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Aerial Biology

Even in open country, game animals can be hard to spot from a low-flying aircraft like this helicopter. Biologists use aircraft to gather information about game populations across the state. The practice began in Idaho, but it is now used in most other states.

Counting Game: Statistical Tally Works Well

On a clear winter morning, two Idaho Fish and Game biologists climb into a helicopter along with an experienced pilot.

The two trained observers sit on opposite sides of the aircraft. Their job is to gather visual data that will be used to generate big game population estimates, which include herd numbers as well as sex and age ratios.

Studies show that trained observers will see only a certain percentage of the animals present. This is known as "visibility bias." For example, in open country with large herds observers typically can see about 95 percent of the animals, and little correction for visibility bias is needed. In timbered terrain with smaller groups, observers would be able to see fewer animals, and the estimate would require more correction.

To get an accurate count, biologists use a model based on statistical sampling to generate population estimates.

Sampling is a statistical way to estimate the total population without having to count every animal – much in the same way the television industry uses a sampling of a few hundred viewers in the Nielsen ratings to find out what people are watching.

"They don't check everybody's television," said Brad Compton, assistant chief of Fish and Game's Wildlife Bureau.

When the helicopter reaches the area to be surveyed, the pilot flies at 40 to 50 mph, and about 100 to 150 feet above the ground. The standard search pattern follows contours at 500-foot intervals in open, steep terrain; at 400 feet if the vegetation is thicker or the terrain gentler; 300 feet in dense vegetation and gentle terrain. The pilot flies a 350- to 400-yard grid over flat terrain.

Inside this issue

Fish and Game biologist Hollie Miyasaki counts game herds from the air, a demanding and sometimes hazardous endeavor, but still the best and most efficient way to get accurate population estimates of the state's game herds.

IDFG photos

If biologists don't correct for the animals they don't see, population estimates typically are low and imprecise. Therefore, when the airborne biologists spot a group of animals they record the group size, whether the animals are moving, standing or bedded down; type of vegetation and percent of screening cover; and percent of snow cover.

They also record information about each flight, such as aircraft type, speed and altitude, flight pattern, and the time of year. All this information is then entered into a statistical model to estimate the number of animals that are missed during the survey.

The model helps biologists provide a better estimate of the number of animals in an area, regardless of animal behavior, vegetation or weather conditions. It was developed after years of research and study (see page 4), and it can predict what percentage of the animals a biologist is likely to see under a variety of conditions.

Adding a standardized sampling system has improved efficiency because not every part of every unit needs to be surveyed to get a good population estimate.

The margin of error typically is plus or minus 10 to 15 percent.

Big game herds are surveyed every few years. Fish and Game has neither the manpower nor the money to count animals in every unit every year.

Elk populations of concern or that have liberal hunting seasons are typically sampled every three years. Populations that are stable or with conservative hunts are sampled about every five years.

Fish and Game biologists survey mule deer populations every four to five years.

But biologists also monitor annual changes in mule deer populations using radio collars to track doe and fawn mortality.

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Staying on Top of Herd Numbers

IDFG photo

Game Counts Help Managers Set Hunting Seasons

Managing wildlife is a little like balancing a checkbook.

"You have to know what your deposits are before you know what you can spend," said Brad Compton, assistant chief of Fish and Game's Wildlife Bureau.

The number of calves and their survival – a concept known as recruitment to biologists – are like the deposits. Natural mortality is like fixed expenses – rent or mortgage, utility bills. The balance is the discretionary spending – or in game management – the harvestable surplus.

And game counts are a reliable way to determine the harvestable surplus in a wildlife population and to maintain healthy populations that can provide consumptive and non-consumptive recreational opportunities for Idaho residents.

By spring, most big game counts are finished for the year, and biologists are working on the data to produce updated population estimates.

The information includes the numbers of animals in game management units or elk management zones, and the age and sex ratios of the herds.

Counts are used to estimate population sizes and trends that form the basis of wildlife management and setting hunt rules and seasons.

Hunting seasons based on sound science are a basic tenet of the North American Wildlife Management model, Compton said.

Idaho big game management is based on population numbers, habitat, public outreach, enforcement, and communication. Because of their role in setting hunting seasons, a primary investment of resources has been in collecting data on population numbers.

"If we don't know the numbers and population structure, seasons may be set to over-harvest or under-harvest," said Craig White, a wildlife staff biologist at Fish and Game.

Game counts allow wildlife managers to compare population numbers to objectives. And that allows them to set seasons to help populations grow, remain stable or sometimes to reduce a herd.

"But counts alone don't fill in all of the details needed to manage a healthy game population," White said

Productivity, survival, distribution and how the animals are using the habitat are also key factors. Managers consider these factors to identify herd composition and trends, and along with the condition of the habitat, to predict changes in distribution and population size.

Trends and changes can alert managers to problems within a herd that may require changes in hunting seasons or rules.

Aerial game surveys are more precise than other methods of counting wildlife, and they have become a key in how Fish and Game manages elk. Biologists count animals in all the high density areas within a management unit, and they also count some of the medium density areas and some low density areas.

The first signs of problems may be detected in population changes in the low density areas.

Having reliable measurements also help inform the public. People want to know how wildlife populations are doing, and they want to be assured that hunting will not harm the population.

Idaho Fish and Game Policy

Idaho wildlife management policy is set by seven volunteer commissioners. The Idaho Fish and Game Commission's policy decisions are based on research and recommendations by the professional staff of the Idaho Department of Fish and Game, and with input from the governor's office, the state Legislature, hunters, anglers and the public.

Idaho Has Counted Game From the Air for More Than 60 Years

Idaho Fish and Game was one of the first fish and game agencies in the country to use helicopters to count game animals.

In 1948, Fish and Game used a Bell 47 helicopter – like the helicopters in the movie and television series M*A*S*H – to evaluate game populations, largely in response to a number of dam construction proposals at the time.

An aircraft can cover more ground than the traditional method of counting and evaluating game herds on foot and horseback.

For about 25 years Fish and Game conducted composition counts from the air to determine age and sex of game animals – how many bulls, how many cows and how many calves.

"We knew we couldn't count everything," said Jim Unsworth, whose own research helped build the survey model that would improve aerial counts. Unsworth is a deputy director at Fish and Game.

A statistical model accounts for animals obscured by terrain and vegetation during aerial game counts. *IDFG photo*

Most counts were done in high density areas, and gathered good information on cows and calves. Bulls were harder to count because their distribution is different. The counts provided age and sex ratios. But they couldn't tell population trends, up or down.

One way to get better numbers was to capture, mark and recapture animals. But that was expensive, and it was possible to cover only a small area. No broad-scale survey was possible.

Then in the mid-1970s, radio-telemetry became available. Once an animal was captured and fitted with a radio collar, it could easily be found and recaptured.

Also by the mid-70s, game managers from Australia to Africa to Idaho were using aircraft to collect information about game herds. But on average, observers would see only about 60 percent of the animals.

Fish and Game started working with the University of Idaho on a way to correct for the animals missed in an aerial survey. A statistical model was developed using information collected on radio-collared animals, which were located before the helicopter survey. Once in the air, observers would record information from each group of animals. Researchers would locate groups missed by observers in the helicopter. The data gathered was then used to calculate a probability of observation estimate.

The model predicted the probability of sighting groups of animals in different types of terrain to correct for the animals not seen, and it allowed a margin of error to be calculated.

In open country with large herds, for example, observers typically can see about 95 percent of the animals, and little correction is needed. In timbered terrain with smaller groups, observers would be able to see fewer animals, and the estimate would require more correction.

Researchers also developed better and more efficient sampling techniques.

The models were tested on the National Bison Range, north of Missoula in Montana, a 30-square-mile enclosure with a known number of animals - and on the Starkey Experimental Forest and Range near La Grande, Oregon, and in Colorado.

Since then survey and sampling methods have become standard, with confidence levels plus or minus 10 to 15 percent.

By the early 1980s, Fish and Game could for the first time make estimates based on real numbers.

Fish and Game's sightability surveys became operational statewide for elk and mule deer by 1990 and 1991. Models have since been developed for moose and bighorn sheep and other game animals.

"We haven't found any more efficient way to collect the data," Unsworth said.

Game managers need the best information possible to manage hunted populations, and the agency is willing to take the necessary risks to get it.

"And that's why we take it seriously," he said.

In the early years, Fish and Game had few safety protocols. Now it has rigid training and safety standards.

Because it's dangerous, Fish and Game is looking for new technologies, safer ways to collect the data with similar efficiency. But it still has found nothing as effective and efficient as the human eye, Unsworth said.

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