Daily Sun*, Flagstaff, AZ (3)  
*The Spokesman-Review*, Spokane, WA (1)  
*Idaho Statesman*, Boise, ID (1)  
*Mountain Living Magazine*, Flagstaff, AZ (1)  
*Helena Independent Record*, Helena, MT (1)  
*Idaho Falls Post Register*, Idaho Falls, ID (2)  
*Bozeman Chronicle*, Bozeman, MT (1)  
*Jackson Hole News & Guide*, Jackson, WY (3)  
*Ventura County Star*, Ventura, CA (1)  
*Teton Valley Top to Bottom* magazine, Jackson, WY (1)  
*Rocky Mountain Outlook*, Banff, AB (1)  
*Banff Craig and Canyon*, Banff, AB (1)  
 KNAU National Public Radio, Flagstaff, AZ (1)  
 German Public Radio (1)  
*The Animal Show* radio show, San Francisco, CA (1)  
*The Saturday Food Chain* AM radio show, San Francisco, CA (1)  
*Defenders* magazine (1)  
*National Parks & Conservation Association* magazine (1)  
*National Wildlife* magazine (1)  
 WildFutures/Earth Island Institute, 'On Nature's Terms' (1)  
 Environmental News Network (1)  
*Wildlife News Archives* (1)  
*Greenlines* (1)  
 Endangered Species Productions (1)  
*Cascadia Times* (1)

## (16) INVENTIONS, PATENTS HELD

None

**(17) HONORS, AWARDS, RECOGNITION, ELECTED MEMBERSHIPS**

**20.** *Exploding Head Award* for “the man who has so many ideas it’s amazing his head doesn’t explode,” USGS Southwest Biological Science Center, December 2010.

**19.** *Star Award* for superior accomplishments as Research Wildlife Biologist and as Station Liaison for the Colorado Plateau Research Station, September 2010.

**18.** *Star Award* for superior accomplishments as Station Leader for the Colorado Plateau Research Station, September 2009.

**17.** *Star Award* for superior accomplishments during special assignments at Yale School of Forestry & Environmental Studies and MIT-USGS Science Impact Collaborative, August 2008.

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**16.** *Paradigm Shifter Award*, USGS Southwest Biological Sciences Center, February 2008.

**15.** *Star Award* in recognition of service as Acting Station Leader for Colorado Plateau Research Station, August 2006.

**14.** *Star Award*, for sustained superior performance on a variety of projects and activities outside the normal scope of duties, from USGS Colorado Plateau Research Station, August 2004.

**13.** *Certificate of Appreciation*, for contributions to the 2004 Western Region Center Directors Meeting, from USGS Colorado Plateau Research Station, July 2004.

**12.** *Star Award*, for outstanding performance as Chair of the 7<sup>th</sup> Biennial Conference of Research on the Colorado Plateau, from USGS Colorado Plateau Research Station, November 2003.

**11.** *Certificate of Appreciation*, for activities in support of the 2003 Flagstaff Festival of Science, from USGS Colorado Plateau Field Station, October 2003.

**10.** *Rick Hutchinson Outstanding Scientific Research Award*, for outstanding scientific contributions to knowledge of grizzly bears in the Yellowstone Ecosystem, from the Greater Yellowstone Coalition, June 2003.

**9.** Elected to membership in *The Society for Policy Sciences*, 2001-present.

**8.** *Star Award*, for development of an alternative management structure for the Colorado Plateau Field Station, from USGS Biological Resources Discipline, 2001.

**7.** *Star Award*, for outstanding performance as Client’s Day Chair for the 5<sup>th</sup> Biennial Conference of Research on the Colorado Plateau, from USGS Biological Resources Division, 1999.

**6.** Invitation to participate in “Conversations in the Wild,” by The Murie Center, Moose, WY, 1999.

**5.** *Special Act Service Award*, for acting as 3<sup>rd</sup> party in negotiations for access to sensitive data to avoid litigation under the FOIA, from USGS Biological Resources Division, 1997.

**4.** Graduate tuition waived, 1980-1984, University of Idaho.

**3.** Graduation *summa cum laude*, B.S., 1979, University of Idaho.

2. Undergraduate Teaching Assistantship (\$1200), *General Botany*, 1979, College of Biology, University of Idaho.

1. Dean's List 1972-1979 (for semesters attended), College of Forestry, Wildlife & Range Sciences, University of Idaho.

## (18) BIBLIOGRAPHY

**114. Mattson, D.J., & E.J. Ruther.** Accepted. An explanation of puma-related behaviors and behavioral intentions among northern Arizona residents. *Human Dimensions of Wildlife*.

**113. Mattson, D., H. Karl, & S. Clark** (2011). Values in natural resources management and policy. In press in H. Karl, M. Flaxman, J.C. Vargas-Moreno, & P. Lynn-Scarlett (eds.). *Restoring lands: Coordinating science, politics, and action*. Springer, New York, NY.

**112. Mattson, D.J.** (2011). Snowbird workshop report: More on opportunities for collaborative mountain lion research. *Wild Felid Monitor* 4(2): in press.

**111. Mattson, D.J., & S.G. Clark** (2011). Human dignity in concept and practice. *Policy Sciences*: Online First.

**110. Mattson, D.J., S.G. Clark, K.L. Byrd, S.R. Brown, & B. Robinson** (2011). Leaders' perspectives in the Yellowstone to Yukon Conservation Initiative. *Policy Sciences* 44: 103-133.

**109. Mattson, D., K. Logan, & L. Sweanor** (2011). Factors governing risk of cougar attacks on humans. *Human-Wildlife Interactions* 5(1): 135-158.

**108. Clark, S.G., M.B. Rutherford, M.R. Auer, D.N. Cherney, R.L. Wallace, D.J. Mattson, D.A. Clark, L. Foote, N. Krogman, P. Wilshusen, & T. Steelman** (2011). College and university educational programs as a policy problem (Part 2): Strategies for improvement. *Environmental Management* 47(5): 716-726.

**107. Clark, S.G., M.B. Rutherford, M.R. Auer, D.N. Cherney, R.L. Wallace, D.J. Mattson, D.A. Clark, L. Foote, N. Krogman, P. Wilshusen, & T. Steelman** (2011). College and university educational programs as a policy problem (Part 1): Integrating knowledge, education, and action for a better world? *Environmental Management* 47(5): 701-715.

**106. Mattson, D.J., & S.G. Clark** (2010). Groups participating in cougar management. Pages 254-259 in M. Hornocker & S. Negri (eds). *Cougar: Ecology and conservation*. University of Chicago Press, Chicago, IL.

**105. Mattson, D.J., & S.G. Clark** (2010). People, politics, and cougar management. Pages 206-220 in M. Hornocker & S. Negri (eds). *Cougar: Ecology and conservation*. University of Chicago Press, Chicago, IL.

**104. Mattson, D.** (2010). Workshop report: Opportunities for collaborative mountain lion research on and near the Colorado Plateau. *Wild Felid Monitor* 3(1): 12-13.

**103.** Jones, A.L., E. Aumack, J. Balsom, P. Beier, J. Belnap, J. Catlin, T.L. Fleischner, E. Grumbine, **D.J. Mattson**, & C. van Riper III (2010). The legacy and future visions of conservation biology on the Colorado Plateau. Pages 1-20 in C. van Riper III, B.F. Wakeling, & T.D. Sisk (eds). *The Colorado Plateau IV: Shaping conservation through science and management*. University of Arizona Press, Tucson, AZ.

**102.** Peter-Contesse, T.J., S.G. Clark, & **D.J. Mattson** (2010). A workshop on large scale conservation: An exercise in group problem solving and leadership. Pages 127-150 in S. Clark, A. Hohl, C. Picard, & D. Newsome (eds.). *Large scale conservation: Integrating science, management, and policy in the common interest*. Yale School of Forestry & Environmental Studies Bulletin 24, New Haven, CT.

**101.** Hendee, J.C., & **D.J. Mattson** (2009). Wildlife in wilderness: a North American and international perspective. Pages 308-333 in C.P. Dawson & J.C. Hendee, eds. *Wilderness management: stewardship and protection of resources and values*. 4<sup>th</sup> Edition. Fulcrum Publishing, Golden, Colorado.

**100.** Rosen, T., R. Watter, & **D. Mattson** (2009). Introducing the Yale Large Carnivore Group. *Wild Felid Monitor* 2(1): 16.

**99.** Bischoff-Mattson, Z., & **D. Mattson** (2009). Effects of simulated mountain lion caching on decomposition of ungulate carcasses. *Western North American Naturalist* 69(3): 343-350.

**98. Mattson, D.J.,** & N. Chambers (2009). Human-provided waters for desert wildlife: What is the problem? *Policy Sciences* 42: 113-135.

**97. Mattson, D.** (2008). Finding common ground with cougars, among ourselves, in cougar management. *Wild Felid Monitor* 1(2): 16-17. **(INVITED)**

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**96. Mattson, D.,** & H. Karl (2008). *Values in Natural Resources Policy and Management: A brief introduction*. For MIT-USGS Science Impact Collaborative website. 22 manuscript pp.

**95. Mattson, D.** (2007). The promise of science to serve society. *Northern Rockies Conservation Cooperative News Letter* 20(2): 4. **(INVITED)**

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1. Brunsfeld, S.J., L. Ashland, C.R. Hatch, **D.J. Mattson**, A.L. Merkel, M. Sargent & G.H. Savage (1982). *Biomass resources in 66 African, Asian, and Latin American countries*. University of Idaho Forestry, Wildlife & Range Experiment Station, Contribution 231.

## (19) NOTEWORTHY PUBLICATIONS

5. **Mattson, D.J.**, K.L. Byrd, M.B. Rutherford, S.R. Brown, & T.W. Clark (2006). Finding common ground in large carnivore conservation: Mapping contending perspectives. *Environmental Science and Policy* 9: 392-405.

*This paper is noteworthy for several reasons, first, as emblematic of an emerging direction in the scientist's research, and, second, as a definitive and empirical demonstration of common ground among participants conflicted over management of large carnivores in the Northern U.S. Rocky Mountains. It is one of comparatively few examples of Q-methodology applied to natural resources, which is relevant because of recent widespread interest among social scientists in this analytic approach to clarifying human perspectives. Google Scholar credits this paper with 23 citations.*

4. **Mattson, D.J.**, & T. Merrill (2002). Extirpations of grizzly bears in the contiguous United States, 1850–2000. *Conservation Biology* 16: 1123-1136.

*This paper has emerged as a seminal work explaining historic regional extirpations of species. It has been singled out as an instructive paper in academe in addition to being instructive regarding key determinants of persistence for modern-day grizzly bear populations. When published, the paper was featured in a press release by Conservation Biology and has since been included in eForum on Biodiversity & Conservation. Google Scholar credits this paper with 68 citations.*

3. Pease, C.M. & **D.J. Mattson** (1999). Demography of the Yellowstone grizzly bears. *Ecology* 80: 957-975.

*This paper is noteworthy as the only which explicitly accounts for behavioral structuring in the demography of a large-mammal population. It also under-girds emerging understanding of demographic drivers for the symbolically and politically important Yellowstone grizzly bear population. When published, the paper was featured in a press release by Ecology and in an article by Science magazine, and is currently credited with 61 citations by Google Scholar.*

**2. Mattson, D.J.,** B.M. Blanchard & R.R. Knight (1992). Yellowstone grizzly bear mortality, human habituation, and whitebark pine seed crops. *Journal of Wildlife Management* 56: 432-442.

*This paper was among the first to conclusively document relations between mortality in a bear population and food availability and behavioral tolerance of humans. For this reason it is considered a seminal work on relations of bear demography to bear behavior and is credited with 127 citations by Google Scholar.*

**1. Mattson, D.J.,** B.M. Blanchard & R.R. Knight (1991). Food habits of Yellowstone grizzly bears, 1977-1987. *Canadian Journal of Zoology* 69: 1619-1629.

*This paper was among the first to report a detailed long-term record of grizzly bear diet, including annual and seasonal variation and implications for bias and design of dietary studies. It is considered the seminal paper on bear food habits and is credited with 140 citations by Google Scholar.*



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