**National Park Service biologist Rick Wallen**

I will get started here. My name is Rick Wallen. I have been a national park biologist for 20 years and I have been at Yellowstone National Park for seven. Um, I went to college nearby in Bozeman, Montana. I’ve been an observer of bison conservation in the debate about conserving the Yellowstone bison population. I’m here for couple decades. I worked at Grand Teton National Park as well so I have been involved in, bison conservation in two parks in the greater Yellowstone area. I’ve worked at Glacier National Park, Brice Canyon, Redwood National Park. Controversy is something that follows national park units all over the country. There is really nothing sacred about a park. It’s an area of a particular mandate that is really preservation oriented. It’s not necessarily, strictly, you know, pristine don’t do anything and watch processes play out because most national parks are too small for that. Yellowstone is no exception to that, yeah. Well it seems like two million acres is big. The animal systems move about on a much larger scale. And we figure bison system probably runs on the neighborhood of, you know, 10 to 15 thousand square kilometers. And you go and calculate that all out and you go oh wow, well a two million acre park might work. But they don’t use cliffs like we see up there, they don’t use the tundra, you know the high elevation like we have a lot of along the east boundary. They don’t use the heavily tempered areas unless it’s interspersed with a lot of open meadows. Much of the southern third of the park is not occupied or used very frequently by bison, so when you get right down to it the occupied area with our two million acre reserve, really is only maybe a quarter million acres. And they don’t occupy any given location 12 months of the year, they move around a lot. They’re very, well the debate is whether they’re truly just nomadic creatures or if they’re actual migratory tendencies. And I tend to believe that it’s both. That they’re nomadic by nature, but in a high elevation environment like we have here, where wintertime is very harsh, deep snow comes to many of the locations that bison occupy in the summer. And they need to be somewhat migratory in order to survive. And so, we’ll see if you study all of the different ungulates of the system you see that all of them are migratory in that they move out of the higher elevations in the summer down to lower elevations in the winter. And that’s no different here compared to anywhere else in the Rocky Mountains or anywhere else in the world where ungulates live in mountainous terrain.

2:53

So with that kind of introduction I think that one of the, one of the truly unfortunate things about bison conservation is that bison are native species to North America. They were native in this, probably third of the continent including much of the Great Plains and into the Great Basin even farther west from here. Like most wildlife species there was a time period over a hundred years ago, even a hundred, and couple hundred years ago where resource utilization was very key. You know we lived off the land. And so many of the wildlife species were hunted or harvested to very low numbers. And the wildlife management profession came along really as a measure to try and restore wildlife populations and Yellowstone is at the center of much of wildlife restoration. They took pronghorn, and elk, and mule deer from Yellowstone National Park, spread them out to locations all around the United States and Canada. And really helped jump- start the restoration process of wildlife across North America a hundred years ago. Well they didn’t take bison out in the same way. Bison left the system and went to fenced reserves as opposed to unfenced reserves. So, in the 1940s when we were restoring all kinds of wildlife in more of a free-ranging kind of environment at their destinations, bison were going to fenced reserves and were much more contained if you will. And so the, the wildlife paradigm shifted for bison as we came out of that low point of a, of a abundance on the continent. And we’re only really have a few truly free ranging scenarios for bison in general.

4:48

Yellowstone is one, Jackson Hole. The bison of Jackson Hole are free ranging with some constraints. Topography and fencing constraints at the south end of Jackson Hull. Everywhere else in the United States, oh I take that back, there is one other location the Henry Mountains of southern Utah. There is a wild bison population that roams on federal lands primarily. It’s a large bureau of land management recreation area with other bureau land management managed areas, around it. , and, right adjacent to Capitol Reef National Park. So, pretty big system down in there, very desert like, so, very limited locations and bison do move around in the higher elevations along the stream corridors there. Other than that, places like Badlands National Park, and Wind Cave National Park, and the, and the six or seven wildlife refuges where you will find bison including the national bison range in Montana, all have fenced boundaries. So, the conservation of the species is certainly the physical form. Somewhat of the assemblage of animals of other ungulates and predators but not complete. And some kind of human interactions in order to manage abundance and manage species composition. Many of the national wildlife refuges will manage to, eliminate adult males at about 10 years of age. And they limit adult male abundance somewhat. So it’s not truly randomized like you would expect in a natural situation. Yellowstone has its own limitations, and one of the things that I wanted to initially start with was our conservation area. And I, if you’ll just pass that around.

6:43

You know biologists, we can’t go anywhere without showing, you know, a data slide or a graphics in some form, so, that’s my one graphic for today. I just put that together for a project report we’re doing as an annual report so before long you’ll see it on our interagency website. Uh we have an interagency website with the five agencies that have gotten together to manage bison in the Yellowstone population. And, and you can google, ibmp.info and it pops right up. And it’s at this point somewhat of a clearing house for organization and keeping of important documents that are involved with decision making in this environment. The environmental impact statement, from 2000 is probably the earliest document accumulated at that website. And then as much as we’ve can find that we’ve put together that’s not deliberative obviously, none of the draft documents are there, but all of the final documents have been coalesced there. The history of, and I’ve got a bunch of nice questions from McNeal that you guys generated. Were those generated from a first or second day discussion with the whole group? Okay, it’s obvious to me that you guys have got quite a bit of background on this particular issue and I think that’s important. That gets us through the first two days of orientation on conservation of Yellowstone bison. Brucellosis is really not the only key driver of our conflict. Area, I think is another aspect. Can we restore wild bison to the landscape much like we’ve done other wildlife species? And that’s and important question to remember. And I don’t have the answer to it because I think it’s, steep in social science, and social acceptance for this species as a wild animal in an environment managed by state wildlife agencies. So, I hope that you’ll debate that and discuss that more over your trip. And, and the final exam, that’s a great question for a final exam. (Laughs)

8:57

You can, because you can write for days on that particular concept. I think that, I think that the conservation area is constrained by not only the topography that we have to deal with but by social acceptance. And bison are big. They’re bigger than other ungulates. They break things. They break more things than other ungulates. And they eat more than other ungulates. And, so when you’re dealing with conservational wildlife species in private land scenario there’s a certain amount of acceptance of what the private land owners refer to as to damage, but what wildlife managers refer to as resources used. That’s not, that’s not uncommon with how wildlife managers deal with all of the other species. They have, what they call damage claims for ungulate grazing in irrigated meadows,for elk, and mule deer, and pronghorn. If you go to the state game agencies, they’ll have a list of how much they paid out to various land owners who claim competition with their livestock on their private lands. We haven’t been able to get to the point where very many private land owners are comfortable allowing bison onto their private lands and you know providing for a little bit of use of their private lands. But it’s possible it could evolve into that in the future. The other aspect of the conflict that I was referring to was the brucellosis that virtually all the questions relate to. So, I scribbled some notes when I got these, we could debate talk about these until way after dark so tell me when you need to go and we’ll close it down and, and then move on.

10:54

The, the issue really relates, kind of got its origin in the introduction of cattle in North America. And brucellosis is a native to bovines of Asia and Africa. So when livestock was brought to North America, you know, there must have been a few infections cases. It went and spread in the North America. And it was really unknown, you know that’s, that’s brucellosis was actually a disease causing problems to humans until about the turn of the last century. And as they discovered that this, this disease that causes fever in humans, that fluctuates from day-to-day and time periods during the day. They finally pinpointed it this bacteria, *brucella abortis,* which is carried by many ungulates. And the disease manifests itself in humans, you know, in like flu-like symptoms, like I said, undulating fever. It doesn’t really manifest itself exactly the way it does in some of the ungulates. In some of the ungulates you actually get intensive colonization of the uterus and the placental tissues and it causes an aborted pregnancy in species like cattle, bison, elk. Not so much in moose and deer, or pronghorn, but they do become infected and moose, deer, and pronghorn tend to die from the disease rather than figure out a way to deal with it and come up with an immune system response that allows the, you know the adult to live for however long its going to live. So there’s a little bit difference in how the disease plays out.

12:48

**Question:** What is the mortality rate within those populations where it tends to be fatal?

I would say that probably every animal that becomes more than just mildly infected would die from it. And that has to do with the life history of the bacteria. Bacteria is really good at proliferating, or reproducing if you will. So that’s probably the challenge in what, the reason I think we end up in trying to do something about brucellosis in livestock is that we can. You know, some other diseases are so fatal there’s nothing you can do about them. But in livestock the, livestock operators were able to, manage the disease by eliminating the effected individuals. And for a long time that’s all they did was eliminate infectious individuals and they would continue to test their herds until they got to zero cases of infection in their animals, two or three times in a row. It’s possible, it probably takes a few years, you know, to go through that repeated testing process. But then as the United States made advances in eliminating the disease from the livestock herds across the country, and they got down to the last few states there became a little bit more of a strategy to just eliminate a herd of animals from a rancher if they came up with any test positive cases. It became easier for the regulatory agencies to just eliminate that particular herd, pay the rancher for ‘em, have the rancher start all over with going to buy new cows. And so as the livestock populations came near the end of the infection cycle and became brucellosis free across the country it was easier. And probably realistically less expensive for the regulatory agencies that did pay the, the indemnity to the livestock operators.

15:03

I think part of the controversy we have with wildlife in the greater Yellowstone area is that, that program was successful in livestock and many of them want to try and apply the same kind of strategy to wildlife and eliminate the disease from wildlife and then have a clean slate across the country. And that there, that this particular disease would not exist here. And so I’m not convinced that we could get there in the next 50 years regardless of how we go about implementing it. We need newer technologies to probably make elimination of this disease in wildlife feasible. So yeah. I guess if these are important questions that guys, I would like to just kind of go down through them and address them and feel free to jump in and ask questions because like I said we could debate and talk about the background that goes into a lot of this for a long, long time. And in the past I’ve done a three-day seminar with the institute to address some of these kinds of things as well. So, initially we talk about what are the factors that determine the risk of transmission of brucella abortis to cattle from bison and the two parts in the ecosystem around here. And I think that the, the primary factors really are overlapping range. You know if range doesn’t overlap you don’t have to worry about it. The disease has to be transmitted from a shedding event, i.e., aborted pregnancy or a live birth where the live birth had enough of, uh, brucella infection in the placenta and amniotic fluid that any interested susceptible individuals could pick up the bacteria. The bacteria has to be consumed by a naive individual in a reasonably decent quantity. There is an infectious dose kind of threshold that a recipient has to accumulate. So if it’s a very minor exposure, chances are it won’t proliferate enough to cause an infectious event in that naïve animal. So you really the, um, the difference of exposure of individuals around the wild land situation is what makes trying to treat the disease very complicated.

17:33

**Question:** So if it’s a real low exposure level then they won’t test positive for the antibodies?

That’s correct. That’s correct. Now, there’s been some estimates of what that threshold is. And I don’t know that there’s a specific threshold. I think it like all of us we’ll have a variable tolerance for viruses and bacterias. I think that’s exactly the way it probably plays out in the wildlife as well. And that individuals’ differences will generate what is that threshold for actual infection. So that, that creates a problem in trying to define what is that threshold of infection and could you, could you drive, shedding down to such a low level that it wouldn’t be a transmission factor in that last, you know, 10 or 15 percent of the individuals that may be shedding. So really in overlapping range, I mean both, you know, spatially as well as in time. So that in space it’s easy to see. But in time, that’s the part that I think a lot of people don’t grasp. And that if you have a shedding event, say you have an infectious live birth and the female cleans up the placenta just fine and the little calf runs away with mom in an hour or two after the event. And the amniotic fluid that was shed on the ground is something that the female doesn’t clean up. But all the tissue gets cleaned up very good, very good. And a lot of times, you know, there will be a little bit of tissue that gets wrapped around a sage brush bush or something because parturition events are kind of messy in the open environment. And so you’ll get a bit of, you know, the water breaks, uh, spills all over the placenta begins to exude and then the, the legs start to come out. And so the placenta where the water broke, catches on, you know, shrubbery, you’ll find little pieces here and there left behind. In some cases, if a, if a birthing event lasts a really long time, you could have tissue spread out for hundreds of yards or a mile or so. So that does two things. It does spread out the infectious dose and drives down in any one spot as a highly infectious location. It doesn’t really, um, doesn’t really biologically cleanse the environment because there are some events where it’s all going to happen in a very small period, you know, area. So, you had a question before we moved on.

20:14

**Question:** Is there a period of time in which the bacteria becomes non-viable?

That’s a, that’s a good question, that’s a great question. The question was “Is there a period of time in which the bacteria becomes non-viable?”. And that’s, the answer to that question is yes. All bacteria die, you know, very easily in heat. And especially in the summer time with high levels of ultraviolet light. And brucella abortis is no different. The challenge is the biology of bison pregnancy period is that they go into that third trimester of pregnancy in about late January, uh, somewhere around there. Maybe some of them in early January. And, so it’s that third trimester of the pregnancy that really is the time period that the bacteria manifests itself to reproduce more. And it has to do with the amount of hormones and estrogen combinations in the uterus at the time. And enough levels of the right chemicals are generated in the third trimester that the bacteria, you know it’s time to reproduce, and they reproduce in big numbers. So, brucellosis associated abortions begin occurring in late January. And occur really all the way up and in to kind of the early part of the actual birthing season. And what happens is animals that come into the pregnancy infected and it’s going to be their first pregnancy after infection are probably going to abort early in the pregnancy cycle because the bacteria are manifesting and reproducing and are effecting that pregnancy. Well that cycle is short enough that if a naïve animal becomes exposed to one of the very early aborted pregnancies, there’s probably a possibility and I would say probably because it certainly happens, you know, and has been documented in the livestock literature. Animals, animals exposed to those early pregnancies that were brucellosis related abortions, can go through that cycle and abort their pregnancy, like right at the end of the pregnancy cycle. So we will see a few aborted or, full-term pregnancies that are, uh, brucellosis positive shedding events. Now when I say that I also have to qualify that, in that, there are a lot of terminations to pregnancies that are unrelated to brucellosis. And, I don’t know how representative my sample is it’s very opportunistic sampling. But I know that probably 15 percent of our pregnancies that have been terminated that, you know, didn’t result in a live calf walking away. We can culture the bacteria from tissues we collect. So that’s a pretty low number but it’s possible that’s a biased sample because of the opportunistic way we’re sampling it.

23:33

So that’s a long dissertation for the first question. I got to hurry here; I’m not going to get through all of them. Then the next question really is what is the state of the scientific understanding of transmission between wildlife species and between wildlife and cattle. And, I think that the mechanism for the transmission is very well understood. It’s shedding during a pregnancy and the birthing event whether it’s full-term or not. A naïve animal licking and becoming exposed to the bacteria. Mucus membrane transmission, the tongue, the lips, um, the nose, the nose on most ungulates is a mucus membrane just inside the hard outer layer. So it’s easy to see that if you have a young calf that’s born even if it’s alive, calf, birth, um, it was bathed in amniotic fluid just before it came out and was born and so there’s going to be bacteria in the little short hairs all over the body. And bison are very social individuals. And many times they’ll have, you know, a crowd of colleagues come and crowd, crowd around a new, little red calf. And they’ll nuzzle it and they’ll lick it and just like mother’s doing. And that’s a transmission, you know, that’s probably the most likely transmission vector that’s on the landscape. And elk do the same thing but they do it to a less prevalent degree because in live births, elk tend to segregate. They’ll go off and hide in the bushes and there won’t be a crowd of elk around to observe the live birth. But if an elk is going to abort a pregnancy before full-term they’re not necessarily going to go off to the side and do that, they’re going to still be aggregated. So there you see the transmission probabilities among elk. Probably more related to just the abortion period, not necessarily the live birth opportunities. The other transmission probability that we don’t know exactly what the percentages are is from the mother to the offspring. And in utero it is completely possible that the bacteria can be passed to the young because the blood is cycling through both individuals. And there is a time period that the disease is so bacterimic that it’s in blood system as well. In addition to that the milk is another factor for transmitting the disease from the mother to the offspring. We know that it’s not common, but it’s possible for transmission from adult females to their offspring.

26:32

**Question:** Can it be transmitted through semen?

There’s no evidence at this point in time, um, there’s not be a lot of research in that realm but if you take and through artificial insemination you can get the bacteria to survive and so it’s possible for transmission to occur that do, that way. But through natural copulation, there is something about that enzymes in the vaginal area that doesn’t allow that bacteria to survive the copulation and fertilization process. So…the really good question here is does the bacteria effect the reproductive potential of the bison? And our investigations over time have found that yes, that does affect the ability of bison to produce that first offspring or live birth and successful live birth in that first pregnancy after infection. So, if infection is at four years of age, that following summer, um, the animal becomes pregnant, that pregnancy probably will terminate due to, you know, excessive reproduction of bacteria in the reproductive tract. Uh, what we’ve discovered is that not every bison and very few will actually recycle and become pregnant the next year, very few. And in some cases it’s several years before a bison becomes pregnant and has a successful, um, calf, um, after having become infected with brucellosis. Um, again we haven’t tested that in a controlled environment, um, but we’ve been accumulating, uh, you know, an annual database of tracking, you know disease prevalence in individuals, estimating the year, um, in which they convert into a positive animal, um, watching intensively during the birthing period for abortion events. And, um, what, what we’ve estimated is that, um, brucellosis probably affects the reproductive potential of population by about 15 percent. So if we were to resolve the disease issue we could have 15 percent greater, you know, uh, calf crop on a, on an annual basis.

28:59

Moving on does brucellosis pose a risk of transmission when it occurs in bison but is not present in the reproductive system? And that’s a really hard question to grasp. It’s a good question. It brings out the idea of latent infection in the individual. And brucellosis is one of those really difficult intracellular diseases to attack and cure in an individual because an animal goes through an active infection period build immunity to the disease, or I should say the ability to produce antibody to fight and fend off the disease will test positive for a long period of time and may continue to test positive forever if it keeps becoming exposed. Uh, but in subsequent years it will have an immune reaction so if it’s exposed it wouldn’t necessarily be infectious. So it’s a good thing to have zero positive animals in population because those animals that have recovered from the disease or you know in essence immune to any kind of future exposure. Now I say that tongue in cheek because the disease will hide, if you will, in the lymphatic tissues and places like your spleen and your limp nodes throughout, um, especially the limp nodes in the back of the jaw and the ones that are around the pelvis and around the reproductive system. And what happens is I would say that the disease is manifested by stress in individuals. And trying to survive the Yellowstone winters around here when green grass disappears, brown grass is certainly available but then it disappears under the snow and is hard to get to animals go through a process of starvation where they’re, you know, gaining their energy from their fat reserves as much as they are from forging under the snow for poor quality food. Um, so they’re gaining a little bit of energy from forging but at some time late winter they’re gaining a lot of energy from their fat reserves. And that’s an energy producing process in the body that is going on at the same time that pregnancy is also kicking in to a point where it needs a lot of energy in that third trimester of the pregnancy.

31:41

So there’s a lot of competing, you know, processes within individually pregnant females for the stored energy that she has or the energy she can consume all around. And so, what we see and the way it was manifest, er, discovered was in the study of wildlife or livestock is that, um, animals can, can basically under stress conditions convert back to infectious individuals even if they’re a, a number of years past that initial infection. We refer to that as a latency of the disease, where under a typical livestock situation you wouldn’t expect it very often. Livestock are well fed throughout the winter. A rancher can’t afford to have his animals get really skinny and then have to feed them up again in the summertime. And so it’s really kind of the difference between infection in livestock and infection in wildlife in that, you know, wildlife are living off the landscape. And it’s a natural part of a, a wildlife system for animals to put on thick fat reserves and then be very, very skinny at the end of the winter and have to recover those fat reserves.

32:57

**Question:** (can’t hear the question, too faint in the background)

Yes. Most definitely, most definitely. And it is, it is for that early period, but as the immune system in the young finally develops it’s not one of the systems that’s highly developed at birth. It takes four or five months to develop. Um, by the time that immune system develops, it’s unlikely that antibodies from the mother have been passed on to where the young is automatically able to produce those antibodies. It’s unlikely that you get that kind of situation. But during that intervening time the mother passes on through the milk and then initially through the blood so there’s certainly some immune response to exposure that that little calf might have for a few months, the first few months of life.

33:53

So you can start to see that there’s a lot of little details that make resolution to our disease issue very complicated. Um, we’ve talked a little bit about overlapping range. As long as we can keep cattle and bison separate, it’s the easiest way to solve our dilemma. One of the things that is on here is the relationship between the serology tests and the culture tests and how infectious an individual is. And the best information we have is that amongst serial positive individuals, close to 50 percent of them will be culture positive. And by that I mean you could kill the individual and extract the spleen and a number of those key limp nodes that I was talking about that are places where the bacteria manifests. And you could take out tissues from the reproductive system and you could get culture positive results in the laboratory. And that’s an indication that that individual is actually infectious, and if pregnant could shed bacteria at either an aborted pregnancy or live birth event. So about half of the animals that we test positive for brucellosis are really, highly likely candidates to be shedders of the disease if they are pregnant. And then that latency issue that we talked about, um, kinda it doesn’t really rule out that all of the rest of them couldn’t later in life become infectious for a short period of time. So, there’s a lot unknown about latency and probably because in the livestock industry it wasn’t worth trying to learn about it because it was something easy to work around; they just eliminate those animals. In wildlife it’s incredibly hard to study because it’s hard to get your hands on an individual every few weeks. And it’s, um, difficult to get specimens that you need to culture without killing the animal. So you don’t have that animal to look at at different time periods. So it’s a huge challenge, in how we were going to go about solving, brucellosis in the wildlife population. So there is a lot of information I think on websites all around for true prevalence of infection within the wildlife populations. And I would refer you to the greater Yellowstone Interagency Brucellosis Committee for some compilation of information on that. We talk, you ask here about what’s the risk of direct or indirect transmission of brucella abortis from bison to cattle, from elk to cattle, from elk to bison, you know all of the different ways that it occurs. And I think that you know, biologically feasible for all of those species to share the disease with each other if that there is that overlap in time and in space that, you know, on the same ranges. Elk is, is a likely vector at this point in time as the as the key threat from transmission from wildlife to cattle in the greater Yellowstone ecosystem. If you go back and study Shivel and who was his co-author, um, McCullah, they wrote a book in the late 1990s called Brucellosis in the Greater Yellowstone Ecosystem. It’s a National Academy of Sciences book. And they, they described eight cases of wildlife to cattle transmission. And in every one of those cases, it’s most likely elk. There was only I think one case that bison were even nearby and I happen to be apart of that lawsuit. Um, the bison that were involved were all male, adult males. And we talked a little bit about the key probability for infection being from abortion events and live births. So the court case was really kind of fun because, you know, we got to poke fun at the other side in that there’s never really been a pregnant adult male in a million history. So it’s really difficult, you know, to kinda prove your case there and the judge snickered and said yeah you’re right. And so kinda threw that argument out in the court case. So, since that book came out in 1998, there’s been about eight or nine new cases in the greater Yellowstone area that have resulted in all of the three surrounding states losing their livestock brucellosis free status. Um, in each of those cases elk was the likely vector. And they did it through indirect reasoning, inductive reasoning in that they couldn’t prove that there was any kind of cattle to cattle transmission. And there wasn’t any way to, you know, test individual elk that might have been in close proximity to the cattle. So we know that there wasn’t any bison in close proximity. So indirectly we went back and said it had to be through elk.

39:09

Yeah, yeah, that’s a good question. And it’s a really good question. Could you do tests on the actual samples collected from the cases that cause brucellosis in the livestock? And there is some of that going on right now. And it’s a collaboration with some friends and colleagues at the University of Montana with the national animal science lab in Aims, Iowa. And what, their, their kinda looking at is from a genetics perspective and, and, you know, samples get thrown in the freezer because we don’t know what to do with. And now we’ve got a genetics sampling has come along so far that all of those bacterial samples are now being looked at to get the genetics of the bacteria and compare them from all of the cases. And we have been able to contribute some, some bacteria from culture positive cases in our Yellowstone bison from the work we’ve done. There has been some work with the State Game agencies outside, you know, the national parks and the three states. So there will probably be an answer to that in the next year and a half. I know the graduate student working on that project. The preliminary information is that when you look at the diagrams of relatedness. The relatedness of the bacteria genetics that were collected from cattle, are more closely related to the elk than to the bison. But they’re not so distant that you can’t completely rule it out just yet. And so really the one of the key questions is,you know, how is the system of bacteria related in the environment and is the bacteria, you know, just uniformed throughout the greater Yellowstone area or there are isolated little populations of brucella abortis bacteria that can be identified as completely separate, in various locations around the greater Yellowstone ecosystem. And to get to that answer, you know, it’s probably going to be eight ten years and three graduate students and a monograph or two here and there. But I think, like I said, we’ve got the technology we’re on the, we’re on the right track and I think that that’s something that’s new that the scientists are working on in a, in a very systematic manner. And, again that’s one, that plays into that I think we are fifty years out, you know, to resolution of this issue. And that may be, that’s at minimum.

41:50

Um, got a question in here that says, what’s the known risk of brucella abortis transmission compared with other diseases? And I’m not really sure how to answer that. Um, I know that there are a lot of other diseases like, um, pair tuberculosis and even tuberculosis that are more, um, pneumatic related so the animal coughs, you know, and the bacteria are spread around in a kind of aerosolized manner. And just breathing in that bacteria creates a transmission vector. And so there’s, there’s actually quite a, number of diseases that are really transmitted that way, so feed ground environments are really susceptible to those kinds of diseases. And, um, I want to say there’s a disease called hemorrhagic fever that is very common in goats and sheep and deer. And so in places in the lower country around here, in the low lands around the Yellowstone ecosystem, that’s pretty common. And it pops up, it’s episodic, it kills off big groups of deer and then, um, you know, it’s gone. So it kills the animals very rapidly so the disease doesn’t persist in the population for long. And, so that’s what’s very different in how brucella operates in that it’s the shedding on the ground and the actual licking or, or nuzzling of the bacteria that’s the primary transmission vector and it’s, not really a debilitating kind of disease for a population that has the infection of brucellosis. To the individuals who are infected it may seem debilitating. There are threaded kind of symptoms that come with it. Um, we ask what is the state of scientific understanding of safety and effectiveness of existing vaccines. And that’s a hot topic of debate, that’s a very hot topic of debate. And in experimental trials, the vaccines are very effective, they do show that, when exposed to an animal that’s a vaccinate, there is a much higher probability of having a successful pregnancy and fending against actually serially converting to serial positive animal. That probability in wild bison is relatively low, um in serial conversion but is much higher when you talk about the, their ability to have a successful wildlife birth. So, it’s a complicated answer to get your head around, but the difference between the two available vaccines really is that the RB51 vaccine has evolved so that it doesn’t confuse the diagnosticians. That if you use the RB51 vaccine as your tool for vaccinating your population, you can tell the difference, or, or, it won’t confuse your test for an individual that later becomes infected or that you test later after you’ve vaccinated. And it has to do with the chemical difference in the, in the structure of the bacteria in the vaccine. So you can vaccinate an animal with RB51 after the initial infection period is over it’s very hard to get it to test positive on any of the tests that we have. And that period is about four months max.; two and a half to four months is the time period. So, an animal could in, in converse this older strain 19 vaccine, doesn’t have that capability. So, if you vaccinate an animal with a strain 19 type vaccine, it’s always going to test positive on all of the brucellosis detection tests. And in the future you’ll never really know if that animal test positive because it’s been vaccinated or it test positive because it has truly been infected by bacteria that was naturally shed in the environment. And so that’s why we’ve been reluctant to try and get on board with use of that particular vaccine. There are indications that, that older vaccine is probably a better vaccine for imparting immunity to the disease. You know, so it’s got some advantages as far as its ability to provide an immune system response but you know it just confuses the matter and we would end up in scenarios where we test and call individuals because their test positive. We’d be, you know, eliminating animals that we really wanted to keep in the system because they’re vaccinates.

46:46

**Question:** Is that a primary objection, vaccinating the wild population?

You know I think that the primary objection to vaccinating wild animals is the concept of tinkering with wildlife. And what a lot of people don’t really look at is the literature on wildlife disease control throughout the world. And there’s a lot of vaccination against wildlife infection with tuberculosis. There is an enormous body of literature about wildlife vaccination of wild animals with rabies. And, rabies is a big issue in the eastern United States where raccoons and foxes and really a whole bunch of small mammals are infected with rabies. And what the wildlife and public health officials are finding is that they put out bates for this rabies, it’s basically a rabies vaccination. And they can build defensive barriers around rabies free areas and protect the disease from spreading into the rabies free areas. But what they haven’t been able to do is eliminate the disease where it already has manifest. I don’t think that vaccination can be done in such an effective manner that it can eliminate the disease. It has to be done in concert with some sort of test and removal of infectious individuals. And at this point in time, that the only feasible way that you could eliminate brucellosis from the wildlife of Yellowstone ecosystem is using vaccination in concert with some way to test and eliminate infectious individuals. And the stumbling block to really moving forward and implementing something like that is that the diagnostic tests to tell infectious individuals apart from non-infectious zero positive individuals is not there. We don’t have that ability without killing the animals. So the circle of dilemma, you know, becomes even more complicated when you look at it. Um, and some sides of the issue will just say, well let’s get on with it and do this, you know, this test and remove. And it doesn’t matter, just remove any individual that test positive because then you are guaranteed to get all of the truly infectious individuals out of the population. And then don’t worry about those individuals that are zero positive but not necessarily infectious. And at Yellowstone and in the national parks and the core of the greater Yellowstone area, you know, it makes us nervous to implement a program like that when our ungulate populations play a critical role, an ecosystem role in the environment where they provide food for a whole host of predators and scavengers. And in implementing a full scale of test and call combined with vaccination kind of a program, you would really be affecting the whole system. And you would be affecting the plant communities because bison are such modifiers of the plant community in that they wallow and they break trees and they keep open areas open. And they provide food for wolves and jays, coyotes, and foxes and other things so.

50:08

**Question:** I know we’ve talked about the and debated a lot of the science, but it seems the other issue is there is time and space so with space being the national forests that they go to in the winter time, um, for grazing, it’s a, the conditions that are in Yellowstone that they, they need to seek shelter in lower areas. And so, you’ve talked about the, grazing wise between the cattle rancher and the cattlemen and the bison. And then I looked at the study that was done in 2005 from the group from Calvary,

Oh the review, yes.

**Question:** What has come from that study that tried to determine when the bison would be leaving and by which routes and, um, and to try to properly determine sustainable, bi, uh, bison levels compared in range of their last go.

Yeah, I saw that question on here, so that was you. (laughs). I, that’s a good question, that’s a good question. We were, I was relatively new to the program at that point time and was just starting to gather a bunch of information. And we were interested in getting, kind of a external unbiased review of all the stuff we gathered up and put together. And, that was a review paper, looked at all of the information we had available and they did build a kind of a cool, little model, looking at what are the probabilities and numbers. And the model projections in that project report were that it doesn’t really matter if you allow animals to go out on an annual basis and you cull two or three hundred on an annual basis. Or you try and keep them in the park as much as you can until it’s finally such a heavy snowfall winter that a whole bunch of them have to leave the park and you have to kill a thousand or fifteen hundred. Over a hundred years, you end up culling the same number of individuals from the population. And the population fluctuates from, you know, two to five thousand animals over time. And we’ve refined that, I’ve looked at trying to build that, correlation between snow pack, animal population density. Right now we are trying to do some remote sensing to look at whether we can incorporate as another co-variant in that analysis forage production.

52:59

I don’t think forage production’s going to be very explanatory, uh, you would think it would, but, I think snow is more of an influence on making that forage inaccessible in those heavy snowfall winters than the total amount of forage that is produced. And what, I think what we’re finding out is that we were finding our numbers. Uh, we think that, you know, if the behavioral aspects of the population don’t change too much, that we probably would expect that, the average winter, we would expect to be able to support a, a population within our conservation area that area that I passed around. We should be able to support a population that ranges between twenty-five hundred and about forty-five hundred. Um, but once you get up to that about forty-five hundred, you run the risk of a big cull event, in a few, and then, a few years following that. And that once you get to forty-five hundred animals in the population, you’re going to have to somehow come up with mortality of about four hundred and fifty animals a year in order to keep it about forty-five hundred. So that’s…

**Question:** …keep the bison, even at springtime within the Yellowstone range

Uh, huh.

**Question:** And, I looked at, you know, the role of grazing rights and the role of a lot of those animals in public land. Um, and it seems though the, the way you see the grazing issue, you see frustration and slaughter of the bison that do get out. Is that, I mean, I just, I don’t see that there’s a solution to those, to those kills. But I think that there is proper management, proper pulling of individuals for, for that. But then, the kills that we’ve seen, you know the counts of only two in one winter to sixteen hundred it seems arbitrary as far as…

55:14

I think I see where you are going and I think that that’s, that’s a false assumption that it’s arbitrary. I think it’s very, very explanatory in if you look at that correlation between population, overall population abundance, snow pack, in the environment and especially in the interior ranges. And it’s directly correlated to those to co-variants in your analysis. And so anytime that you get an average or above average snowfall you should expect, you know, mass movements, to the lower elevation ranges. And right now, the low elevation ranges can only sustain, you know, certain number of individuals. And until we can allow for our conservation area to be expanded, to be able to incorporate a little bit larger low elevation number, we’re going to be in this cycle. And we, we the national park service have always been supportive of our state partners, should they choose to expand that conservation area and until 1995, you know, that conservation area boundary was the exact boundary of Yellowstone National Park. Every single animal that left Yellowstone National Park, was killed, one manner or another. Um, and what we noticed was that that wasn’t routine. It didn’t routinely occur until the population abundance reached about that two thousand to twenty-five hundred animals. Um, so,all of the things that we talk about are very similar. I think that the responsibility and management is something that’s, where we can, we can move the debate and move how we responsibly manage this population. I think that it needs to be managed in a way that it protects the genetic integrity, it protects the role the bison play in ecosystem processes in that they still continue to be migratory so that they have that opportunity to occupy all of the potential habitat that Yellowstone has to offer.

**Question:** That’s, I mean that’s where, I guess where my other strain was at because they were out of the bounds. It wasn’t based on any numbers because they were…

Oh I see what you’re saying.

**Question:** because they were out. They were non-brucellosis. For the males, irregardless..

Oh yeah.

**Question:** …of the situation inside the park because they were out they were slaughtered. But it was because of the fear of brucellosis apparently by the cattlemen.

57:53

Ok, I see what you’re saying. So you, so you call that arbitrary, I, I guess I would call that deliberate in that our state partners deliberately, you know, are worried about brucellosis as a infection vector. You know, and so, because of that, that very deliberate concern, about the disease and they see the Yellowstone bison as a vector for that, that disease. That they have a very proactive, deliberate management strategy for dealing with animals from our population that move out of the park. And they’re very untolerant if you will, is that a word? I don’t know if that’s a word or not. Um, ten minutes? Alright, cool. This is actually, probably, the root of, you know, of what I think you guys are debating a lot, is how is a, what is a responsible management strategy for this highly, revered population of wild bison? Um, because it represents, wild life. Yellowstone bison represents bison as wild life. Many other bison in the country on ranches and farms around the country only represent bison in the physical form. And so, because of the fact the Yellowstone National Park’s management jurisdiction only encompasses the park, we have to build partnerships with responsible organizations that would have that management responsibility when our trusted resources leave our jurisdiction and are managed by others. And so we, it’s not an easy issue it’s a debate constantly. And I think that the long term solution is that we have to have a credible program for managing bison at the boundary of the conservation area, regardless of where the boundary of the conservation area is. And so if you look at where we are at right now, we’re managing no differently as we were when the boundary of the conservation area was just the national park boundary. You know, over the course of the last fifteen years we pushed that out a little bit. And you can see those polygons on the map, where ever that is, that are a little bit beyond the park boundary. And I think over time, the role of conservation organizations in wildlife conservation is to work with state game managers, state wildlife managers to look at effective ways to allow wild bison to be in the state of Montana and the state of Idaho, and the state of Wyoming. And be under, you know, a wildlife management type of management rule. And come up with a way that’s a credible way to deal with all animals that wanna go farther than that. And that’s no different than how we manage wolves, and how we manage grizzly bears, and in reality how we manage dear and pronghorn. There are places in eastern Montana that deer and pronghorn are not tolerated because too many of them show up on individuals’ and farmers’ land. So, the model for bison is progressing and the method in which we manage animals at that boundary of the conservation area is really the root of much of the conflict. And if we can come up with a way that is much more humane treatment of animals than simply putting them in a trailer, and locking the trailer shut, and unlocking it at the slaughter plant, I think that many of the sides that are so far distant in their, opinions of how we do things around here could come together and see that we, you know, we can do it.

1:01:50

There are rules and regulations that are challenges, there are few states that have rules for wild bison. Utah, out of fifty, Utah has rules for wild bison. Wyoming has rules for wild bison if they go to Jackson Hole or if they go out the east gate as far as Wapiti. So there’s twenty, well there’s probably about forty miles of Wyoming outside the national park. But their rules are for adult males only. They don’t allow females. So without females, you don’t really have a viable wildlife management strategy. Montana really has none, if you will, it’s our inter-agency bison plan. And you saw those tiny little you know polygons for the state of Montana. So anywhere else in the country, the state doesn’t have rules and regulations it’s the national parks and the refuges and the preserves that do the best they can to manage for as many wild characteristics in those populations as possible. Possible solutions, possible solutions are for states to change their laws, designate areas from where they probably could manage wild bison. Um, but it would require legislative change to rules and codes of regulations. So there’s a process that conservation groups can work with. There’s state wildlife agency. It would require multi-agency partnerships much like what we have here to develop management plans for wild bison and some of those landscapes. And another valuable partner is the tribal entities of the many tribes around the country that operate as, independent governments. And they have cultural ties to bison because of their religious beliefs about bison on the landscape and they make very good partners. So, in kind of closing, I would throw out some wild harebrained ideas that we come up with occasionally. And that you know, you change some of these laws and regulations that are governed by the Ag industry and the Ag regulatory agencies, and you make the laws just flexible enough that you can develop quarantine areas that have no influence over the brucellosis class free certifications of the various states. And you still implement all your same regulations in livestock industry, that you do outside those designated quarantine areas. And slowly over time, you test the idea that you can take Yellowstone bison and instead of sending them to the slaughter plant, you send them to a hunting preserve if you will. You know, all of the animals that have no other choice but to die because they’re infected, you send them to a hunting preserve and the tribal entities can kill the animals in a spiritually, meaningful way rather than the captive bull in the in the slaughter plant. And you come up with a quarantine type of a program in a place where you can actually quarantine out disease free animals and find the disease free animals from the Yellowstone population that really could go to many of these places that don’t actually have to be quarantined because they’re disease free. And then you test the social acceptance of bison as wildlife in our society, because of all of the things that they do as just the same as deer and elk do, they eat things.

1:05:31

And they break things more often than deer and elk do. So, society and private land owners have to learn to live with wildlife and I’m sure you’ll get some of that debate, and, and perspective from ranch owners around here in your time here. And there’s a vision amongst the livestock industry and I’ve met livestock operators that would be perfectly happy building the kinds of facilities to protect their livestock and allowing live bison, you know, on portions of their land. But, it’s a hard thing to do I think from a societal perspective. And at this point time I see room for a small increase in size of our current conservation area, but not huge. We’re never going to get to 50 million bison again. And we will be lucky to get to 10 thousand. Uh, right now if we can manage for twenty-five hundred to forty-five hundred, I think that we will be able to preserve all of the nature role that bison play in the Yellowstone ecosystem. Um, bears will have food, wolves will have things to chase, the scavengers will have extra protein because these animals die from a variety of reasons. And, the plant communities will go through their ebbs and flows because of the wallowing and the trampling and the grazing and things of that nature. So there is a way to make this work. And the debate will have to evolve in the social arena for it to become more acceptable and people are going to have to learn to live with the fact that a certain number of animals from the Yellowstone bison population are going to have to disappear. Not necessarily on an annual basis but pretty frequently. Uh, and if you don’t like it to occur for, to the slaughter plant, we’ve got to get the groups that have responsibility, you know, for managing these animals outside the national park to kind of come together to accept some change of the way we do business. Andso, we’re the bad guy. I didn’t wear my black hat. We fully are willing to take on the bad guy role, but we think we’re in the bad guy role because of the success we’ve had in restoring bison from twenty-five in the early 1900s to two thousand to four thousand animals at this point and now, time. And we’re not going to solve social dilemma in my career or the careers of my staff. But if we can make these small incremental steps in improving the situation, that’s what management of public trust resources is all about because we’re constantly looking for the greatest good for the greatest number of individuals and constituency groups on the landscape.

1:08:27

And I didn’t get through all of the questions but I would be happy to give you my notes or, or e-mail some thoughts to ya, if that’ll, if that’ll help some. Um, other burning questions that I completely missed in, in my discussion? Keep a going. (Laughs)

**Question:** You said that the ag industry is starting to change it’s point of view. Do you think that the loss of the brucellosis free status from over time is subsequent to the body in area one in that was also stated in the counties that border Yellowstone…

Yes.

**Question:** as area two is a step, is a way to start to increase the availability of bison roaming back on to range lands that was, you know, given to cattle rangers to maintain the natural vegetative state because the race and the obsess of bison…

Right.

**Question:** wanting to go back to the range lands.

Yeah, the brucellosis action plan that the state put together. I think that’s, I think that’s the only way that we can make progress and come up with a way that bison can have more room. That we have any hope of expanding the current conservation area. And, um, I’m perfectly comfortable with the conservation area boundary where it’s at right now. Because we have to learn to build a credible boundary management program, like I said, and the more pressing issue I see in the next 10 to 20 years is, is there a place for Yellowstone bison to go outside Yellowstone park besides the slaughter plant. And, we’re not even positive there is. Um, if there’s no willing takers, then we don’t have any other choice. But if there are willing takers, we’re willing to work the system and make it be a credible move and not just a move for political statement purposes. And so, we are going to continue to send animals to the slaughter plant, you know, in the near term and we hate it. And so, you know, we’re constantly looking for new avenues for dealing with that surplus if you will because the preservation mandate of the national park is great. The natural processes play out but the animals because of their migratory nomadic behavior when population density reaches a threshold level, their going to want to immigrate to a new location and reduce that density to what is more comfortable for them in the park. And that’s a process that will never go away.

1:11:22

It will be, you know a part of bison, you know, and bison life wherever bison go. So, that I think, how to remove animals from the system credibly is something not only we have to figure out but if there are new landscapes for bison to go to it has to be figured out there. And, and hunting’s a great role. Hunting plays that role for most other species in environments outside national parks. But hunting doesn’t have a role inside Yellowstone National Park. And that’s a difference between what we’re trying to deal with. And so acceptance of a bigger conservation area could give hunting a little bit more of a role in abundance management. But then you would have to accept migratory behaviors earlier in the, in the fall when hunting is more ethical. And migratory behaviors occur now most regularly in the end of the pregnancy cycle and hunting is really not very ethical. Um, it’s not very ethical to send them to the slaughter plant at that point either. Um, so we’ve got to, we’ve got to do that. New program.

**Question:** We were anxious to have the facts from the experts…

Yeah, I think that that’s the root of much of the conflict is how much information a constituency group gathers before they make their, um, statement or their opinion. And if you gather two-thirds of the information you could come up with a completely different perspective than if you gather 90% of the information. And then when you gather 100% of it, it could be even a completely different um and so…

**(someone speaks in the background):** You might even be able to retire.

You bet. You bet. (laughter in background)

**Question:** Hey Rick before you leave us, one one more or two more questions...(cant hear the rest approximately 14 seconds long)

We’ve done the first flight. We do three flights in the summer so we can kind of build the confidence interval around our estimates. Um, from the first flight it looks like our population somewhere in the thirty-three hundred animals perspective and about just under 500 new calves this year.

**Question:** This question is about um...(cant hear question approximately 10 seconds)

(interruption) Cool.

**Question cont’d:** …which tribe are allowed to hunt bison, not in the park but outside the park?

Yeah um, trying to remember. The treaties allow tribal hunting on non-reserve federal lands and Yellowstone National Park is considered reserved federal land.

1:14:52

Um, so they can hunt on the national forest of burling management places things of that nature. Um, the Nesperas tribe and the confederated Kootenai Salish tribes of the flathead valley are both actively involved in bringing hunters to the area around the park on an annual basis. And the, uh, Batak tribe, I’m not sure if it’s both the Bataks and the western Shoshones. But from the, uh, I think it’s near Blackfoot, Idaho, I can’t remember what they call their reservation. But, um, they have been working their treaty interpretation and it looks like in the near future they’ll participate in tribal hunts as well. So…

**Question:** So some of those places are just outside of where you’re staying so, …just above town where bison from Yellowstone migrate out of the park. For service where the hunters go.

1:15:49

So a good question to ask your tribal contacts are: “Would you be willing to take Yellowstone bison at your wildlife, or your tribal lands and would you manage them, you know, genetically, you know, number wise like they would be wildlife on your tribal lands?” And then the solution, a possible solution that’s been thrown around is the idea of hunting reserves because, you know, the time that we end up having conflict is so late in pregnancy that we send them to slaughter and it’s unethical and we debate about all of that. Um would they be willing to or could they see a reservation somewhere that could take animals’ late pregnancy, allow them to survive the pregnancy and then be a part of a hunting reserve during the appropriate time of year. And see if they would engage and talk about that .

1:16:57

END: 1:17:19