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From: Chris Servheen
Sent: Friday, August 24, 2012 11:34 AM
To: mark_haroldson@usgs.gov; 'Frank T van Manen'
Subject: # mortalities in the ecosystem 2002-2011
Attachments: more questions Chris Servheen questions-3rd demographic workshop.docx

Can you answer a quick question for me please – how many known and probably mortalities occurred in the entire ecosystem 2002-2011? I ask because in your answer to question #1 (attached) you say “25 would not have been counted”. How many total mortalities were there 2002-2011 so I know the % that would not have been counted.

Thanks,

c

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"If there are no dogs in heaven, then when I die I want to go where they went." - Will Rogers

1. If we use the suitable habitat line with 6 km in the valleys, how many mortalities would have been outside this line and not counted between 2002-2011, especially independent females?

Based on our records of known and probable mortalities of independent-aged bears, 25 bears would NOT have been counted during 2002-2011: 9 F, 16 M (annual range = 0-5 for both F and M, with higher counts occurring in more recent years; see Fig. 1). All were independent-aged bears.

2. If we use the new mark-resight estimator to obtain a more accurate estimate of population size, what will the new total population size estimate be and what will the sustainable mortality limits for females be? I don't think we can answer this yet but we need to when the method is applicable.

Too early to provide definitive answers, but just to give you a sense of what the population estimates would be, let's assume a mark-resight estimate of Fcoys, (excluding moth sites) of 70, which is within the range of the preliminary estimates Megan and Gary presented: with the current age and sex ratios, etc. that would translate to approximately 876 bears. Mortality limits for independent females at 6% would be 18 F. If we kept male mortality limits at 15%, it would be 45 M. Again, this is just to give you an example; we don't know yet of course where the actual mark-resight estimates will end up. Also, this is based on 1 age class for independent bears; with subadult (2-4 years) survival being different from adult (5+ years) survival for 2002-2011, we would really need to incorporate that into the total population estimate and mortality limits for both age classes.

3. Can we backcast the application of the new estimator to 2002? If so, could we see what the allowable levels of mortality based on the Chao2 during this time (2002-2011) were compared to the allowable levels of mortality based on the new estimator and what mortality actually occurred?

Yes and no; we could backcast based on the mark-resight estimator alone (i.e., excluding observations of unmarked Fcoys made at moth sites). If Fcoys at moth sites are to be counted separately, as we discussed at the workshop, that portion could not be calculated retroactively. This is an important point; recall that we discussed defining an area of influence around moth sites for Fcoys based on telemetry data. Using that distance to buffer moth sites, we would exclude observations of unmarked Fcoys from within that zone from the mark-resight protocol. We would conduct moth site-only flights (approximately 3 days) to 'census' Fcoys at moth sites; that number would be added to the mark-resight estimate. We would have to come up with some procedure to estimate uncertainty associated with the Fcoy count at moth sites (e.g., duplicate counts).

4. Does chao2 count FWC outside the 6-km buffered suitable habitat lines now? In other words, are there areas outside the 6-km buffered line contributing to the population size estimate? They do count against mortalities now and the females in these areas figure into survival estimates, correct?

Observation flights are mostly contained within FWS suitable habitat line. However, there are ground sightings outside the FWS suitable line that contribute to the Chao2 estimates (45 Fcoy observations out of 1691 occurred outside FWS suitable habitat during 2002-2011; 23 out of 1691 [1.3%] if we use the FWS suitable with the 6-km buffered areas). Because of the rule set, it's difficult to determine how many *unique* Fcoys this number represent. There are no sightings of Fcoys outside FWS suitable line nor the "smooth" line in the Upper Green River. All Fcoy sightings in the Upper Green are within FWS suitable habitat.

Note that there are some areas inside the FWS suitable habitat boundary that are not being surveyed (e.g., southern portion of the Wind River Range). See Fig. 3 for a map with the FWS suitable boundary, the additional areas if the 6-km 'smoothed' is considered, and the current flight units. See Fig. 4 for locations of Fcoys observations during 2002-2011.

5. What is the new sustainable total mortality level for independent females based on the updated demographic data (2002-2011)? 6%?

We've been corresponding back and forth with Rich on this and 6% would be the new sustainable mortality limit based on the 2002-2011 data. (there are some intricacies in setting mortality limits if we consider the different survival for subadults and adults but we won't complicate things at this point).

6. 7.6% of the Chao2 population estimate was the actual mortality rate of independent females between 2002-2011. Will this given mortality rate for independent females result in lambda as .988 even with a larger population estimate using the new estimator?

The 7.6% is based on 1983-2001 vital rates and sex and age class ratios derived from the stable age distribution (i.e., based on previous workshop supplement). If we update those rates and ratios with 2002-2011 data, that percentage will change. Also, keep in mind the 7.6% is derived from the model-average Chao2 estimate of independent females and the total estimated mortality, which is different from our estimate of female survival based on known-fate analysis; the 2 methods aren't really comparable and we would caution to put too much interpretation on the 7.6%.

7. If we move the population size estimate within the suitable line plus the 6 km areas of the valleys (excluding the Green River exclusion), how much will this change the Tpop estimate, if at all?

For the Chao2 estimator, this could affect the total population estimate because some Fcoys are sighted from the ground outside the FWS suitable habitat line (see Fig. 4). However, these represent only 1.3% of Fcoy observations so the change would likely be small.

For the mark-resight technique, total population size would not change because the area surveyed with the observation flights essentially are contained within the FWS suitable habitat boundary.

8. How many indy females died in the upper Green outside the suitable line over the past 10 years (2002-2011)?

We first tallied the management captures outside FWS suitable habitat in the Upper Green River as a potential indicator of removals in the future; 7 bears were captured for conflict management, 3 adult M, 3 subadult M, and 1 subadult F. Three of these captures occurred in 2005 and 4 in 2010. Two of these captures, both males, resulted in removals (1 in 2005 and 1 in 2010). I.e., no independent-age females died in the Upper Green River area during this time period.

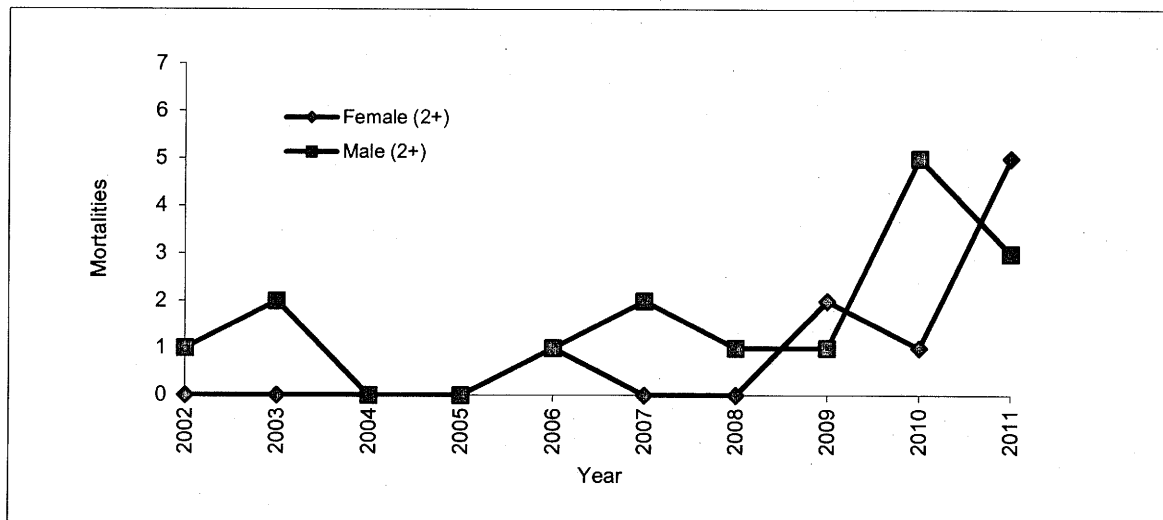


Fig. 1. Number of known and probably grizzly bear mortalities outside smoothed FWS suitable habitat boundary, GYE, 2002-2011.

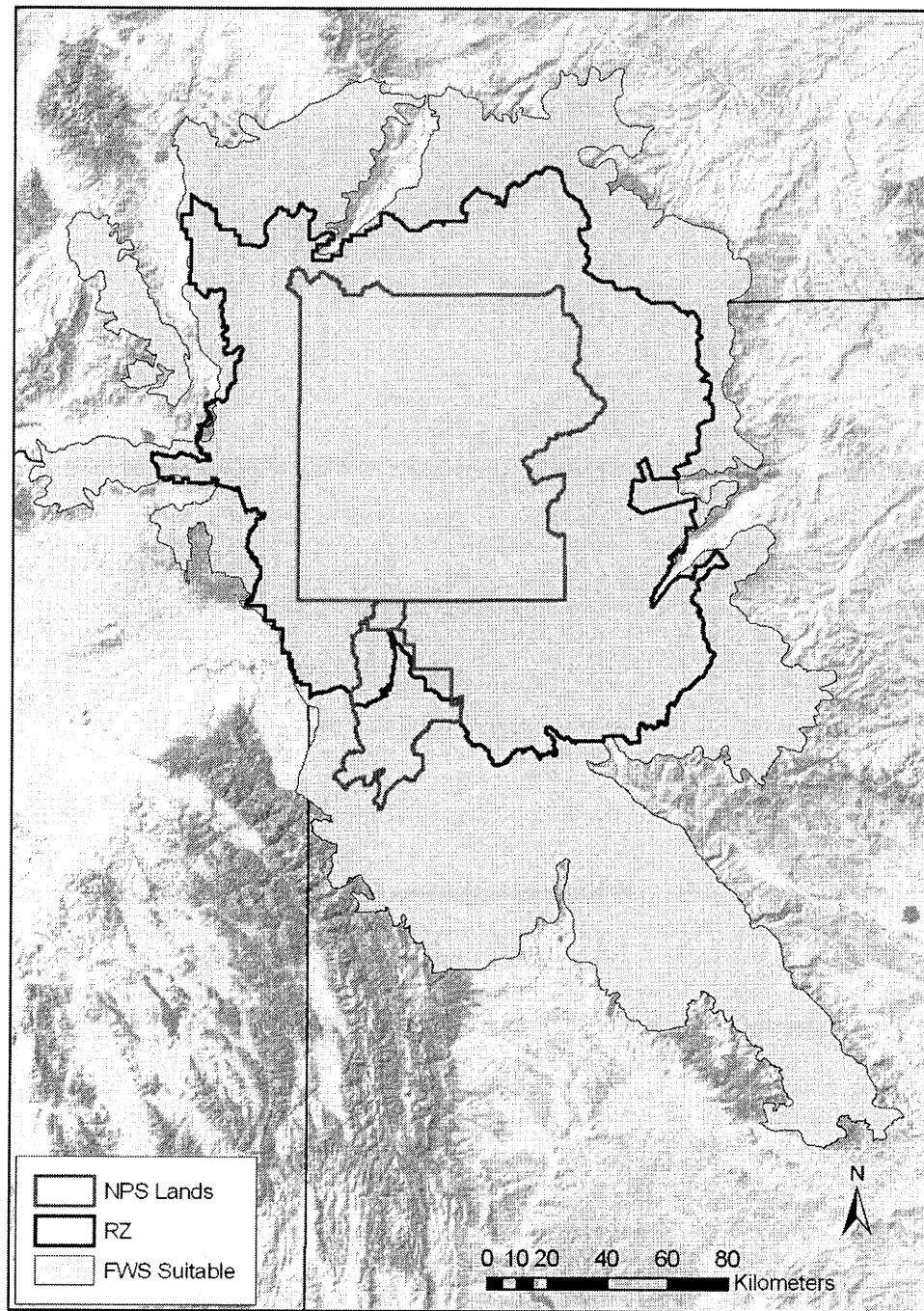


Fig. 2. FWS suitable habitat with recovery zone and NPS boundaries.

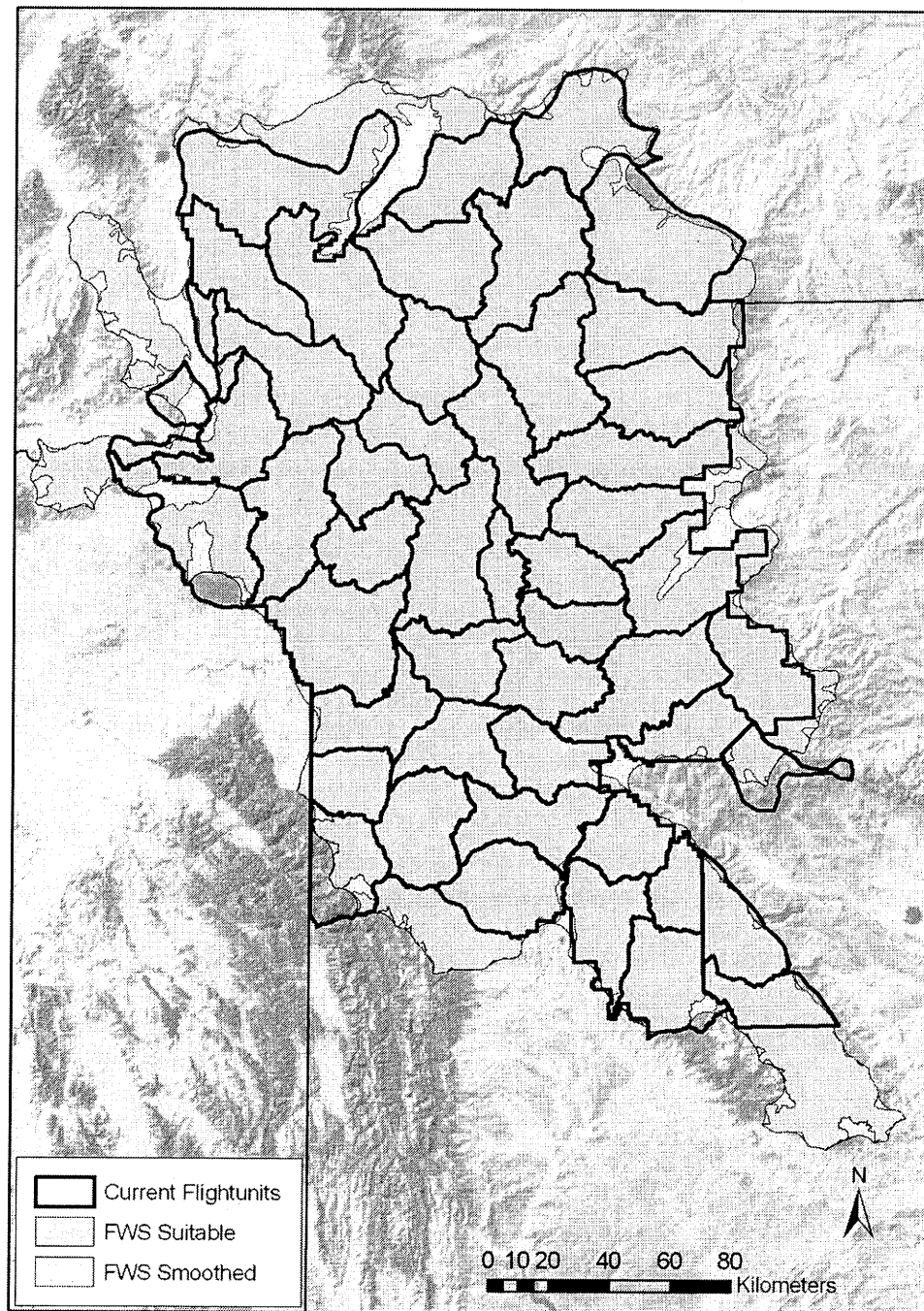


Fig. 3. Current observation flight units and FWS suitable habitat; 6-km buffer areas (FWS smoothed) identified in yellow.

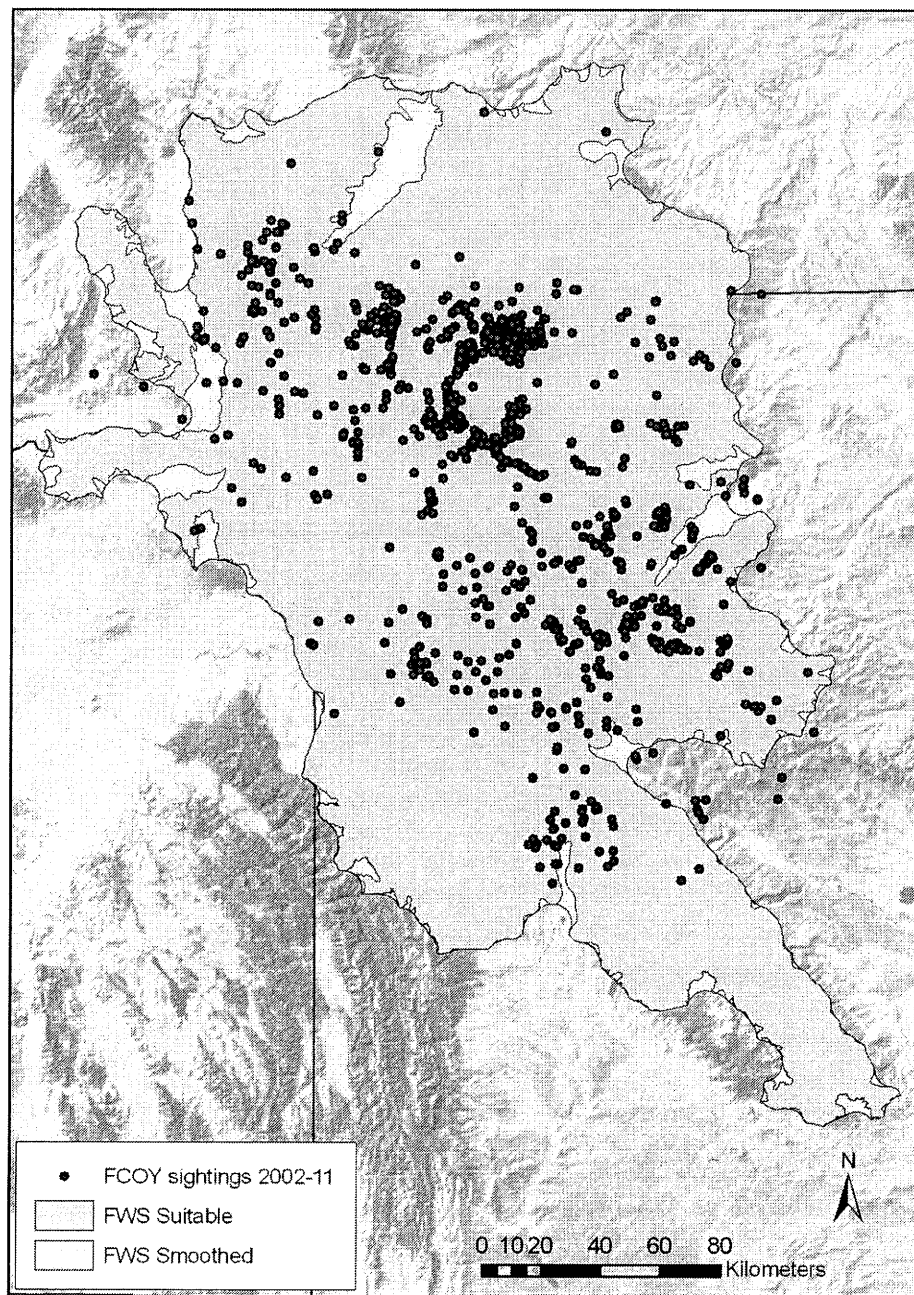


Fig. 4. Observations of Fcoys and FWS suitable habitat, 2002-2011. Forty-five of 1691 observations occurred outside the FWS suitable habitat boundary; 23 of 1691 occurred outside the smoothed FWS boundary.

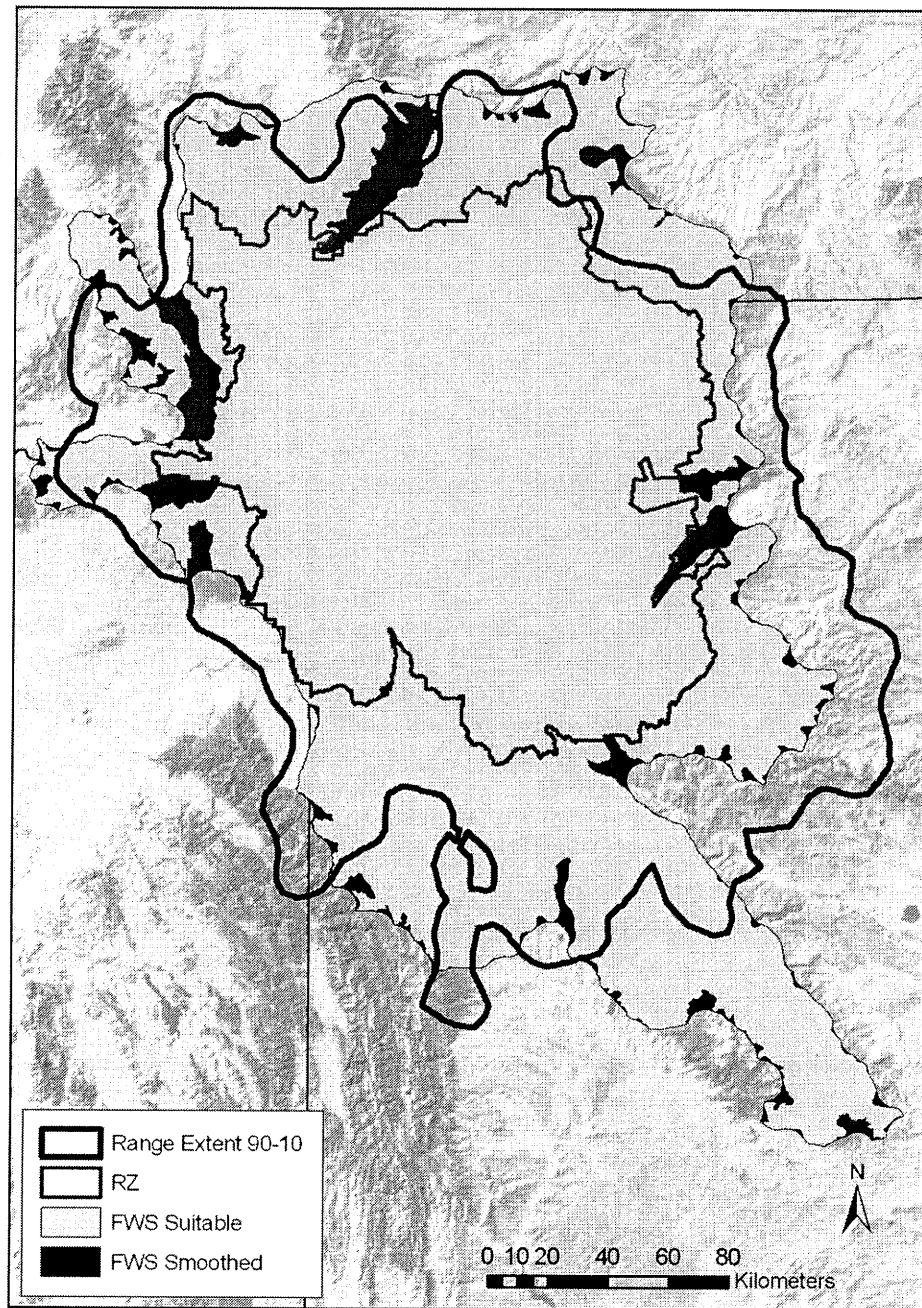


Fig. 5. FWS suitable habitat and estimate of grizzly bear range extent, 1990-2010.