THE ART AND SCIENCE OF
Mule Deer Management

By Jim Heffelfinger

Deer management is not rocket science as they say, but it can be complex to execute and confusing to explain to the nonbiologist. Many decades of trial and error have honed the practice of deer population management well. That doesn't mean they have it all figured out or that it is simply a matter of getting all-knowing biologists in a dark room to hammer out the next year's management plans. Wildlife is held in public trust and biologists working for private, tribal, state, provincial, and federal entities are the trustees who manage all wildlife for their constituents, sometimes with only fragments of information and some educated guesses. It is a collaborative process involving the public, landowners, experts, and experienced managers who work together to manage deer populations in a way that is guided by public desires and informed by science and experience.

From the outside looking in, deer management looks easy. We see the season dates and permit numbers in straight clean rows and columns in the hunting regulations and we know it takes science and experience to produce those. We think similarly when we look at sausage in its finished form, but those involved behind the scenes know that getting to the finished product is a bit messy. The truth is, behind the science of mule deer management there is also quite a bit of artistry.

Scientific Foundation
Science is the foundation of the North American Model of Wildlife Conservation. Management must have a scientific foundation to be justified and defendable. Once a scientific foundation is established, we can build many different management structures upon it for different purposes and they all might look very different from one another. Science from wildlife research provided the roadmap to proper management of wild populations from the very start of the profession. Aldo Leopold, the father of modern wildlife management, was paid by the Sporting Arms and Ammunition Manufacturers to conduct a game survey of the north central states in 1931. Since then, managers and scientists have worked together to learn more about the animals we hunt.

Proper management of deer populations requires that decisions be based on solid information collected in a consistent way. Although all information should be considered in management decisions, it is sometimes tempting to place too much emphasis on anecdotal information. It is very common for biologists to be accused of mismanagement by hunters because they didn't see as many deer as they usually do during their 6-day hunt this year. Or, if someone comes upon a big buck killed by a cougar, it is easy to jump to the conclusion that we have a lion problem in that unit. We don't want our agencies making management decisions based on anything but consistently gathered data with robust sample sizes. For about 100 years, conservation-minded people have been making steady improvements in determining the most meaningful population parameters to monitor and the best methods to gather that information.

From a strictly biological standpoint, deer management is based primarily on two categories of information: harvest and survey data, supplemented by other forms of guidance from population

Overwinter survival estimates are often used to help predict if the population is increasing or decreasing.

models, vegetation surveys, survival estimates, and other supportive data. Sometimes deer surveys are erroneously thought of as a count of how many deer are in a Game Management Unit. This is not possible from a technical or budgetary standpoint. Instead, biologists sample a representative portion of the population to obtain information that helps to estimate demographic and abundance information such as: buck:doe ratios, fawn:doe ratios, density estimates, sightability models, and deer observed per hour of survey. Deer managers compare current-year estimates of population parameters to their goals, but also track long-term trends in survey data. Only through standardized and scientifically designed surveys can deer managers collect useful information that is informative for making decisions.

Along with information from deer surveys, harvest data are the second major source of deer management information. Harvest data consist of two general categories: hunter questionnaires and biological data collected from the harvested animals. Almost all states question hunters in some way shortly after the hunt to obtain information like hunter success, an estimate of harvest, days per harvest, hunter-days expended, and that is all useful in managing deer populations. In addition, states collect biological data such as weights, ages, antler classes, disease samples, and antler measurements.

These survey and harvest metrics must be consistently measurable and compared to population objectives or goals that managers and the public develop together. Population objectives may not be a certain number of deer, but rather a range of population parameters to manage within, like buck:doe ratio, fawn:doe ratio, hunt success, number of antler points, and age structure. Data collected on public opinion, called "human dimensions" research, is also part of the scientific foundation of management. The input an agency gathers at a public meeting is not necessarily representative of what most hunters think. Wildlife agencies are now employing human

Mule Deer Survey Trends

Shaded areas are guideline ranges

BUCKS/100 DOES — FAWNS/100 DOES
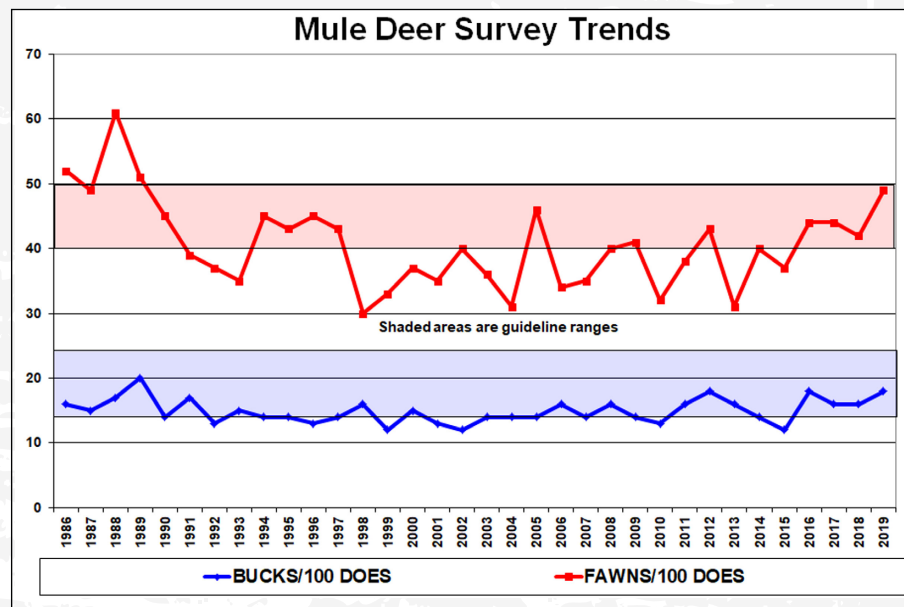
Biologists apply population data to guidelines or objectives and monitor trends in deer populations.

dimensions specialists to design valid surveys and conduct research focus groups to better understand public perceptions and desires related to how we conserve wildlife.

Artistic Ability
Do biologists have all the answers? Not 100% of the time. Managers never have all the science they would like to make management decisions. The public often thinks biologists know how many bucks are in a management unit and then simply prescribe the right number of tags to harvest an appropriate percentage of

available bucks. The truth is, biologists rarely know how many deer there are, and they don't need to. When I speak to the public sometimes someone will express surprise and dismay that agencies allow hundreds of tags for a deer population and then openly admit we don't know how many deer there are in the population. Is that careless and negligent? No, because of what can be called the art of mule deer management.

Managing a deer population is like sighting in a rifle scope. You have a target that you are trying to hit just

Photo: Tom Koerner/USFWS

By recording the number of bucks, does, and fawns seen on surveys, biologists are able to use trends in ratios to make management decisions.
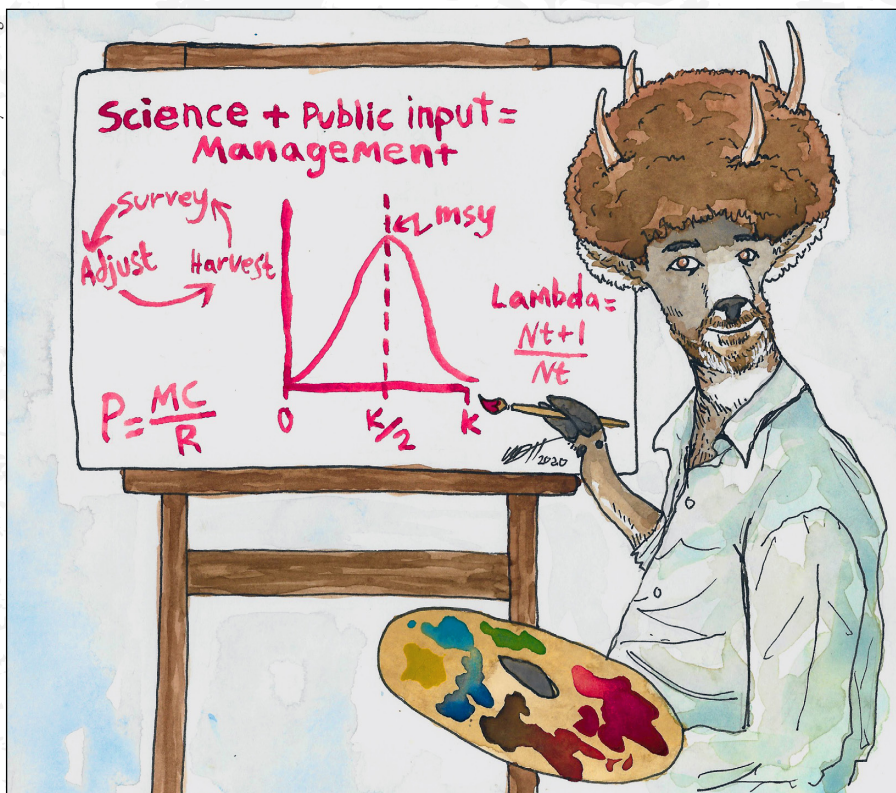
Mule deer management is a blending of art and science, guided by public input.

as a deer manager does. Starting out, you may have no idea how close you will come to your target on your first try. You start out conservatively and use a big target close to you. After you take action, whether it be prescribing a number of tags or pulling the trigger, you then assess how well you did. Based on how close you are to your target, you adjust and try again. After a few tries, you can gauge how much you adjusted last time and what effect that had on the outcome. You are now well on your way to meeting your target, but then you flinch (harsh winter) or a gusty crosswind picks up (large fire) and introduces a new variable that affects the very thing you're trying to adjust. This is how biologists manage deer populations when they don't have all the answers to start with. They may have to do some guessing initially, but by making incremental adjustments like a scope, and monitoring what happens with surveys and harvest data, they can dial it in tight even though they are missing a few pieces of the puzzle. As new variables interfere with your process of dialing into the target, you just keep adjusting accordingly and continue to monitor the results.

"Adaptive Management" is the fancy term for using feedback to adjust and improve your management. In deer management, the target is usually is not a single target, but a range of guidelines to stay between. In the real world, management may be more like driving on a foggy road than shooting a small bullseye. Managers attempt to drive down the center of their lane defined by the management guidelines. They strive to stay between the lines and not swerve out of their lane. This is where trends are important – if you are trending toward the center line of the highway, you want to make an adjustment before you get there so your trajectory doesn't take you out of the lane. Managing for a range of deer abundance with antlerless tags and managing within a range of buck:doe ratios with buck tags is much the same.

Experienced biologists can look at many, many sources of data input, while considering past actions and the consequences, and have a very good idea what to change and how much to change it. This intuition to make good decisions based on the totality of all input is difficult to teach to others and could

never be replaced by a spreadsheet or a computer model.

Blending Art and Science

Science can define the limits of appropriate management to tell us what is biologically harmful to a deer population. Within these scientifically defined sideboards is a wide range of options for managing deer herds with none of them causing a decline in the deer population or resulting in ecological harm to the habitat. These many potential ways to manage a deer herd in a scientifically sound way is what give managers the flexibility to accommodate a diversity of desires for different management styles. The best example of this is the balance between managing deer populations for mature bucks and high buck:doe ratios vs. providing ample hunting opportunity so people can get a deer tag and go hunting every year with friends and family and get meat in the freezer. Science shows us that managing for 1 buck per 10 does provides a lot of opportunity to hunt, but fewer mature bucks. Conversely, managing for 50 bucks per 100 does provides quality bucks but many people will not be able to deer hunt. There are many advocates for both management styles, but neither is better supported by science since they are both within the sideboards of appropriate management.

Biological science and experience can guide management to achieve those goals, but it takes a different kind of science – human dimensions research – to determine the desires and perceptions of the public. Biologists must manage deer populations in a manner agreeable to the public by blending art and science to achieve management goals. Agencies have statewide, management unit, or herd management goals that are developed collaboratively through a public process.

Agency biologists use their knowledge and experience to prescribe the harvest of an appropriate number of deer, but within the constraints of the law, they don't care how, or by whom, the deer are harvested. There is an awful lot of cussin' and discussin' about allocation

Aerial surveys are used to gather a majority of direct survey data for management.

Agencies manage mule deer populations to provide ample hunting opportunity statewide and also some areas with more mature bucks and fewer hunters.

of tags by weapon type, by residency, for youths, in response to complaints of hunter crowding, and through an endless variety of preference systems to get credit for previous applications. These are often considered the social aspects of deer management, where hunting opportunity is managed not based on biological capacity, but in accordance with the public's desires for how they want their hunting opportunity managed. All this can be done within the boundaries of what is biologically appropriate.

Wildlife agencies actively seek out input from the public and encourage engagement from interested citizens. When it comes to hunting, sportsmen and women are not shy about providing input and contribute endless combinations of different ideas they would like to see implemented. So many people want different things, it is impossible to accommodate all wishes and a certain segment of the public is always going to feel like no one is listening to them. To serve and satisfy the maximum number of people, agencies make sure they offer a diversity of experiences to choose from. Most states manage for a lot of opportunity because that is what statistically sound human dimensions research shows most of the public wants. However, those same states also provide some units that are managed for older bucks, high buck:doe ratios, fewer

competing hunters and a more enjoyable hunt. In addition to all these social, biological, and scientific considerations, managers sometimes also run into legal and financial obstacles to establishing certain management structures.

In the end, managers have to take into account the appropriate sideboards of biology, then consider the goals and guidelines developed with full public engagement during the hunt recommendation process. Managers don't ever have all the information they need so they compare the current year's population characteristics and metrics to management guidelines and objectives and decide if any adjustment is needed. Continual monitoring of the most important population parameters provides trends that are much more important than any current year number because it allows managers to forecast future conditions and make course corrections before things get too far outside of guidelines. Through time, this experience, supported by long-term datasets, gives mangers a good "feel" for what is going on in the population. Being able to read many streams of data from a deer population and knowing what to do is very much more of an art than simply science.

The long history of success in North American wildlife conservation, and deer management in particular, is ample

proof of the success of our system. We don't know everything all the time, but we know enough about how these systems work to fill in the blanks of the jigsaw puzzle and span the gaps in our knowledge base. Agencies must listen to what their constituents want, but the hunting community must also trust in the experience of biologists to blend art and science. By working together as hunters, scientists, managers, and organizations like MDF, we will continue to assure a bright future for mule deer.

Jim Heffelfinger is a Certified Wildlife Biologist who has worked as a biologist for the federal government, state wildlife agencies, universities, and in the private sector. Jim has authored or coauthored more than 220 magazine articles, scientific papers, and 20 book chapters in regional, national, and international publications. He is a Full Research Scientist at the University of Arizona and Professional Member of the Boone & Crockett Club. Visit www.deernut.com and follow him on Instagram: @Jim.Deere