# A NEW WILDLIFE SIGHTING REPORTING AND DATABASE SYSTEM FOR LASSEN VOLCANIC NATIONAL PARK

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*ABSTRACT:* Visitors and employees in national parks may observe species of interest to wildlife biologists and resource managers. These sightings are useful to researchers and managers only if the data can be efficiently acquired, stored and retrieved for analysis. We identified several problems in the wildlife sightings reporting system at Lassen Volcanic National Park, including a confusing array of reporting forms; incomplete contact information for the reporter; insufficient reporting of the animal's description, behavior and location; and a cumbersome data entry and retrieval system. We developed a new system to correct these problems. A single reporting form corrects the aforementioned data gaps and includes a park map so the reporter can mark the approximate location of the sighting. Resource Management staff use a clear overlay with a numbered 1 $mi^2$ grid to assign a location code for each sighting. This code and the report information are entered into a Microsoft Access database. Queries can be conducted for individual species and the location codes can be used to create sighting-distribution maps. The new system, in place since July 1999, has proven easier to implement and to query and therefore more useful than the previous system. A total of 553 sighting reports was received in 1999 and 2000, representing 720 animals of 39 species. These reports reflect several important biases inherent to wildlife sighting reporting data.

*Key words*: wildlife sighting, park, Lassen, database, California, red fox, *Vulpes vulpes*

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National Park Service lands provide habitat for hundreds of wildlife species nationwide. The opportunity to view wildlife is one important reason why people visit the National Parks. Park visitors and employees may observe species of interest to resource managers and wildlife biologists, including rare, threatened, unusual or injured wildlife. Many national parks have long maintained databases of wildlife sightings reported by park visitors and staff.

These databases are often composed largely of anecdotal records submitted by non-biologists, which can limit the reliability of the data. The species identification may be questionable unless a thorough description of the animal is included (Newmark 1995). The reports may be biased toward certain taxa (Newmark 1987), such as large-bodied diurnal animals that occur near campgrounds, roads and other areas of high human use. In addition, wildlife reporting systems are not standardized (Newmark 1995, Boarman and Coe 2000), often differing among parks or within the same park over time. These limitations can make wildlife sightings databases "unwanted ugly ducklings of data sets" (Boarman and Coe 2000: 32), unattractive to managers and researchers.

Despite these limitations, wildlife sighting reports can contain valuable information. They provide a record of animal occurrences that may prove useful for later researchers, especially in the absence of formal inventories (Quinn and Van Riper 1990, Boarman and Coe 2000). Patterns of sightings over time can guide researchers to areas where a species of interest may be found and studied. Sightings may represent the only records for rare or unusual species (e.g., Smith 1999), and may provide information of immediate interest to managers, such as the locations of injured or begging wildlife, animals that might prove dangerous to humans, or marked study animals. However, both the short-term and long-term utility of these reports may be compromised if the data cannot be efficiently acquired, stored and retrieved for analysis.

Numerous problems existed in the wildlife sighting reporting and database system used at Lassen Volcanic National Park, a 430-$km^2$ reserve containing portions of Lassen, Plumas, Shasta and Tehama counties in northern California. At least five different sighting report forms were in use, such as the National Park Service's official Natural History Field Observation Form 10-257 and individual *ad hoc* forms for bears, red foxes, and any sightings by the park's interpretive staff. These forms collected different information with an inconsistent level of detail, and many personnel were understandably confused as to which form should be used under which circumstances. None of the forms provided adequate space to describe the animal's appearance, behavior and exact location, and incomplete contact information for the person reporting the sighting often made follow-up impossible. The sightings data were stored in dBase III+, an outdated DOS program with inadequate documentation that was

familiar to only one person (J.A.) in the park's Resources Management Division. Because of the lack of a user-friendly interface, Resources Management staff often filed the sighting report forms without entering the data into the electronic database. As a result of these shortcomings, the wildlife sighting reporting and database system was inefficient, inconsistent, incomplete and difficult to query.

Our goal was to develop a more efficient, thorough and user-friendly system to minimize the limitations of the wildlife sighting reports while maximizing their benefits and maintaining compatibility with the previous system. We revised the system to use a single all-purpose reporting form containing more room for describing the animal's appearance, behavior and location. The data would be stored in a user-friendly database that could be easily updated and queried to generate GIS-compatible summary reports. The new system increased the efficiency and utility of the Lassen Park database, and may prove useful for resource managers in other national parks, national forests and nature preserves.

## METHODS

The new system we developed consists of three primary components: a single reporting form, a clear gridded overlay and a Microsoft Access database. The front side of the reporting form contains short entry blanks for the name, phone number and address of the person submitting the report, the wildlife species observed, and the date, time and location of the sighting (Figure 1). Longer entry blanks are provided to describe the animal's appearance and behavior, the presence of offspring, and other important details such as whether the animal was injured or marked with a radio collar, ear tag, etc. The back of the form has a park map showing roads, trails, campgrounds and landmarks. The person completing the form marks the location of their wildlife sighting on the map, fills in the information on the front, and then hands the completed report to a park ranger, who delivers it to the Resources Management office.

The Resources Management staff have a transparent overlay showing the park map divided into numbered 1-$mi^2$ squares. We chose 1 $mi^2$ as an acceptable compromise between accuracy and confidence, and because the grid was easily generated by a slight modification of a 4-$mi^2$ grid developed for photostation surveys of carnivores (Zielinski and Kucera 1995). Resources Management staff use the overlay to determine which grid square contains the sighting location; the grid number provides a location code for the sighting. They then enter the sighting information, including the location code, into the Microsoft Access database using an on-line data entry form we developed (Figure 2). We also developed a basic query that can be easily modified so that the sightings of any particular species between any given dates can be recovered. The results of such queries can then be exported to a geographic information system such as ArcView to generate maps of sighting occurrences for particular species. These maps can illustrate either the number of reports received or the number of animals sighted, since several individuals of the same species may be reported as one sighting.

## RESULTS

The new system was implemented in July 1999. Park staff were issued the new report forms and were asked to discontinue using the older forms. Reports received on the old forms, however, were still entered into the new database. Although some staff were reluctant to abandon the old forms, the transition was effectively complete by the end of the year. All sightings from earlier in the year were also entered into the new database to provide complete coverage for 1999.

The park collected 553 sighting reports in 1999 and 2000, representing 720 animals of 39 species (Table 1). Park staff submitted 96 (34.4%) and 84 (30.7%) reports in 1999 and 2000, respectively; the remainder were submitted by park visitors. Most sightings occurred in the summer, with 460 (83.0%) sightings reported in June, July and August. Sightings were most common between 0800 and 2200 hrs, local time. Up to 30 individual animals were sighted at a time, but 91.0% of the reports mentioned sighting only one individual.

Red foxes (*Vulpes vulpes*) were the most commonly reported species, accounting for 51.7% of the reports and 41.1% of the animals sighted. These sightings were concentrated in campgrounds, parking areas and along the main road (Figure 3). After red foxes, the most frequently reported mammals were black bears (*Ursus americanus*), unidentified foxes, American martens (*Martes americana*) and mountain lions (*Puma concolour*). Bald eagles (*Haliaeetus leucocephalus*), buffleheads (*Bucephala albeola*) and ospreys (*Pandion haliaetus*) were the most frequently reported birds. Highly unusual sightings of questionable validity included one fisher (*Martes pennanti*) and one lynx (*Lynx canadensis*), neither of which is believed to actually occur in the Lassen area.

## DISCUSSION

Wildlife sighting report data can be useful to managers and researchers on short- and long-term time scales. The changes we made in the wildlife sighting reporting and database system at Lassen Volcanic National Park were intended to increase the benefits of the system while minimizing its limitations. To date, feedback from staff and visitors has been primarily positive. The use of a single, all-purpose form has made it easier to ensure that the forms are in stock and used when the need arises. A

## Wildlife Observation Reporting Form
**Lassen Volcanic National Park**

Please use this form to report sightings of significant or unusual wildlife (such as cougars, bears, foxes, coyotes, marten, eagles, falcons, etc.) or any animal that is injured or acting strangely.

Name: _____ Phone number: _____

Address: _____
(Park employees: just enter 'LAVO' as your address.)

**Sighting Information - Please be as accurate and thorough as possible.**

Wildlife observed: _____

Sighting date: Day: _____ Month: _____ Year: _____ Time of sighting: _____ am pm

Weather conditions: _____

Location: _____

**Please place an 'X' on the map on the back of this form to indicate the exact location where you saw the animal. If you are unsure of the exact location or have questions about the map, one of the park staff would be glad to help you.**

Please describe the animal, including any distinguishing marks, ear tags, radio collar, etc.: _____

_____

_____

_____

Please describe the animal's behavior (eating something, acting strangely, injured, etc.): _____

_____

_____

_____

Did the animal have any offspring with it? _____

Other information: _____

Thanks for taking the time to complete this form. The valuable information you have provided will help us preserve and protect the wildlife in Lassen Volcanic National Park for generations to come.

Park Staff: Please route to Resource Management. Additional copies available from Resources Management.

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[This space for Resource Management staff use only]

St Vl SUQ: _____ Entr: _____

Fol.Up / Com: _____

WSRform.doc Revised: 5 August 1999

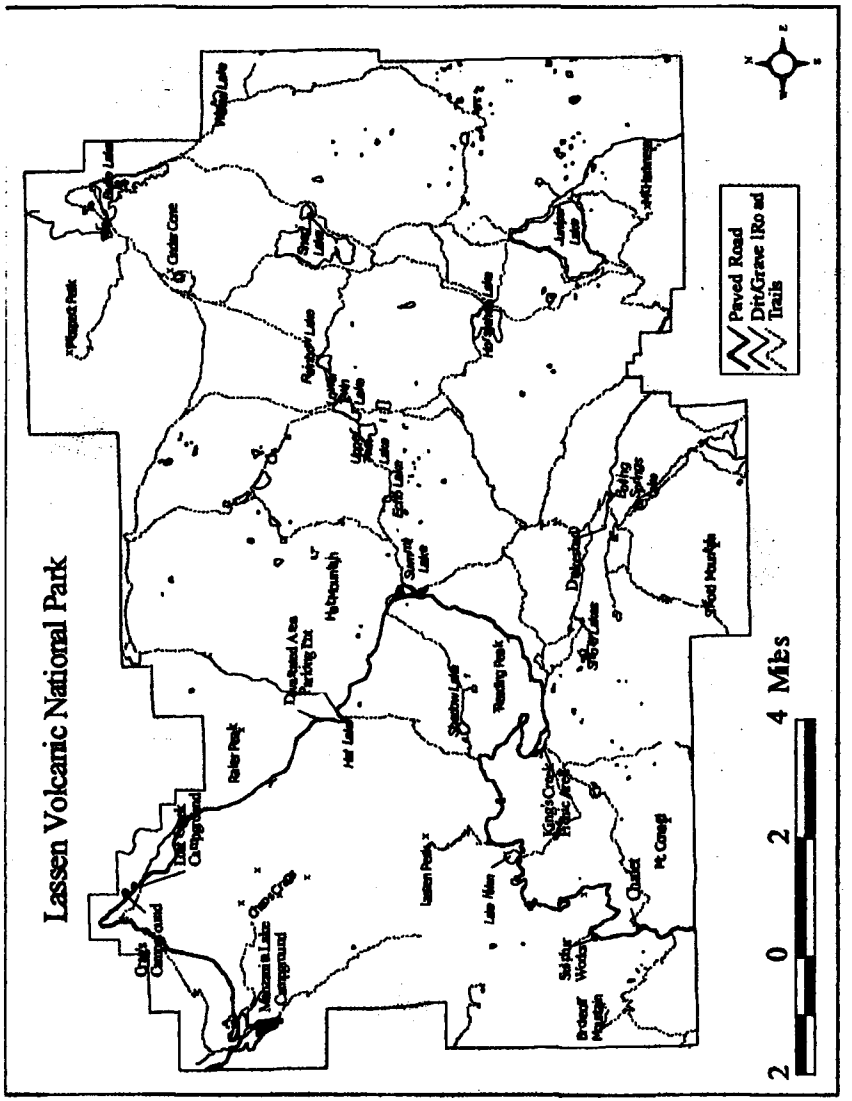


Figure 1. The new wildlife sighting report form for Lassen Volcanic National Park, printed on both sides of a single sheet of paper.

Table 1. Number of animals reported in 1999 and 2000 in Lassen Volcanic National Park. The number of reports submitted is in parentheses. Up to 30 individuals of the same species were reported on a single sighting form. Reports containing multiple species were entered as a separate sighting for each species.

| Species | 1999 | | 2000 | |
|---|---|---|---|---|
| **Carnivores** | | | | |
| Badger | 1 | (1) | 1 | (1) |
| Bear, black | 79 | (67) | 64 | (60) |
| Bobcat | 5 | (5) | - | |
| Coyote | 1 | (1) | - | |
| Fisher | 1 | (1) | - | |
| Fox, Red | 141 | (133) | 155 | (153) |
| Fox, Unidentified | 29 | (27) | 9 | (9) |
| Lynx | - | | 1 | (1) |
| Marten, American | 9 | (8) | 8 | (8) |
| Mink | 1 | (1) | - | |
| Mountain Lion | 3 | (3) | 6 | (5) |
| Mustelid, Unidentified | - | | 1 | (1) |
| Weasel, Long-Tailed | 1 | (1) | 3 | (2) |
| Weasel, Unidentified | 1 | (1) | - | |
| **Other Mammals** | | | | |
| Bat, Unidentified | - | | 30 | (1) |
| Beaver | 1 | (1) | 2 | (2) |
| Deer, Mule | - | | 3 | (2) |
| Marmot, Yellow-Bellied | 1 | (1) | - | |
| Mole | - | | 1 | (1) |
| Pika | - | | 2 | (2) |
| Porcupine | 1 | (1) | - | |
| **Raptors** | | | | |
| Eagle, Bald | 11 | (10) | 5 | (4) |
| Falcon, Peregrine | - | | 2 | (1) |
| Goshawk, Northern | 2 | (2) | - | |
| Harrier, Northern | - | | 1 | (1) |
| Kestrel, American | - | | 4 | (1) |
| Merlin | - | | 1 | (1) |
| Osprey | 7 | (6) | 5 | (3) |
| Owl, Great Horned | - | | 1 | (1) |
| Owl, Unidentified | - | | 1 | (1) |
| **Other Birds** | | | | |
| Bufflehead | 37 | (6) | 34 | (6) |
| Egret, Great | 1 | (1) | - | |
| Grackle, Great-Tailed | - | | 2 | (2) |
| Grebe, Western | - | | 3 | (1) |
| Merganser, Common | - | | 37 | (2) |
| Oriole, Bullock's | - | | 2 | (1) |
| Woodpecker, Pileated | 1 | (1) | - | |
| **Reptiles / Amphibians** | | | | |
| Boa, Rubber | 1 | (1) | - | |
| **Other** | | | | |
| Sugarstick (*Allotropa virgata*) | - | | 1 | (1) |
| **Totals** | 335 | (279) | 385 | (274) |

handful of staff were disgruntled by the discontinuation of the sightings forms they had developed for their specific circumstances. Resources Management interns required approximately one day per month during the summer to keep up with data entry. The reports were used to generate bi-weekly summaries of bear sightings and activities to prevent negative human-bear interactions. The reports were also useful for identifying a problem with a few begging red foxes, prompting the installation of food storage lockers and increased ranger presence at specific campgrounds. Several ongoing monitoring efforts, such as for raptors, bufflehead and carnivores, will benefit from the increased ease of generating species-specific summaries and sightings maps. The red fox research project in particular will benefit from reported sightings of specific marked individuals at known times and locations. Additionally, the sighting records are now more accessible to researchers from outside the park, such as the current effort to develop comprehensive species inventories for all national parks.

Important limitations may be inherent to this type of data collection system, although our system has attempted to minimize them. Wildlife sighting reports, especially those submitted by park visitors, are often considered inherently unreliable. The accuracy of the species identification and location often cannot be determined, especially years after the report was originally submitted. Our new system explicitly requests the person reporting the sighting to describe the animal's physical appearance, providing a limited opportunity to confirm or correct the species identification. Confidence in the sighting location is increased by requesting both a written description and a mark on the park map. This redundancy also makes it less likely that the person completing the form will omit the location information. The written descriptions of the animal, its behavior and its location are stored verbatim in the electronic database. The mark on the map can clarify a non-specific location, such as "trail between Butte and Snag Lakes," which is 6.4 km long. This map location is recorded only to the nearest 1 $mi^2$ because many people may not know their exact location, especially on roads or trails or in the backcountry. Persons submitting reports are requested to provide their names, addresses and phone numbers so

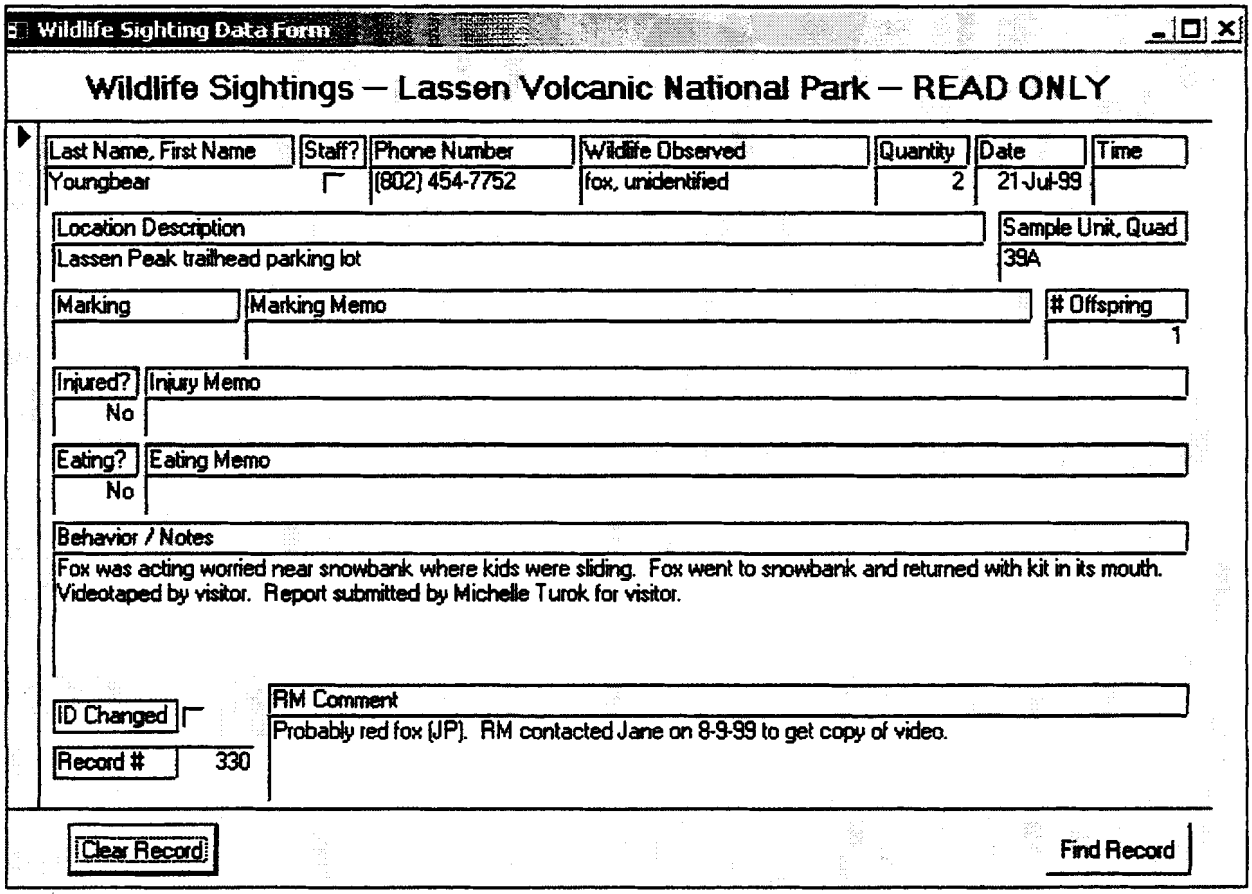


Figure 2. A sighting record in the new database. An identical electronic form is used for data entry.

that Resource Management staff can contact them if more information is needed to clarify the species identification or sighting location, and most reports received in 1999 and 2000 included this information. The electronic database contains several fields for comments and clarifications by the Resources Management staff. Codes for ranking the reliability of the species identification could easily be added, but the main drawback is that the senior biologist does not have time to evaluate every sighting. The paper report forms are filed and stored at the Resource Management office, sorted by year and species, should someone want to refer back to them.

Wildlife sighting reports contain inherent biases. Sighting effort is concentrated at times and in areas of high human activity. Nearly 80% of the approximately 400,000 annual visits to Lassen Volcanic National Park occur between June and September, primarily because the main road and most campgrounds in the park are usually open only from early June through mid-November (Lassen Park 2000). The sighting reports follow a similar pattern and clearly reflect the diurnal habits of most humans. Red foxes were sighted almost exclusively along the road corridor (Figure 3), especially in major campgrounds (e.g., 54 sightings at the Summit Lake campgrounds and 41 at the Southwest Campground) and parking areas (e.g., 49, 57 and 24 sightings at the Devastated Area, Lassen Peak and Bumpass Hell parking lots, respectively). Very few reports were received from the wilderness areas of the park. This bias can help resource managers reduce conflicts between humans and wildlife. For example, if an animal is reported begging at a campground, park staff can quickly respond with increased education, law-enforcement and animal-management activities. This response can be more thorough and organized than if a visitor merely reported the begging animal to a park ranger, and the report also provides a historical

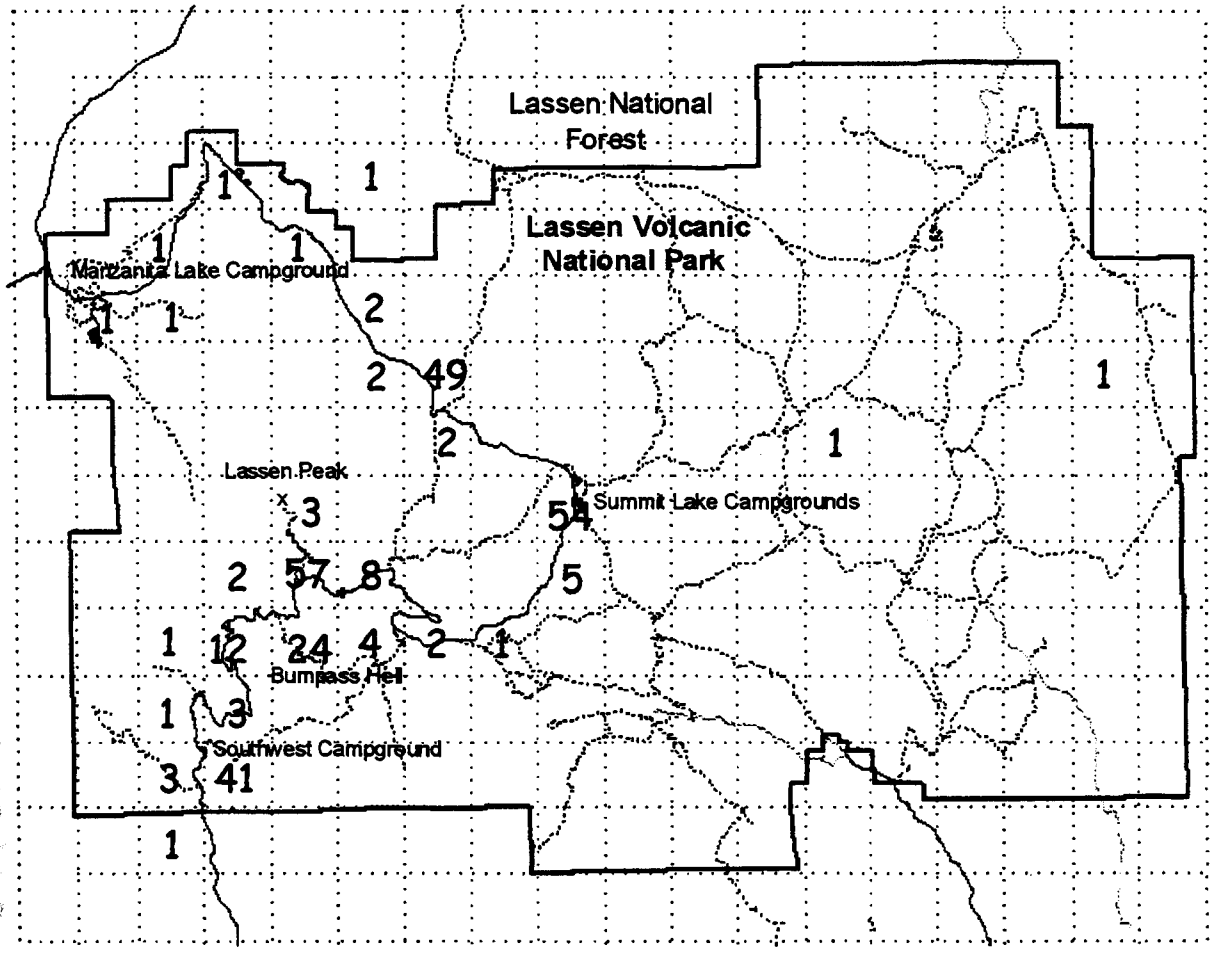


Figure 3. The number of red foxes sighted per square mile in Lassen Volcanic National Park for 1999 and 2000, illustrating several of the biases discussed in the text.

record of the problem. We plan to provide blank sighting report forms to all visitors receiving backcountry use permits, but a bias toward high-use areas will likely remain.

The number of reported sightings cannot be considered an index of species abundance. A single animal active in an area with many humans may generate numerous sighting reports. For example, virtually all of the 287 red fox sightings reported in 1999 and 2000 can be attributed to three individual foxes which were known to scavenge in the parking lots and campgrounds. The foxes could be identified by their uniquely-colored radio collars and ear tags, and these sighting records were easily extracted from the list of red fox sightings via the field noting human markings on the sighted animal. On the other hand, many species may never be seen by most visitors or may not be reported if seen. Mule deer (*Odocoileus hemionus*) were undoubtedly sighted far more frequently than the number of reports would suggest. Steller's jays (*Cyanocitta stelleri*), Douglas squirrels (*Tamiasciurus douglasi*) and chipmunks (*Tamias* spp.) were ubiquitous at most campgrounds in the park but were not reported at all. Our system promotes this bias somewhat, as our form requests people to report sightings of "significant or unusual wildlife," with carnivores, raptors and injured animals given as examples. It would be impractical to expect park staff to report every squirrel, deer and songbird encountered on a daily basis. Indicating certain taxa of interest encourages more staff to submit reports when such sightings occur.

Sighting reports may provide evidence of rare or uncommon species within a park, although such evidence can be frustratingly inconclusive. The reports of fisher and lynx sighted in the park are most likely mis-identifications. Extensive photostation and trackplate surveys have shown that fisher distribution is discontinuous is California, with no extant population in the Lassen area (Truex et al. 2000). No confirmed sightings of lynx have been reported in California, although the Lassen region is an appropriate habitat type that may be within dispersal distance of known lynx occurrences in southern Oregon (McKelvey et al. 2000). The person reporting the lynx sighting is a park employee who sees bobcats on a weekly basis and claims this animal was not a bobcat. These sightings raise intriguing questions but carry little weight without additional evidence.

To be useful, database software should be widely available and easily upgraded, especially when natural resource data are concerned (Quinn and van Riper 1990). Microsoft Access is part of the Microsoft Office suite of programs, and training workshops and use guides are readily available for park staff. Microsoft Access can be cumbersome but supports customizable on-line data entry forms and queries that, once written, require little training to use. With five minutes of training, a novice at Microsoft Access could retrieve all the sightings of a certain species between any two target dates, simply by modifying a few parameters in a basic query that we have written. Microsoft Access accepts dBase III+ files, so we will be able to import the older sighting records into the current database without having to re-enter data.

Our system remains a work in progress. Next steps include importing the old dBase III+ records into the Microsoft Access database and confirming that all the old paper records are included in the database. These tasks must be completed before we can make any useful comparisons with the data collected under the previous reporting system. We are developing a short training manual for new users and a macro that will export a species' location codes to ArcView to further simplify the production of maps. We plan to prepare bi-annual sightings summary reports that would be available to interested parties.

Clearly, wildlife sighting reports are not scientific inventories or monitoring programs and should not be treated as such. Researchers using wildlife sighting records to infer the status of a species within a park or a group of parks (e.g., Newmark 1987, 1995) are making assumptions that may be untenable. Within their limitations, however, sighting reports can provide managers and researchers with data that can be useful in the short- and long-term. These records can contribute to species inventories, guide researchers to promising locations and contribute to generating testable hypotheses. We hope that our new system for Lassen Volcanic National Park will minimize the inherent limitations of wildlife sighting reports while maximizing their usefulness. Likewise, we hope this paper will provoke broader discussions about the merits of these data sets and stimulate efforts to standardize these systems across parks.

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