

New! FAQs: Gaining an understanding of extirpations; evaluating release sites/habitat; and monitoring for effects of translocations on source populations (posted 5/13/14)

Some constituents have posed questions about how the Department gains a better understanding of extirpations, how it evaluates the suitability of habitat and release sites for translocated bighorn sheep, and what effects translocations have on source populations. Here are answers to those questions:

Why are we reintroducing bighorn sheep to a mountain range when we don't fully understand why the original population was extirpated?

Several theories exist about what caused the bighorn sheep's past decline, and we are conducting a research project to better understand the various factors that put a bighorn sheep population at risk. We may never know the reasons for the original population's decline.

The bighorn sheep recently translocated to the Catalina Mountains may be affected by the same pressures that the original population experienced and, through the use of modern technology, they will help us to better understand these pressures and learn about the establishment of a relocated population in historic habitat. This gives us an unprecedented and incredibly valuable opportunity to learn about the ability of the Catalina Mountains to support a bighorn sheep population.

We track individual animals collared with Global Positioning System (GPS) collars to evaluate a number of factors, including the habitat they use, the size of their groups, their movement patterns, and their proximity to areas of human activity. These quantitative analyses will allow us to evaluate what factors put an individual bighorn sheep at risk, and how this influences population persistence. This increased knowledge may have important relevance to management decisions, such as those related to fire, recreation, and predators, as well as future translocation strategies, and will help inform future management in the Catalina Mountains and beyond.

How do you evaluate habitat quality and determine the suitability of a release site?

There are a number of habitat evaluation criteria available to evaluate bighorn sheep habitat quality, yet we primarily rely on a method termed the Cunningham-Hansen and Cunningham-Brown methods (Cunningham 1989). These are modifications of earlier versions of the Hansen and Brown methods, developed for bighorn sheep in general, refined to reflect measured bighorn sheep habitat use in Arizona. Evaluations support the suitability of this approach in describing habitat use (e.g., Wakeling and Miller 1990).

The Cunningham-Brown technique is used to compare and rank habitats at various potential release sites and identify the most favorable release habitats. The Cunningham-Hansen technique allows the wildlife manager to evaluate a specific release location and determine which blocks of habitat within that location are likely to be the most suitable for bighorn sheep. Ultimately, bighorn sheep must rely on their own experience to define the most favorable for their needs. Observation of bighorn sheep locations in the Catalinas is increasingly consistent with habitat quality rankings, and ongoing research will identify if any further modifications to the evaluation method are warranted.

The Catalinas are currently tied for the highest potential ranking using the Cunningham-Brown method for translocation.

Literature Cited

Cunningham, S. 1989. Evaluation of bighorn sheep habitat. Pages 135–160 in R. M. Lee, editor. The desert bighorn sheep in Arizona. Arizona Game and Fish Department, Phoenix, Arizona, USA.

Wakeling, B. F., and W. H. Miller. 1990. A modified habitat suitability index for desert bighorn sheep. Pages 58–66 in P. R. Krausman and N S. Smith, editors. Managing Wildlife in the Southwest, Arizona Chapter of the Wildlife Society, Phoenix, Arizona, USA.

How do you monitor source populations to ensure there are no detrimental effects to those populations resulting from translocations?

Generally speaking, captures for translocations do not occur if a source population is below a specific objective. That objective is often numerical (e.g., at least 150 bighorn sheep observed on survey [as for the Virgin Mountains] or at least 650 estimated in population [as for the Kofa Mountains]) and based specifically on the historical performance of the source population. Historical performance can provide biologists with insights into the realistic highs and lows an individual population can be expected to exhibit; this performance can also identify when a translocation from that population is likely to have the least effect.

In each case, translocations generally follow a survey. Most translocations are conducted in November, whereas surveys precede them in October. In some cases, when a particular survey may indicate a very high population, two translocations or a small translocation may occur without the benefit of an additional survey. And all populations are surveyed at least once every three years to monitor their overall performance.

Following translocations, bighorn sheep herds are monitored with a follow-up survey. These follow-up surveys may not occur in the year immediately following a translocation, but generally occur within two years following the capture. In the meantime, reports from bighorn sheep hunters and any trail camera monitoring data that we collect are used to determine if an interim survey is needed.

Not all populations are affected by translocations in the same way. In some instances, only a few animals can be removed every few years, whereas in other situations the population may sustain repeated translocations with little rest between. This is dependent on the reproductive output, forage quality, predation rates, disease exposure, and several other site-specific variables that ultimately influence population productivity. Regardless, monitoring occurs prior to any translocation to ensure the action will not be detrimental to the population before we engage in a capture and removal.

For general FAQs about the Catalina Bighorn Sheep Reintroduction Project, see next page.

Catalina Bighorn Sheep Reintroduction Advisory Committee

Frequently Asked Questions

12/24/2013

Who is on the Advisory committee and what Agencies are involved?

The Advisory Committee is composed of local informed stakeholders from several diverse groups. These include Brian Dolan and Joe Sheehy from the Arizona Desert Bighorn Sheep Society, Mike Quigley from The Wilderness Society, Brian Ham Sportsman, Acasia Berry and Sergio Avila from the Sky Island Alliance, Les Corey and Trica Oshant Hawkins from the Arizona Wilderness Coalition, and Randy Serraglio from the Center for Biological Diversity. Also engaged in the process are representatives of the Arizona Game and Fish Department (Department) including Commissioner JW Harris liaison for the Arizona Game and Fish Commission and the United States Forest Service. The Committee was established in December 2012 to address the challenges and to find a successful course for this adaptive management project over the next several years.

Why are bighorn sheep being reintroduced into the Catalina Mountains?

Bighorn sheep are being reintroduced because the Catalina Mountains are a part of their historical range; we are simply restoring them to a natural ecosystem that they were an important part of for thousands of years. Returning bighorn sheep to their native habitat is an effort to restore the Catalina Mountain ecosystem. As long as one of its key pieces is missing, the ecosystem is in some ways incomplete.

Are bighorn sheep an endangered species?

No. Bighorns are not listed as threatened or endangered. However, their numbers were very low in the early- to mid- 1900's when efforts to restore them began. By 1957 their numbers had increased slightly to 1,500. The first translocations occurred that year. Today, after close to 2,000 translocations, the statewide bighorn sheep population is estimated at around 5,500. Translocation is considered to be the single most important tool in restoring bighorn sheep populations.

What happened to the former herd of bighorn sheep in the Catalina Mountains?

Bighorn sheep were extirpated from the Catalinas during the late 1990's, yet the specific reason for their disappearance will never be fully understood. Factors contributing to the herd's decline and ultimate extirpation include reduced habitat quality due to a long regime of fire suppression and human disturbance from increased recreation and urbanization. Other factors potentially contributing to their extirpation included disease and predation. Increased predation of bighorn sheep by mountain lions may also have been related to increased vegetation growth due to fire suppression.

What is different today than from when the former herd died out?

We would not want to put more bighorn sheep in the Catalinas if there were not reasons to believe the previous conditions that led to decline have been addressed. Many possible factors influencing that decline have changed for the better, most notably the significant improvements to the habitat due to the Bullock and Aspen fires.

How did the Bullock and Aspen fires improve the habitat?

The Bullock and Aspen fires improved the habitat structure by burning out dense cover and improved understory growth. Bighorn sheep require good quality forage and they need to be able to see approaching predators. The structure of a burned forest is important because it offers better forage and better sightlines for bighorn sheep. The recent fires burned 24% of historic sheep habitat.

How will good bighorn sheep habitat be maintained?

A portion of the Catalinas did not burn in the Aspen and Bullock fires, and the burned areas will need to re-burn periodically to remain in good condition. In its natural fire regime, a forest is healthier when fires are low-intensity and not catastrophic. The Forest Service is working on a planning process that would allow fire to play its natural ecological role on the mountain.

How have other factors contributing to the loss of sheep been addressed?

The hiking and hiking-with-dogs trail restrictions established in 1996 in the bighorn sheep recovery area were likely established too late for the previous herd. These restrictions do not need to be altered; as written they will reduce the negative effects from human disturbances on our new herd of bighorn sheep. The hiking public is supportive and respectful of the need to coexist with native wildlife.

Did disease kill off the previous herd?

In the late 1980's, a ram wandered into the Catalinas from the Superstition Mountains. Some have suggested this ram could have introduced disease to the old herd. If that theory is true, that disease vector no longer exists. Should additional outbreaks of disease occur corrective action (vaccination, treatment, etc.) can be quickly taken; the reintroduced sheep are wearing GPS collars that are programmed to send mortality alerts which allow for immediate response and investigation to determine the cause of death.

How many bighorn sheep will be transplanted and what is the population goal?

The goal of the project is to establish a self sustaining population of bighorn sheep in the Catalina Mountains that coexists with resident predators without administrative intervention. Population models suggest that the habitat can support around 110 bighorn sheep. This number allows for a balance between the population's natural recruitment (birth and survival) and mortality (death) rates.

Since there are no currently existing source populations of bighorn sheep in the state that could support a single transplant of 110 animals, the plan is for three targeted releases of 30 animals each over the span of 3-4 years. In order to carry over as many individuals as possible into subsequent release years, it is imperative that the mortality rate of these initial releases be minimized.

Are the bighorn sheep being introduced so that they can be hunted?

No. Desert bighorn have been a part of the Catalina Mountains since the end of the Pleistocene. A goal of wildlife management is to restore native wildlife populations to their historical habitat. Hunting surplus animals from a healthy and abundant population is a byproduct of successful population restoration but not the driving reason for it. If bighorns are ever hunted in the Catalinas again it will be with the full engagement of the public as we do with all hunted species.

Our current and most immediate focus is re-establishing a viable population of sheep.

How many bighorn sheep are hunted each year in Arizona?

The number of bighorn sheep hunt permits issued each year varies depending on population estimates within a game management unit or a subdivision of that unit. Based on those estimates, a very conservative formula is applied to determine the number of permits which will be available through a draw (lottery) system. In 2013, a total of 107 sheep hunt permits were issued statewide and more than 9,000 hunters applied through the draw. Because permits are issued so conservatively and because interest in the hunt is so high, hunter success averages 96% statewide. In Arizona, there is a lifetime bag limit of only one sub-species of bighorn sheep per hunter.

Did hunting wipe out the former herd of bighorn sheep from the Catalina Mountains?

No. In the early part of the 20th century, bighorn sheep were so plentiful that their meat appeared in markets in Tucson. By the time the herd began to seriously decline, better wildlife management and regulated hunting had become common and relatively few bighorn sheep were hunted in the Catalina Mountains. In the latter 20th century, the most sheep ever taken in one year in the Catalinas was 4 in 1978. Following that year, the annual hunt harvest ranged from 0 to 2 per year with a total of 19 sheep harvested between 1978 and 1992. Hunting was stopped after 1992 because of the continuing downward trend in the bighorn sheep population.

How many bighorn sheep mortalities can be sustained before the project would be curtailed?

This tipping point is under constant evaluation and has yet to be determined. It would also be dependent on the circumstances and locations of the mortalities as well as the corresponding remaining chances for the success of the project. This reintroduction effort has been designed around an adaptive management approach—meaning that instead of sticking to an initial plan no matter what happens, ongoing analysis of events and conditions will inform future management actions. It may be that under some circumstances relatively few sheep losses will be cause for ending the effort; it may also be that under different circumstances relatively high losses in the first or second year will not jeopardize successful restoration or be cause for ending the project.

Mountain Lion Management

How many bighorn sheep will be eaten by mountain lions?

There is no way to estimate how many sheep will become prey to mountain lions. Such predation events depend on a number of factors, including the vegetation type and the availability of escape terrain in the area of the mountain where sheep roam, the availability of other prey species, and the odds of a hungry lion finding a sheep rather than a deer. Additionally, these factors change over time. The project features monitoring of bighorn sheep through GPS collars so that we have an up-to-date picture of what is happening to the sheep daily.

It is important to note that the definition of success for the project is lions and sheep coexisting in a natural balance without continued human intervention; failure is a possibility here--should mountain lion predation on bighorn sheep become excessive, the project will fail.

Is there any other way to remove mountain lions besides killing them?

No. The greatest natural cause of death to lions in the wild is fighting with other lions over resources. Arizona, like many places in the west, has a robust and healthy lion population. There are few-to-no open territories available for relocating a lion. This is in contrast to reintroducing animals into unoccupied habitat or for a cooperative or less aggressive species like bighorn sheep.

Are mountain lions endangered?

Mountain lions are not endangered. Their numbers are robust and even trending upward. They are repopulating areas where they were formerly extirpated, including expanding their range and numbers into the Midwest. Mountain lion numbers are dependent upon the availability of prey and suitable habitat. The fact that humans do not routinely see mountain lions in the wild does not mean that they are not thriving; although secretive, they are quite abundant.

How many lions are in the Catalinas?

Surveying mountain lion populations is difficult because of their secretive nature. The only indicators available currently to assess mountain lion populations are incidental observations and harvest trends. As discussed previously, all indications are that we have a very robust and increasing population of lions in the Catalinas. Additionally, according to veteran wildlife biologist Maurice Hornocker, *“There now may be more mountain lions in the west than there were before European settlement.”*

How many mountain lions are legally taken in the Catalinas each year?

Mountain lions are hunted throughout the state but it is a rare and often coincidental occurrence for any hunter to successfully take a lion. Over the past 20 years the state’s annual harvest has remained fairly consistent. This suggests that we have a stable population that can support a conservative harvest. Over the past ten years in Game Management Unit (GMU) 33 (which includes the Catalina Mountains) we have seen an increase in lion observations and harvest. This corresponds roughly to an increase in whitetail deer numbers after the Aspen and Bullock fires. Since 2003, the annual harvest of lions in GMU 33 has increased steadily from 7 lions in 2003 to 22 lions in 2012, again suggesting that we have an increasing population that is in congruence with the increased availability of their primary prey, whitetail deer.

Will every lion that kills a bighorn be tracked down and killed?

No. Not all mountain lions that prey on bighorn sheep are likely to be found. If a female with young kittens is the predator that takes a bighorn sheep, we will not take that animal.

How do wildlife officers or contract hunters get to the kill site to remove a mountain lion?

They hike in by foot.

What are wildlife officers doing to ensure that the lion they remove is the one that killed the sheep?

There is a very high probability that if a mountain lion killed the bighorn sheep, it will remain in the vicinity of the kill and carcass so it can feed over a period of a few days. When a mortality signal is detected from a sheep tracking collar, inspection of the dead bighorn sheep occurs as soon as possible after the death. An analysis of the mortality site includes determining the cause of death (the type of wounds on a dead sheep can be indicative), as well as surveying the

immediate surroundings (covering of the remaining carcass, scrapes, tracks, etc). If the mortality site evidence indicates the sheep died due to mountain lion predation, efforts are made to immediately remove that lion. Lions are tracked by wildlife management professionals and/or an experienced houndsman. Additionally, forensic samples of the bighorn sheep and the mountain lion are collected and analyzed to confirm predation as the cause of death and the removed lion as the predating individual.

Why are you killing mountain lions to protect sheep?

Removing mountain lions that kill bighorn sheep is a short-term management strategy to allow for the bighorn sheep population to grow and become self-sustaining. Only mountain lions that prey on sheep will be removed. While certain individual mountain lions are removed, the overall population of mountain lions will not be substantially affected. The mountain lion population in the Catalinas is among the most abundant in Arizona.

In all reintroduction efforts throughout the West, lion predation is a leading cause of death of bighorn sheep. When sheep populations are initially low, the impact of such predation exceeds a natural balance and can be devastating to the herd in the early stages of establishment. In order to reduce the impact of lion predation on reintroduced sheep and to give the sheep a better chance of more quickly reaching a sustainable herd size, a lion management plan was created for this project. The plan created is the most conservative possible but still addresses the need for the small, initial sheep populations to have a chance. Additionally, predator management for this project is a short-term, limited activity.

The mountain lion management plan has been—by far—the most difficult issue the Advisory Committee and Department staff have wrestled with, and it is also the one that causes the most concern among the public. The plan finally agreed upon was based upon the life history parameters of mountain lions and bighorn sheep. The following data offer an important glimpse of how mountain lions can so successfully reproduce and recolonize in comparison to bighorn sheep. A female mountain lion may produce a litter of 3 kittens every year, but on average, one kitten survives every year in the litter. Bighorn ewes have 1 lamb per year, of which only 25% tend to survive, meaning that the average recruitment for bighorn sheep is 1 every 4 years. Thus, in 10 years, there may be 10 kittens but only 2.5 lambs recruited to those populations.

What this means is that sheep reproduce slowly and therefore do not have the ability to replace higher-than-average losses within a herd. In the early stages of this project, when sheep numbers are 30 or 60 after the first one or two releases, lost sheep have a tremendous impact on the total herd population curve and future population genetic diversity. Thus, we need to make some effort to help the herd quickly reach sustainable numbers.

Lions eat sheep; that's natural. Removing—or killing—lions as a means of controlling the adverse effects of predation on the reintroduced sheep population is a short-term and limited activity. It is not to punish lions for doing what lions do, but rather to give the initially small population of sheep an opportunity to become established. If the sheep herd cannot become established without significant or ongoing lion removal then the project will fail and the effort will be stopped.

It is important to reiterate that only lions that kill sheep will be pursued. This is in contrast to

other options that have been used elsewhere, including preemptively attempting to remove every lion from the mountain range, increasing the sport harvest limit locally to encourage increased lion hunting, or other indiscriminate or invasive means. None of that is happening in the Catalinas—in fact, the bighorn sheep recovery area has been closed to sport hunting of lions using hounds (the most effective and directed means of lion hunting) in an effort to reduce disturbance to sheep and to be consistent with the no-dogs restrictions on hikers.

How can you justify killing one species to protect another?

Complex management decisions such as these are not lightly made. There is no answer to this question that can satisfy everyone. We respect that there are those that object to the taking of any life at any time for any reason. We also feel that wildlife have intrinsic value and do not exist solely for our use.

However, there are times when actions must be taken to manage individuals of one species for the benefit of another. Such actions are based on sound science and years of research and experience. One species would never be exterminated to save another. However, there are times when one species is in jeopardy because of another. These actions are always guided by the latest science and with the deepest of respect and concern for both species.

At least two bighorn sheep have been killed, and two mountain lions have been killed by Department marksmen, since the November 18, 2013 bighorn release. Did wildlife officials expect the killing to begin so soon?

We expected that lions would prey on sheep. Exactly how soon that would happen could not be predicted. However, predation commonly occurs soon following release because during the early weeks and months, translocated bighorn sheep remain unfamiliar with their new surroundings and are exploring their new home. It takes the sheep a little while to learn where the best habitat is located.

Might the project be cancelled if sheep and lions continue to die? And if it were cancelled, would the Department consider recapturing the sheep and returning them to their home ranges?

We are committed to achieving the best possible outcomes for restoration of the Catalina Mountain ecosystem. For the bighorn sheep reintroduction piece of that restoration, failure is a possible reality. We will be analyzing events and conditions on an ongoing and daily basis to determine whether or not the reintroduction effort is progressing or at risk. Should circumstances indicate that the reintroduction is not succeeding—and that adaptive management changes in the project's implementation will be unable to change that dynamic—then the reintroduction effort will be halted. At that time, any remaining bighorn sheep in the Catalinas would not be recaptured. Remaining bighorn sheep may wander and find others in other nearby habitats, or simply join pioneers that may explore into the Catalinas from those nearby habitats.

Are the sheep showing signs of forming a cohesive herd or are they quite scattered? Would forming a cohesive herd help protect the bighorns from predation by mountain lions?

At present, the bighorn sheep continue to explore their new habitat and have not yet formed herd units. Individual bighorn sheep in a group tend to be less vigilant, but larger groups of bighorn sheep may offer more protection, as more individuals are watching for predators from more directions.

What is the cost of this project to taxpayers?

None. The estimated cost of this project is \$600,000.00 and the majority of the funding is coming from private philanthropic donations, excise taxes on hunting and fishing equipment and proceeds from license and tag sales. Anyone who has not purchased hunting or fishing licenses, purchased firearms or ammunition, or provided a donation to this project has not contributed funds toward this conservation effort. Bighorn sheep conservation is an expensive undertaking and the proceeds from the sale of bighorn sheep hunting permits does not come close to covering the annual expense of managing the program. Of the 107 bighorn sheep tags issued in 2013, the AGFD raised approximately \$40,000 in permit sales (97 Res. @ \$272.50 + 10 Non-Res. @ \$1,407.50). Yet the annual expense of the statewide bighorn sheep conservation program varies from year to year, but averages between \$300,000.00 and \$400,000.00 annually. Some of the major expenses included in this average are regular helicopter population surveys, research projects and studies, water developments, habitat restoration and transplant projects such as this one. The difference is made up by the sale of three annual special bighorn sheep permits, other license and tag fees, excise taxes and donations from individuals and organizations such as the Arizona Desert Bighorn Sheep Society. **No taxpayer funding is being used** nor is the project being used in any way to generate a surplus of funds. We encourage people to donate to the restoration project and donations can be made at www.adbss.org.

Could the Game and Fish Department and the advisory group have been wrong about the viability of reintroducing bighorn sheep to the Catalina Mountains?

Although the decision to proceed was taken after careful consideration of the factors involved and in an effort to balance all aspects of ecosystem restoration in the Catalinas, the possibility does exist that this experiment might not work. This is a wildlife management experiment. Many years of study, planning, and community coordination were invested in this effort. The difficulty in restoring a population after it has been extirpated underscores the importance of maintaining those populations that are in place. Our objective is to establish a self-sustaining population within a naturally functioning ecosystem, and we are doing all we can to make that successful. This is a wildlife experiment that can inform bighorn sheep management statewide.

Why are meetings of the Catalina Bighorn Sheep Advisory Committee not open to the public?

Many committees such as this one, working in a deliberative fashion, do not open their meetings to the public and are not bound by open meetings requirements. Participants need to feel comfortable brainstorming, sharing ideas, and speaking freely. There are many avenues of discussion in a complex project that lead to other avenues of discussion and occasional dead-ends. The process of exploring all avenues is best done with a focused group of people who share the historical knowledge of the working group and are not distracted or dissuaded by a constantly changing group of participants.

How will you inform the public about the project's progress and decisions that are made?

We have endeavored to provide complete, accurate, and timely information throughout this process, but wildlife management is often complex and full of variables, and does not always occur in neat time frames, let alone 24-7 news cycles. The Advisory Committee, together with Department personnel, need the space and time to analyze and interpret data and draw conclusions in order to provide the public with accurate and complete information. Going forward, we will be providing twice-monthly status reports on the project. These status reports will be available to the public and the news media and will include all pertinent information since the previous report. We foresee that there may be times when the report is little more than "all the sheep are moving around the mountain" and we will take advantage of those times to provide deeper context or more fully explore other aspects of the project (how the collars function, bighorn sheep natural history, etc).

Should significant events occur which exceed the capability of the regular project status updates, we will convene additional public forums. Of course, at any time, public comment and questions can be submitted through the Department for consideration or answering here.

What public outreach has the project provided to date?

Over late summer and into fall, three public meetings were held to inform the public about the project and its upcoming implementations. These meetings were advertised and covered by the media. Additionally prior to the bighorn sheep release we provided a guest opinion article in the paper and shared copies of the project proposal and its associated Predator Management Plan for reference.