SOUTH DAKOTA RIVER OTTER MANAGEMENT PLAN

SOUTH DAKOTA DEPARTMENT OF GAME, FISH AND PARKS
PIERRE, SOUTH DAKOTA

WILDLIFE DIVISION REPORT 2012-07

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This management plan is intended to provide general, strategic guidance for 5 years to the South Dakota Game, Fish and Parks Department (SDGFP) and potential partners for the recovery and sustained management of the river otter in South Dakota. It identifies what we strive to accomplish related to river otter management. This plan includes working cooperatively with interested publics in both the planning process and the regular program activities related to river otter management.

This plan will be used by SDGFP staff on an annual basis and will be formally evaluated at least every 5 years. Plan updates and changes, however, may occur more frequently as needed. All text and data contained within this document are subject to revision for corrections, updates, and data analysis.

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This plan is a product of hours of discussion, debate, and input from many wildlife professionals. In addition, those comments and suggestions received from the public who recognize the value of river otter and their associated habitats were also considered.

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RIVER OTTER MANAGEMENT GOAL

South Dakota will manage river otter populations with scientifically sound data and techniques to encourage occupation of suitable available habitats in South Dakota. River otter populations will be enhanced to justify delisting and to provide sustainable use and enjoyment within the social tolerance level for this species.

INTRODUCTION

RANGEWIDE PERSPECTIVE

Description

The river otter (*Lontra canadensis*) is a member of the Order Carnivora, Family Mustelidae. Its cylindrical-shaped body ranges from 35-54 inches (89.0-137.2 cm) in length, with the tail comprising more than 1/3 of the total length. Maximum length is reached at 3-4 years of age. Weight ranges from 7.5 to 34 pounds (3.4-15.4 kg). Females are 3-21% smaller than males (Melquist et al. 2003).

Adaptations for a mostly aquatic lifestyle include short legs; a long, rudder-like tail; hind feet that are nearly completely webbed; and short, dense fur. Eyes are located high on the head on the same plane as the ears, allowing vision while the animal is mostly underwater. Small, rounded ears are situated far back on the head. The sleek fur has a soft, dense, and oily underfur mixed with guard hairs, forming an effective water repellant for insulation (Higgins et al. 2000). The pelt becomes prime following an autumn molt. River otters in northern locations have the longest and densest fur (Toweill and Tabor 1982).

Tactile and auditory senses are acute in the river otter. Individuals presumably use their long, sensitive whiskers to locate prey in turbid water and while foraging in the dark (Melquist and Dronkert 1987). They are near-sighted, but likely can detect movement at significant distances. The importance of their sense of smell is unknown, but their use of scent marking may indicate the value of this sense (Melquist et al. 2003).

River otters can stay submerged for as long as 4 minutes. They undergo bradycardia, a slowing of the heart rate, while underwater (Melquist and Dronkert 1987).

Life History

River otters have a complicated reproductive strategy. Females are induced ovulators and undergo delayed implantation of embryos. Most females breed annually. Breeding success of a female is influenced by habitat, prey, and density-dependent factors (Melquist and Dronkert 1987). Males may not be successful breeders until age 5-7 years. Females likely advertise their reproductive availability with scent marking. The female uses a naturally sheltered area or a burrow excavated by another species to bear a litter that typically numbers 2-3 pups. She seeks a secluded area with abundant

food for the birth and care of her litter. Pups may emerge from the natal den at 2 months and leave the natal area with the mother at 3 months. A typical family unit is a female with her dependent or nearly independent young (Melquist et al. 2003). Adult males are typically solitary, although bachelor groups have been observed during the nonbreeding season.

River otters are active year-round. They are most active during the evening and the hours from dawn to midmorning. They communicate with various scent-marking strategies designed to advertise their presence in an area and to encourage transient animals to travel through the area without confrontation (Higgins et al. 2000).

River otters may live 10-15 years in the wild. They have few natural predators. Human-caused mortalities are due to legal harvest, accidental trapping, road kill, and drowning in gill nets (Melquist et al. 2003). A study of river otters along the Mississippi River in Minnesota revealed that all accidental trapping mortalities in the study area were females (Gorman et al. 2008). They speculated that trappers concentrated in beaver (*Castor canadensis*) habitat, which may attract female river otters seeking natal den sites.

Whether river otters are territorial has been debated. Their system of social interactions likely varies across the species' range, possibly related to food availability. Researchers in Minnesota found that river otters in their study area shared space and were neither solitary nor territorial (Gorman et al. 2006). The authors found high annual home range fidelity for both sexes. Home ranges of males were more than 3 times greater than those of females in the study area.

Habitat

River otters occupy a wide array of habitat types. As with all wildlife species, food, shelter, and water are the basic habitat needs, but certain features favor this species, including abundant food and limited disturbance. Pollution and other water quality threats may limit river otters (Melquist and Dronkert 1987).

Riparian vegetation along a wetland margin is a key habitat feature. Such vegetation may attract beavers, which enhance areas for river otters by creating foraging habitat and denning areas. Beaver bank dens, either active or abandoned, are important sites for temporary otter denning or resting (Melquist and Dronkert 1987). Water storage reservoirs often do not support river otter populations because of the annual draw down, the lack of vegetative cover for otters and prey species, and the absence of sites for denning and resting (Melquist et al. 2003).

River otters often use fallen trees or logjams for shelter or foraging. Diverse habitat structure may take the form of rocky shorelines in coastal areas. Melquist and Dronkert (1987) called important food sites "activity centers," where river otters may linger as long as they find food and shelter and experience limited disturbance.

Beavers and river otters are closely associated because of river otter use of beaver ponds, lodges, and bank dens and otter exploitation of prey supported by beaver ponds (Melquist et al. 2003). Melquist and Hornocker (1983) identified 15 different kinds of resting sites used by radio-implanted river otters in central Idaho. Natal den selection is diverse. River otters do not excavate natal dens. They may use naturally sheltered sites or cavities or dens created by other animals (Melquist and Hornocker 1983).

Distribution

The river otter, beaver, and gray wolf (*Canis lupus*) are thought to have occupied the largest geographic areas among North American mammals at the time of European settlement. Beavers and river otters likely occurred in all major North American waterways until the 18th century (Toweill and Tabor 1982). River otters were considered common on many rivers of the Northern Great Plains (Jones et al. 1983).

Melquist et al. (2003) used various sources to summarize distribution changes from the time of European settlement (historical range) to 1977, 1988, and 1998-99. By 1977, river otters occupied less than 75% of the historical range. Causes for the species' decline included wetland loss and degradation, habitat conversion for human settlement, and overharvest. The species occupied more than 75% of the historical range by 1988. As a result of wetland protection and enhancement and otter protection and reintroduction, the species expanded to approximately 90% of historical range by 1998, occurring in 48 states and 11 Canadian provinces. Remaining unoccupied areas of the historical range are mainly concentrated in the central and southwestern portions of the U.S.

Reintroduction has been an important river otter recovery tool. Raesly (2001) summarized reintroduction efforts as of 1998, compiled through contacts with wildlife agency biologists. Between 1976 and 1998, 21 states and 1 national park had reintroduced river otters, releasing a total of 4,018 animals. At the time of this article's publication, 28 states had regulated trapping of river otters. Missouri was the first state to reinstate a river otter harvest of animals that originated entirely from reintroduction. Most of the respondents considered reintroduction projects successful in restoring extirpated populations.

Raesly (2001) determined that the most common site selection criteria were based on habitat quality, prey base, favorable water quality, presence of public land, and consideration of land uses in the area. The author recommended that better data collection and longer monitoring studies be conducted following reintroduction; a number of states monitored reintroduced animals for only 1 or 2 years.

Reintroduction projects have used animals from a variety of sources, but river otters from coastal Louisiana have been used extensively (Raesly 2001), raising some concern for genetic integrity. The majority of states that have conducted reintroductions have chosen animals based on availability, rather than genetic similarity (Serfass et al. 1998), but the authors determined that reintroduction source populations generally

agreed with the species' current taxonomic classification. Serfass et al. (1998) also concluded that river otters in the sampled populations in the U.S. and Canada showed general genetic similarity, likely due to the species' relatively large home ranges and the ability of animals to disperse long distances.

In addition to Raesly's synopsis, other studies have summarized results of reintroduction projects for Minnesota (Berg 1982), Missouri (Erickson and McCullough 1987), Pennsylvania (Serfass et al. 1993, Serfass et al. 1996), Indiana (Johnson and Berkley 1999), and Nebraska (Bischof 2003). A recent study evaluated suitable habitat for river otter reintroduction in South Dakota (Kiesow and Dieter 2005).

Feeding Habits and Depredation

River otters feed primarily on fish in proportion to the prey's availability. Crayfish and frogs may also be taken, with other animal and plant material consumed in much smaller quantities. River otters do not seek out specific fish species, but prey on slow-swimming, injured, or weak fish and fish that gather in large schools. River otters take prey by diving and chasing fish or digging in wetland substrates (Toweill and Tabor 1982).

Prey size ranges from <1 inch to 20 inches (Melquist and Dronkert 1987). Melquist and Hornocker (1983) found that 93-100% of river otter scats in central Idaho contained evidence of fish and that food had the greatest influence on river otter movements. Fish were found in 80% of digestive tracts of river otters examined during winter in western Oregon (Toweill 1974). Toweill (1974) determined that river otters were not a major predatory threat to salmon in the study area because of low otter density and the species' habit of preying on salmon that were either dead or "spawn outs."

River otter stomachs from Michigan's Lower Peninsula were analyzed in the early 1940s (Ryder 1955). Game and "pan" fish, primarily members of the centrarchidae family, were found in 41% of the stomachs. Forage and "noxious" fish were found in 55% of the stomachs. The author speculated that river otter predation may benefit game fish and is an insignificant threat except in small trout streams or ponds.

River otter scat analysis in northwestern Montana indicated fish presence in more than 93% of scats (Greer 1955). Sunfish were documented in 58.2%, suckers in 33.3%, sculpins in 21.0%, and trout in 18.5% of scats. Frogs were an important diet component in all seasons. Similarly, analysis of river otter digestive tracts from animals trapped in northeastern North Carolina indicated fish occurrence in 91% of tracts and scats (Wilson 1954).

River otter digestive tracts from animals trapped over a 6-year span in Wisconsin, Michigan, and Minnesota were analyzed, along with river otter scats in Wisconsin (Knudsen and Hale 1968). Nongame fish were the primary prey, with game fish occurring infrequently. The authors concluded that river otter feeding habits were neutral or beneficial to other species.

Researchers studying river otter feeding habits in a boreal ecosystem of northeastern Alberta found fish in 92% of otter scats (Reid et al. 1994a). The most common prey were less agile species that inhabited shallow waters, such as members of the Catostomidae and Cyprinidae families. Diet shifted between seasons, likely due to ice cover on larger lakes. Ice cover affects the ability of river otters to access beaver and muskrat burrows and lodges. Shoreline structure may cause ice cover to be patchy, allowing river otters to access to water beneath the ice.

Hatchery managers at fish-rearing sites in the eastern U.S. were surveyed to determine wildlife depredation impacts (Parkhurst et al. 1987). Mangers reported that the peak in predation at facilities occurred from early June to early September. Predation by mink (*Mustela vison*) and river otters was the exception to the summer peak, with activity peaks from late fall to early spring. Methods considered most effective in deterring predators were top screens, enclosures, and shooting. The authors recommended that hatchery managers could benefit from better information on potential predators, including migration periods and seasonal movement patterns.

Analysis of river otter feeding habits in the Red River drainage in North Dakota indicated that fish and crayfish were the most important prey items (Stearns and Serfass 2011). Fish evidence was found in 83% of scats; crayfish evidence was found in 51.1% of scats. Cyprinids, such as carp and minnows, were found in 65% of scats, with catfish, suckers, and sunfish found in smaller percentages. Fish declined in importance during summer, with a shift to crayfish. The most commonly consumed size class was composed of fish 4 – 8 inches (10.1 – 20.0 cm) in total length. Prey size also changed seasonally, with the largest mean prey size during spring.

Interspecific Relationship to Beaver

Beaver and river otters are considered to have a commensal relationship, with the otter benefiting from the presence of beaver while the beaver is neither benefited nor harmed. LeBlanc et al. (2007) found that the source–sink dynamic of beaver populations creates ponds that are occupied and later abandoned, developing a mosaic of ponds that strongly influences the use of habitat and the distribution of the river otter during summer. The authors' work in New Brunswick showed that good otter habitat consisted of streams and rivers with high numbers of beaver colonies (LeBlanc et al. 2007). Winter ice had a strong limiting effect on otter behavior and dispersion in a study in Alberta (Reid et al. 1994b). The authors stated that "river otter exist in a commensal relationship with beaver in boreal Alberta, especially in winter" and hypothesized that "the annual carrying capacity for otters is determined by the availability of winter habitats." In Maine, researchers found that otters selected watersheds with a high abundance of old and active beaver colonies (Dubuc et al. 1990). Melquist and Hornocker (1983), working in Idaho, reported that otters used active and abandoned beaver bank dens and lodges more than any other type of den or resting site. Based on radiotracked animals, Melquist and Hornocker found that river otters rarely used lakes and reservoirs that lacked escape cover and shelter, even if food was abundant.

Beaver ponds, lodges, and bank dens provide a source of food for otters, shelter from predators, and access to water in winter. In a region like the Northern Great Plains, with low gradient streams and harsh winters, it is probable that self-sustaining populations of river otters will be limited to streams with significant beaver populations. Beaver presence must be combined with abundant fish food sources for otters. It is unknown whether such areas exist in South Dakota or if potential habitats are actually population sinks for river otters.

Evidence that river otters were abundant on the upper Missouri River (prior to the arrival of European fur traders and the near extermination of beaver) comes from the journals of Lewis and Clark (Burroughs 1961). Lewis and Clark did not report otters in present-day South Dakota. The expedition first reported river otters in present-day North Dakota at the mouth of the Heart River near Bismarck. Clark and Lewis both commented several times on the abundance of both beavers and otters in the upper Missouri River basin in present-day Montana.

One of the objectives of the expedition was to gain advantage in the fur trade for the United States. Lewis and Clark recorded information on beaver very carefully. Although they noted beavers frequently, the abundance of beaver didn't impress them until they had ascended above the mouth of the Little Missouri River. Lewis stated on April 16, 1805: "There was a remarkably large beaver caught by 1 of the party last night. These animals are now very abundant." From this point on, they continually comment on the great numbers of beavers (Burroughs 1961).

Survey Methods

States and other jurisdictions monitor river otters for a variety of reasons, including determining the need for reintroduction, determining sources of existing populations for translocation, and evaluating reintroduction success. Monitoring may help in setting harvest quotas and in gathering population data needed for international trade status (See Ecological and Legal Status Section). Survey methodology should be logistically realistic and designed with the use of the data in mind.

Various methods are used to monitor furbearer populations, many of which have been applied to river otters with varying degrees of success. Intensive study of a population is extremely valuable (Melquist and Hornocker 1983), but typically not feasible. Melquist et al. (2003) reviewed the challenges associated with surveying the river otter, a secretive, wide-ranging species that uses multiple dens. Swimley et al. (1998) also discussed limitations of some commonly applied survey techniques. Scent stations and track surveys are time consuming and may produce unreliable results. Snow track surveys require specific, unpredictable conditions in many areas. Harvest and trapper surveys are only relevant in areas with a harvested population (Swimley et al. 1998).

Indirect population monitoring methods have included scent station indices (Robson and Humphrey 1985, Olson et al. 2008), bridge sign surveys (Roberts et al. 2008), and

various other otter sign-detection attempts (Dubuc et al. 1990, Newman and Griffin 1994, Kiesow and Dieter 2003, Gallant et al. 2007, Olson et al. 2008, Shardlow et al. 2009).

Robson and Humphrey (1985) noted a rapid loss of interest in scent stations by river otters in northeastern Florida. Lack of reliability of scat surveys to monitor a river otter population in New Brunswick, Canada was described by Gallant et al. (2007).

Researchers have compared indirect detection methods. Olson et al. (2008) collected data on latrine site visits and scent marking in Pennsylvania. Others have compared indirect indices to more direct population measurements. Roberts et al. (2008) compared bridge sign survey results with catch-per-unit effort (CPUE) in assessing the status of river otters in Missouri. They advised against the use of sign surveys alone and recommended that sign surveys be used in conjunction with another technique that directly measures relative abundance, such as CPUE. Melquist et al. (2003) recommended that telemetry studies can provide important population data, particularly when combined with other population indices.

Bridge sites were compared to random sites in southern Missouri (Crimmins et al. 2009), investigating whether river otter avoidance of humans might impact their use of bridge sites. The authors found that river otter sign was more likely to be detected at random sites than at bridge sites, particularly during summer. When detected, scat abundance was also higher at random sites than at bridge sites during summer. The authors recommend caution in use of bridge-site survey data alone in making management decisions.

Researchers in Kansas recently reported on an evaluation of sign and track surveys, which are commonly used to assess river otter populations (Jeffress et al. 2011). Observers surveyed 110 randomly selected sites in eastern Kansas in 2008 and 2009 to test for differences among observers, substrates, sign type, survey length, and proximity to access points. Detection probability for both scat and tracks was 0.337 for a 400-meter survey. Detection probability for tracks was nearly 3 times lower than scat. Detection was highest in mud substrates and lowest in snow and leaf litter substrates. Detection probability increased almost 3-fold when survey length was increased from 200 meters to 1,000 meters. The authors did not find that surveys conducted via access points, such as bridges, biased the results either way.

States that harvest river otters can gather information to help describe age structure and reproductive status of females (Tabor and Wight 1977). However, Melquist et al. (2003) cautioned against relying heavily on harvest information to describe population status of furbearers because of the influences of fur prices, weather conditions, and prey cycles.

Chilelli et al. (1996) reviewed river otter biological and harvest data from 1970-1989 for 10 northeastern states. Because harvest data were used to estimate the proportion of juveniles harvested, age estimation techniques were compared. The authors determined that radiograph readings of teeth were more accurate in assigning ages

than counting cementum annuli and that assigning ages as juvenile or nonjuvenile was sufficient to determine population recruitment. Females and juveniles were more vulnerable to harvest during fall or early in the trapping season. River otter harvest and beaver harvest were not independent of each other. Harvest of both species was correlated with the previous year's average beaver pelt price in most of the states included in the study. The authors recommended the development and use of a CPUE index to assess population status in the northeastern states (Chilelli et al. 1996).

Three river otter aging methods were compared on skulls collected in Minnesota – cementum annuli counts, cranial suture closure patterns, and canine tooth radiographs (Kuehn and Berg 1983). The authors found good agreement between the methods. Cementum annuli counts were costlier than the other methods and yielded little information beyond what was found by examining radiographs for open apical foramens and pulp cavities.

Because river otters are difficult to capture and particularly to recapture, mark-recapture population estimates are not feasible and unlikely to be accurate (Melquist et al. 2003). Several studies have explored the usefulness of techniques that identify individual animals as a population estimation technique for this species. A radioisotope, ^{65}Zn, was detectable in feces of 2 captive river otters for at least 215 days (Knaus et al. 1983). In a related study, 10 animals captured in Louisiana for the purpose of implanting radio transmitters were injected with ^{65}Zn. Subsequent scat collection allowed the researchers to estimate the population based on the ratio of radioisotope-marked scats to unmarked scats. The usefulness of this method is limited by the ease of finding scat (Shirley et al. 1988). The topic of noninvasive genetic sampling has generated significant interest in recent years in the wildlife profession (Waits and Paetkau 2005).

An alternative to collecting scat or capturing river otters was explored in a study in Colorado, in which 2 trap types were tested for the ability to collect hair for subsequent DNA analysis. Fresh fecal samples are needed for DNA analysis, which may be difficult to collect in arid climates; hair is an alternative DNA source. Trap sets were designed for a 1-time set to prevent hair collection from more than 1 animal per set (Depue and Ben-David 2007). Probability of capturing an otter in the snare was nearly 2 times as high compared to rate of capture with the foot-hold, although this difference was not statistically significant. Benefits of snares included their portability and versatility in set locations, reduced cost and potential increased effectiveness in large-scale studies. The authors suggested that the use of both snare and foot-hold sets would increase otter captures.

A recent study in Missouri used DNA extracted from scat samples and anal sac secretions to identify individual animals and estimate density (Mowry et al. 2011). The researchers found that population size along 8 sampled rivers was best predicted by a combination of scats per latrine and latrines per kilometer.

An issue related to survey methods is trapping technique evaluation. Researchers in Alaska compared Hancock and unpadded leg-hold traps. Traps were equipped with

transmitters to indicate that they were sprung. Two-thirds of captured animals had some type of injury regardless of trap type. Hancock traps caused abrasions or edemas to appendages and were more likely to cause serious damage to canine teeth. Otters can become trap-shy from Hancock traps. Leg-hold traps were lighter, easier to set, and had better trap utility in this study. The authors recommended Sleepy Creek #11 traps for live-trapping river otters (Blundell et al. 1999).

River otter sign or harvest information has been used to produce occupancy or population models (Tabor and Wight 1977, Dubuc et al. 1990). Tabor and Wight (1977) examined female carcasses collected from trappers to estimate annual survival and recruitment rates in western Oregon. Dubuc et al. (1990) developed a model to predict river otter usage of watersheds in Maine based on 39 variables. Most variables were measured on maps, rather than in the field. Four variables predicted use: percentage of wetlands with beaver sign; total stream length; percentage of forested land with a mixture of hardwood and softwood, which also indicates good beaver habitat; and shoreline diversity.

Review of these studies demonstrates that survey method evaluation will undoubtedly continue as state and provincial authorities seek tools to help responsibly manage this species. Identifying a suitable survey technique will be challenging in an area with small and scattered river otter occurrences, such as South Dakota.

Survey Methods in Nearby States

The Wyoming Game and Fish Department (WGFD) does not presently monitor river otter populations. The river otter is a protected nongame species and a species of greatest conservation need, with no furbearer season designated. WGFD is cooperating with Dr. Ben-David at the University of Wyoming to develop a monitoring program for river otters in the Green River systems in southwestern Wyoming, using DNA and other noninvasive techniques. A survey challenge in Wyoming is getting access to search terrestrial habitats. The agency hopes to expand efforts to additional river systems in the future (Martin Grenier, WGFD, pers. comm.).

The Montana Department of Fish, Wildlife and Parks (MFWP) does not monitor live river otters. The agency collects age structure, sex ratio, and median age data from harvested animals to monitor population trends. MFWP is currently funding research at the University of Montana to test the use of hair snares and DNA analysis as noninvasive monitoring tools (Newton 2010) (Brian Giddings, MFWP, pers. comm.).

Based on information available on the Iowa Department of Natural Resources (IDNR) website (http://www.iowadnr.gov/wildlife/pdfs/river%20otter%20log%202003%20complete.pdf), Iowa's river otter population is monitored by data collected from harvested animals. Prior to the first harvest opportunity during 2006-2007, IDNR collected otter teeth and reproductive tracts to determine variables needed to create a population model. Dr. Bill Clark at Iowa State University modeled the population, with a conservative estimate of

7,000 river otters in the state prior to the 2006-2007 harvest of 400 animals. IDNR mandates checking of carcasses within 48 hours. Sex and age information continues to be collected from harvested animals to monitor population status.

The state of North Dakota does not currently conduct annual surveys for river otters. However, sign/scat surveys were conducted on foot, from a boat/canoe, or from bridges in northeastern North Dakota during 2006-2008 by Frostburg State University, MD. An evaluation of scat survey techniques also was conducted. The survey methods used during this effort are not necessarily logistically feasible for annual monitoring of river otters by the North Dakota Game and Fish Department (Stephanie Tucker, North Dakota Game and Fish Department, pers. comm.). A similar, short term monitoring project, again being conducted by Frostburg State University, is being planned for central and western North Dakota.

The state of Nebraska conducts winter bridge sign surveys for river otters (Sam Wilson, Nebraska Game and Parks Commission, pers. comm.). These surveys are conducted throughout the state in each of the agency's districts in selected areas. Observers scan the stream or river on both sides of designated bridges. An emphasis is placed on looking for slides. Other sign is noted. Surveys are conducted on streams or rivers that are partially or completely frozen and during at least 1 to 6 days after a snowfall accumulation of at least 1 inch (2.54 cm). Surveys are not to be conducted if there is significant nighttime snowfall the night before the survey. Actual survey time at each bridge is estimated at 10-15 minutes.

A graduate study concluded that river otter populations in Minnesota could be monitored with aerial snow-track surveys using 0.25 or 0.50 mile (402 m or 804 m) contiguous plots (Martin 2007). River otter data from Minnesota were used to develop a spatial model that recommended a minimum of 15-20 helicopter flights after at least 3 unique snow events to reach a precision goal with a standard error of < 0.05 (Aing et al. 2011). Minnesota Department of Natural Resources continues to evaluate monitoring techniques and expects to select a formal method of surveying river otters following several additional years of evaluation and data analysis (John Erb, Minnesota Department of Natural Resources, pers. comm.).

The state of Ohio initiated bridge sign surveys for river otters in 1999 (Ohio Division of Wildlife 2011). A 300-m section of stream is surveyed for any type of river otter sign by walking along the stream on both sides of selected bridge sites in eastern Ohio. Surveys are conducted within 3 days of rain or snow during November and December.

As part of a larger study in eastern North Dakota, muscle tissue from 21 South Dakota river otters was analyzed (Brandt 2010, Stearns et al. 2010). The authors detected 2 population clusters, with North Dakota and Minnesota otters forming one cluster and South Dakota otters forming a second cluster. Minnesota appears to be the source of North Dakota river otters. South Dakota's population is derived from results of a reintroduction by the Flandreau Tribe in Moody County, although some sampled animals from South Dakota were genetically similar to river otters from the North

Dakota-Minnesota population cluster. The authors recommended that the populations in North and South Dakota and Minnesota would benefit from mixing between populations to avoid inbreeding.

Harvest Scenarios

Management options include total protection; adjusting opportunities to capture animals by season length and harvest period; establishing harvest quotas, management zones, and closed areas; limiting harvest by individual trappers; and restricting the size, type, and number of traps allowed (Melquist and Dronkert 1987). Melquist et al. (2003) described Canada's long-term use of registered traplines, which helps reduce competition among trappers, particularly during times of high fur prices.

River otters are vulnerable to overharvest because of their low fecundity rate, the long interval between generations, their ability to travel extensively, and, when restricted to riparian corridors, their limited travel routes (Toweill and Tabor 1982, Melquist et al. 2003). This has led some states to regulate river otter harvest by allowing only 1 animal/trapper/season (Toweill and Tabor 1982). River otters can be vulnerable to take in beaver sets. Hill (1978), as cited in Melquist and Dronkert 1987, analyzed otter and beaver trapping in the southeastern U.S. and found that 1 river otter was taken for every 6-10 beavers. However, some studies have found that otters are often taken in beaver sets, with most catches made by a few trappers.

CITES Considerations

The Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) regulates international trade of certain animal and plant species. Species are assigned to Appendix I, II, or III. Appendix I species are threatened with extinction and may be affected by trade. Appendix II species may not be currently threatened with extinction, but trade impacts may need to be monitored. Appendix II may also include species that are similar in appearance to threatened species. The Appendix III species list may include species that any CITES-participating country regulates within its jurisdiction and seeks cooperation from other participating countries to control trade.

The river otter is an Appendix II species under CITES because of similarity of appearance to other listed species and not because of its conservation status. Export of live or dead specimens or parts and products requires an export permit from the country of origin. Export permits are issued by the country's CITES Management Authority following satisfaction of 2 conditions. The CITES Scientific Authority must conclude that the exports will not be detrimental to the species' survival, and the CITES Management Authority must determine that specimens were obtained legally.

Although states may institute river otter harvest without CITES authorization, CITES allows access to desired international trade. CITES authorization follows standard federal rule-making procedures, following submission of a request from a state or tribal

wildlife management entity seeking export approval. The submitting entity must provide the following biological information (U.S. Fish and Wildlife Service 2001):

1. Information on the condition of the population, including trends and population estimates where such information is available.
2. Information on total harvest of the species.
3. Information on distribution of harvest.
4. Habitat evaluation.

The U.S. Fish and Wildlife Service (2001) also described minimum requirements for a river otter management program:

1. There should be a controlled harvest, methods and seasons to be determined by the State or Indian Nation.
2. All skins must be registered and marked.
3. Harvest levels should be determined annually by the State or Indian Nation.

SOUTH DAKOTA PERSPECTIVE

Ecological and Legal Status

The river otter's dependence on reliable food and diverse aquatic ecosystems has caused it to be considered an indicator of high-quality aquatic environments (Melquist et al. 2003). River otter dependence on fish prey may make them vulnerable to contaminants in aquatic systems, because fish can concentrate mercury up to 4,800 times that of the surrounding water (Sheffy and St. Amant 1982). Furbearer carcasses from animals trapped within the Wisconsin River watershed in Wisconsin were analyzed for mercury levels. Furbearer species included muskrat (*Ondatra zibethicus*), beaver, red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), mink, and river otter. Fish-eating predators had higher mercury levels than herbivorous predators. Mercury levels in the fur agreed with soft tissue levels; brain tissue had the lowest mercury levels. Mercury levels in piscivores paralleled mercury levels in fish, crayfish, and bottom sediments (Sheffy and St. Amant 1982).

A study in Ontario documented mercury levels in fish at sites upstream and downstream from a chlorine plant and from uncontaminated lakes. Mercury levels in northern pike (*Esox lucius*), burbot (*Lota lota*), and walleye (*Stizostedion vitreum*) remained elevated 200 miles downstream of the chlorine plant. Mercury levels in fish from uncontaminated lakes were much lower, although levels were higher than levels considered maximum background concentrations, possibly due to the oligotrophic condition of the lakes. The authors report anecdotal information that local trappers no longer used some segments of the sampled drainages because mink and river otters had disappeared (Fimreite and Reynolds 1973).

The river otter has been included as an Appendix II species under the Convention on International Trade in Endangered Species of Wild Fauna and Flora since 1977 (Melquist et al. 2003). Appendix II designation mandates that export of specimens of Appendix II species be accompanied by an export permit from the country of origin. The U.S. Fish and Wildlife Service's Federal Wildlife Permit Office sets export quotas on the number of pelts from each state that can enter international trade. The state requesting export tags must submit population information from their jurisdiction to demonstrate that harvest and export are not harming the species.

The river otter is protected from take in South Dakota by 2 provisions. South Dakota Administrative Rule 41:10:02:04 lists the river otter as a state threatened species. Take of river otters is regulated by the following statute:

> SDCL 34A-8-8. Permitting capture of endangered and threatened species--Authorized purposes. The secretary of agriculture and the secretary of game, fish and parks may permit the taking, possession, purchase, sale, transportation, exportation, or shipment of species of plants or wildlife which appear on the state list of endangered or threatened species for scientific, zoological, or educational purposes, for propagation in captivity of such fish or wildlife to insure their survival.

However, take may be allowed under the following statute in the event of property destruction:

> SDCL 34A-8-11. Permits for capture or destruction of, wildlife to protect life or property--Violation of permit--Emergency protection of human life. Upon good cause shown and where necessary to alleviate damage to property or to protect human health, endangered or threatened species found on the state list may be removed, captured, or destroyed pursuant to a permit issued by the secretary of game, fish and parks. A violation of the terms of the permit is a Class 2 misdemeanor.
>
> Carnivorous animals found on the state list may be removed, captured, or destroyed by any person in emergency situations involving an immediate threat to human life, provided that the removal, capture, or destruction shall be reported to the secretary or his representative within twenty-four hours of the act.

South Dakota Administrative Rule 41:08:02:12 deals with possession of wild animals caught outside established seasons:

> Any trapper who finds a dead wild animal in a trap or snare belonging to the trapper at a time when the established season is closed shall leave the animal undisturbed in the trap or snare and shall contact a department representative within 12 hours. The department representative may authorize the temporary possession of the wild animal until it can be surrendered to the department.

Research and Monitoring

In early 2001, the SDGFP worked with South Dakota State University's Biology Department to determine the current distribution of river otters in the state and assess the feasibility of river otter reintroduction (Kiesow 2003). Two peer-reviewed publications followed (Kiesow and Dieter 2003;2005). Kiesow and Dieter (2003) described the current distribution of river otters in South Dakota while Kiesow and Dieter (2005) described the reintroduction feasibility portion of Kiesow's (2003) thesis. Since then, SDGFP has consulted with a regional wildlife biologist to further investigate the distribution of otters in the state, evaluate survey methodology suitable for long-term monitoring in South Dakota, and collect biological data from incidentally caught and killed river otters. The following is a summary of those efforts.

Kiesow and Dieter (2003) assessed the distribution of river otters in South Dakota and determined if there were any remnant populations in the state. Seventeen linear waterways were selected for analysis based upon 3 criteria: 1) water permanence, 2) gradient, and 3) stream order 3 to 7. Study streams included the Big Sioux River, Missouri River, James River, Little Minnesota River, Jorgenson River, Medicine Creek, Grand River, Vermillion River, North Fork of the Whetstone River, Moreau River, Virgin Creek, Cheyenne River, Bad River, White River, Little White River, Rapid Creek, and Belle Fourche River. They measured habitat, looked for otter sign along transects, and collected information on sightings from the South Dakota Natural Heritage Program

(SDNHP), tribes, landowners, trappers, and conservation officers. See Figure 1 for a map of South Dakota watersheds, rivers and creeks.

Thirty-four confirmed sightings of otters were recorded prior to and during the Kiesow and Dieter (2003) study. Approximately 75% of the sightings occurred in the eastern third of South Dakota. Half of the sightings occurred along the Big Sioux River. Most of the observations in Moody County were likely the result of a reintroduction of 34 otters by the Flandreau Santee Sioux Tribe. In 1998, 17 otters were released into a section of the Big Sioux River that runs through tribal lands (Kiesow 2003, Kiesow and Dieter 2003). Another 17 otter were released in 1999-2000 in close proximity to the first site. Otters originated from Bayou Otter Farm, Theriot, Louisiana (Raesley 2001).

Kiesow and Dieter (2005) determined the availability of suitable habitat for a potential river otter reintroduction into South Dakota. The authors evaluated habitat on the same 17 waterways selected in Kiesow and Dieter (2003). These waterways were ranked based upon stream characteristics, watershed features, water quality, prey availability, and other factors. Riparian habitat, prey base, and water quality were the 3 main factors that provided suitable river otter habitat. Results showed that the Bad River, Big Sioux River, James River, North Fork of the Whetstone River, and the Little White River were the most suitable linear waterways of those evaluated for sustaining a population of river otters. The authors concluded that it was feasible to reintroduce river otters to South Dakota and recommended reintroduction into the 5 rivers selected.

Proposed reintroduction protocol included a public relations component, obtaining source stock from the state of Missouri, and a recommended release of 20-30 otters at each of the 5 prioritized rivers/streams with a slight bias towards females. Reintroduction and monitoring should occur over a 2-year period, followed by monitoring by radio-telemetry and continued longer-term monitoring using a combination of winter aerial surveys and bridge sign surveys. Total cost for a 5-year reintroduction project was estimated at $144,500. Reintroductions by the state did not occur at that time because of higher priorities within Wildlife Division.

In the winter of 2005-2006, the SDGFP contracted with Jacquie Ermer, a biological consultant, to investigate the use of latrine site and snow track surveys for long-term monitoring of river otters. This project occurred in Roberts and Grant counties. Information on current sightings and incidental catches was collected. Interviews with wildlife professionals, information on sightings, and a review of Kiesow and Dieter (2005) provided guidance on survey site selection. Ermer concluded latrine site surveys were time consuming and limited by flood or ice conditions (Ermer 2006). Slides were easy to identify when snow was present. Ermer (2006) urged additional data collection on current status, distribution, habitat use and availability, and natural history. She also recommended aerial snow track surveys to determine distribution over a large (i.e. statewide) area and the development of a practical, long-term monitoring scheme. In addition, the origin of South Dakota otters should be determined and river otter awareness programs developed (Ermer 2006).

Ermer was contracted the following winter (2006-2007) to evaluate aerial snow track survey methodology and continue to investigate river otter distribution within eastern South Dakota (Ermer 2007). Selected rivers and river segments and a connected zig-zag series of 8, 20-mile long transects were flown using a fixed-wing aircraft in Day, Clark, Codington, Hamlin, and Marshall counties. Surveys required at least 0.5 inches (1.27 cm) of fresh snowfall and safe flying conditions. The James River, a portion of the Elm River and Big Sioux River and the Little Vermillion River were surveyed with no observations of otter sign. Reports of recently observed otter sign along the Vermillion River and in Meyer Lake Waterfowl Production Area (Grant County) were further investigated by aircraft. No otter sign was detected on the Vermillion River; sign was observed near Meyer Lake.

Ermer continued to assist with the collection of river otter observation forms, necropsies, and educational activities. Despite the limited observations of otter sign using aerial snow track surveys, Ermer recommended continued evaluation of this method and estimating detection probability. Ermer also recommended that sign surveys (aerial and ground), licensed trapper surveys, confirmed sighting reports, carcass collection, and population modeling be implemented initially for at least 3 years to determine the status of river otters in the state as precursors for a long-term monitoring program.

During the winter of 2007-2008, Ermer coupled aerial snow track surveys and bridge sign surveys to determine river otter distribution in eastern South Dakota (Ermer 2008). The project was meant to continue investigating the use of aerial snow track surveys and use bridge sign surveys to collect additional information on river otter distribution. Ermer also assisted in the collection of river otter sightings and conducted necropsies on incidentally caught otters. Surveys were conducted at bridges that were outside an 8-mile (12.87-km) buffer of known otter locations or previously surveyed otter areas and in watersheds with suitable habitat. Sixty-seven potential bridge sites were selected randomly; 36 bridge sites were surveyed. At least 1 inch (2.54 cm) of snow was required before each site was walked 300 meters upstream and downstream of the selected bridge. A Cessna aircraft was used to survey portions of the upper and lower James River, Vermillion River, mid- and lower Big Sioux River, and lower Missouri River after at least 0.5 inches (1.27 cm) of snowfall. Six 20-mile (32.2-km) long transects were flown in Day/Brown, Grant, Hamlin, Marshall, and Moody counties to survey basin wetlands for otter sign. A survey of all SDGFP trappers was conducted to identify beaver habitat in the state to help identify potential otter habitat. No sign was observed from the bridge sign surveys. Sign was observed on the Big Sioux River, upper James River, and on the 20-mile (32.2-km) transect in Moody County.

There continues to be a need to determine the distribution and extent of breeding of river otters in South Dakota (Ermer 2008). Ermer (2008) proposed using a combination of multiple methods: sign surveys (aerial snow track and bridge sign surveys), surveys of licensed trappers, continued collection of river otter sightings, and carcass collection. If feasible, a small-scale study to estimate home range, fecundity, and survival should be conducted.

Distribution

The SDNHP maintains a database of rare animal and plant species and plant communities in the state. Because the river otter is a monitored species, the NHP maintains records of reported river otter observations. Data are from a variety of sources including universities, government wildlife agencies, private contractors, and the general public. Not all observations are confirmed by SDGFP.

These river otter observation data are classified into 4 main types: sighting, sign, incidental trap, and road kill. Observations are categorized based on the primary method used to identify the animal as a river otter. Sighting observations are based upon the actual observation of a live animal. Sign observations are based on only tracks, slides, runs, scat, latrines, rub sites, or dens. Incidental trap observations are those that are the result of the incidental catch of a river otter while targeting other species. Road kills are observations that are the result of an otter found dead on the road or hit by a vehicle. An observation can be an individual animal or a group of animals.

The SDNHP database contains 170 reported river otter observations from 1979 through 2011. This is an increase over the 34 observations documented by Kiesow and Dieter (2003). Forty-eight percent of reported river otter observations are from within the Missouri-Big Sioux watershed (Table 1a and Figure 2). River otters have also been reported from 6 of the 9 other watersheds found in South Dakota (Table 1a and Figure 2). We define watersheds as hydrological unit level two subregions delineated by the U.S. Geological Survey National Watershed Boundary Dataset.

River otters have been observed in 35 South Dakota counties and all 4 SDGFP Regions (Table 1b and Figure 3). Forty-seven percent of the reported river otter observations occurred in 3 counties: Moody, Roberts, and Grant (Table 1b and Figure 3). Moody County continues to have the most reported river otter observations (n = 46; Table 1b and Figure 3; Kiesow and Dieter 2003, South Dakota Natural Heritage Program Database 2012). Reports varied by SDGFP region: Region 1 = 6, Region 2 = 17, Region 3 = 84, Region 4 = 63 (Figure 3).

Since 1979, an average of 5.2 reported river otter observations was recorded per year. An increase in annual reported river otter observations began in 1998 (Figure 4). From 1998 through 2003, an annual average of 6.0 reported river otter observations was recorded compared to an average of less than one otter reported per year before 1998. This increase coincides with the reintroduction of river otters by the Flandreau Santee Sioux Tribe and research conducted by Kiesow and Dieter (Kiesow 2003, Kiesow and Dieter 2003;2005). The annual average number of reported river otter observations increased to 16.0 between 2004 and 2011. This recent and stronger pulse may be partially explained by the survey and public relations work done by Ermer (2006, 2007, and 2008). The highest number of reported river otter observations occurred in 2011 (n = 25).

Reported river otter observations vary by season and are most frequent in the spring (n = 53; Figure 5). The fewest observations occurred during summer (n = 29). Seasons are defined as follows: spring spans 20 March through 20 June, summer spans 21 June through 22 September, fall spans 23 September through 20 December, and winter spans 21 December through 19 March. From 1979 through 2011, reported river otter observations were most frequent during the months of November (n = 35), March (n = 29), and April (n = 27; Figure 6).

Incidental trapping observations (n = 66) were the most frequently reported observation type (39%; Figure 7; South Dakota Natural Heritage Database 2012). A similar number of reported observations was based on sightings of live animals (n=55). Both of these observation types account for 71% of all reported river otter observations. Thirty seven recorded river otter observations (22%) were based on sign, and 12 (4%) observations were classified as road kill.

Reported river otter observations from 1979 through 2011 revealed some monthly patterns based on observation type (South Dakota Natural Heritage Database 2012; Figure 8). Incidental trapping observations were most frequent during the month of November (n = 30). These types of reports were also frequent in the months of March (n = 8) and April (n = 9). Observations of this type were documented in all months of the year excluding January and August. Sightings of live animals were reported during all months of the year, but most frequently reported in April. Observations of sign were common in March (n = 13). Only 4 months of the year (January, July, August, and October) did not have reports of road killed river otters.

To learn more about the distribution of river otters in the state, SDGFP surveyed furbearer license holders with a 2010 license or a 2011 license purchased prior to 1 May 2011 (Huxoll 2011) . Each of these license holders was asked if they had observed river otters or their scat during the year prior to receiving the survey and if so, in what county the observation was made. Ninety-two otter and 3 scat observations were reported in 22 different counties. Of the 92 observations of river otters, 41% were from Moody, Grant, and Roberts counties.

Reproduction

Reproduction has been documented in 8 counties: Bon Homme, Brookings, Codington, Grant, Hamlin, Minnehaha, Moody, and Roberts counties (Figure 9). These locations provide evidence of reproduction in the Missouri-Big Sioux and Minnesota watersheds (Figure 9). Evidence of reproduction is based on the observation of a family group, information collected from necropsy such as the presence of corpora lutea, age (determined by the closure of the foramen and pulp cavity width of the lower canine), credible observation of a young animal, or evidence indicating lactation.

THREATS

Habitat Loss and Degradation

Melquist et al. (2003) summarized various habitat destruction and degradation practices that have impacted river otter populations. Such practices may take the form of mining operation impacts to wetlands, shoreline development, pesticide residue runoff and other contamination of wetlands, accumulation of toxic substances in river otter prey, and human disturbance of otters during sensitive periods, such as the birth and rearing of pups.

The Rocky Mountain Region (Region 2) of the USDA Forest Service prepared a conservation assessment for the river otter (Boyle 2006). The author described a number of threats that may affect river otter sustainability in this region, including water development, fluctuating water levels in reservoirs, and riparian vegetation loss and degradation due to agricultural use, urban development, and timber harvest. Boyle (2006) speculated that the predominant use of linear drainages by river otters in the Region 2 states may make them particularly vulnerable to habitat fragmentation.

Kiesow and Dieter (2005) evaluated 17 rivers or streams in South Dakota as potential reintroduction sites. Evaluation criteria included stream size, water gradient, water permanence, prey availability, and corridor vegetation. Although some water quality information was collected, no analysis of mercury concentrations was conducted. The study used fish data collected from other sources in the analysis.

Incidental Trapping, Poaching, and Road Kills

Of all river otter observations reported to the SDNHP from 1979 through 2011, 57 were of otters found dead or killed (dispatched) due to injuries judged to eventually be fatal. Seventy-one percent of reported dead river otters were killed directly by traps (n = 40; Figure 10). Eleven vehicle collisions in 6 counties accounted for 20% of the total river otter mortality. Of those river otters dispatched, 4 sustained trap-related injuries, and 1 had injuries suspected to be caused by a vehicle. The remaining dispatched river otter was incidentally trapped and subsequently bit the observer. This river otter was killed and tested for rabies; the test results were negative.

Approximately 70% of the 66 incidental trapping observations occurred in 4 counties: Moody, Grant, Roberts, and Codington counties (Table 2a). Moody County had the highest number of incidentally trapped (n = 25; Table 2a) and total river otter observations (n = 46; Table 1b) in the state. Incidental trapping observations made up 44% of the total number of observations for Grant County (7 of 16). In Roberts County, incidental trapping observations made up 37% (7 of 19) of total reported otter observations. Six of the 7 reported river otter observations in Codington County were incidentally trapped otters.

Thirty-six incidental trapping observations were reported in southeastern South Dakota (SDGFP Wildlife Division Region 3; Figure 11). Twenty-five of the incidentally trapped otters were killed directly by the trap, 4 were released alive, and 7 were dispatched after being caught in a trap. In northeastern South Dakota (SDGFP Wildlife Division Region 4), 27 incidentally trapped river otters were reported: 14 were found dead in the trap, 12 otters were released after being incidentally caught in a trap, and 1 was dispatched after being caught in a trap (Figure 12). Two incidental trapping observations were reported from west of the Missouri River. An incidentally trapped river otter in Haakon County was released alive, and an otter caught in Lyman County was found dead in a trap.

Of the 66 incidentally trapped otter, 26 (39%) of the trapping activities were targeting beaver, 5 raccoon (8%), and 1 mink (2%; Figure 13). The target species for 51% (n = 34) of the incidental trapping river otter observations was not reported. Trap types used include Conibear, foot- or leg-hold, Hancock, and snare (Table 3). Of the trap types reported, Conibear traps were the most frequently used.

Reported vehicle collisions with river otters occurred in 7 counties (Figure 14). Five collisions occurred on local roads (graded, gravel, or hard surface roads as defined by South Dakota Department of Transportation), 2 occurred on state highways, 1 on a US highway, and 3 on interstate highways.

Information Obtained from Necropsies

Since 2004, 38 river otters were opportunistically obtained and biological data were collected (Ermer 2011). Necropsies were performed at the Webster SDGFP field office and at South Dakota State University when carcasses became available. The necropsied otters were opportunistically collected from 11 different counties in 2 SDGFP regions (Table 4) from 2004 through July 2011. Forty-five of the otters necropsied were obtained from Moody County (Table 4). November and April were the most common months that otters were obtained which coincide with the autumn beaver trapping season and greater movements during the latter part of the breeding season.

Most of the river otters obtained for necropsy were incidentally trapped (n = 29) or road-killed (n = 8). Prior to necropsy, otters were skinned and salvageable pelts were tanned and used for educational purposes. Of the 38 otters examined, 58% were male (n = 22) and 42% were female (n = 16; Figure 15). Based on visual inspection of tooth wear, 11 of the females and 12 of the males were adult. The age of one male otter was not determined. Nine of the females had visible corpora lutea indicating they were reproductively active. Five of the reproductively active females were from Moody County (Table 5). Otter weights ranged from 8 to 26 pounds (3.63 to 11.79 kg). Stomach contents included pieces of minnow, crayfish, carp, sucker, northern pike *(Esox lucius*), bullhead, frog, catfish, green sunfish (*Lepomis cyanellus*), Johnny darter (*Etheostoma nigrum*), sand shiner (*Notropis stramineus*), and vegetation. Minnow, carp, and crayfish were the most common items found in the stomach of otters. Not all stomach contents were identified to species or genera. Nine stomachs were empty, and 2 stomachs were too damaged to determine contents.

Parasites and Diseases

Neither diseases nor parasites are thought to be major mortality factors for river otters (Toweill and Tabor 1982, Melquist and Dronkert 1987). Melquist et al. (2003) summarized published information on ectoparasites, helminth endoparasites, viruses, bacteria, fungi, and protozoans documented in river otters in North America. Although this threat could benefit from additional study, it is likely minimal when compared to the effects of habitat loss. During necropsies of opportunistically obtained otters in South Dakota, 8 of the 38 had visible wrist worms (Ermer 2011). These worms are not detrimental to otters and do not pose a human health risk.

In November of 2007 a female otter was incidentally trapped in Moody County. When trying to release the animal, the observer was bit. The animal was dispatched and the head removed to test for rabies. Test results from South Dakota State University's Animal Disease Research Diagnostic Laboratory in Brookings returned negative for the disease.

OBJECTIVES AND STRATEGIES

A 5-year schedule is included in Appendix 1.

Population Status

Objective 1: Determine distribution of river otters in South Dakota by 31 December 2013.

Strategy 1. Update knowledge of river otter occupancy of certain drainages in South Dakota by 31 December 2013.

Activity 1: Complete South Dakota State Wildlife Grant Project 55-R-1, "Determination of river otter distribution and evaluation of potential sites for population expansion in South Dakota."

Progress: This project was funded and began on 1 October 2011. Project objectives are:

1. Update river otter occupancy status of drainages with evidence more than 5 years old.
2. Determine river otter occupancy status of agreed-upon drainages.
3. Evaluate agreed-upon sites for reintroduction suitability.

Strategy 2. Use various information tools to solicit river otter sightings and discourage incidental take of river otters (timeframe - ongoing).

Activity 1: Maintain and update website (http://gfp.sd.gov/wildlife/management/diversity/river-otter.aspx). This website includes a link to a brochure about river otters in South Dakota, with tips on avoiding unintentional capture of river otters.

Activity 2. Continue use of tools to collect reports of sightings and incidental take from GFP staff, including collection of specimens and completion of necropsies as needed.

Activity 3. Solicit information on location of beaver habitat from Division of Wildlife staff.

Objective 2: Determine delisting goal by 31 December 2014.

Strategy 1: Evaluate results of South Dakota State Wildlife Grant Project 55-R-1 to draft delisting goal by 30 September 2014.

Activity 1: Solicit input from furbearer specialists to review draft delisting goal.

Activity 2: Contingent upon determination that delisting is biologically justified, prepare for Commission action to delist this species.

Objective 3: Determine harvest options.

This objective is contingent upon delisting of this species in South Dakota and a determination that harvest can be sustained. Harvest is not anticipated during the course of this 5-year plan.

Research

Objective 1: Determine life history characteristics for river otters in South Dakota by 31 December 2016.

Strategy 1: Determine and describe den site characteristics by 31 December 2014.

Activity 1: Develop and periodically collect data from Wildlife Division staff to document characteristics of known or suspected den sites.

Strategy 2: Determine causes of mortality and reproductive status of river otters in South Dakota (timeframe – ongoing).

Activity 1: Continue specimen collection and necropsy completion as needed.

Reintroduction

Objective 1: Determine need for reintroduction to expand river otter populations by 31 December 2014.

Strategy 1: Evaluate results of South Dakota State Wildlife Grant Project 55-R-1, “Determination of river otter distribution and evaluation of potential sites for population expansion in South Dakota.”

Activity 1: Complete South Dakota State Wildlife Grant Project 55-R-1.

Progress: This project began on 1 October 2011 and is proceeding on schedule.

Strategy 2: Contingent upon review of results from South Dakota State Wildlife Grant Project 55-R-1, prepare for reintroduction that would occur from January 2015 through December 2016.

Depredation Options

Objective 1: Identify and address conflicts caused by river otters

Strategy 1: Determine an appropriate system for addressing site-specific depredation problems caused by river otters by 30 June 2012.

Activity 1: Develop a depredation protocol for addressing depredation problems.

Progress: A subgroup of the GFP River Otter Management Planning Team has developed a draft depredation protocol to address situations where individual river otters are causing site-specific problems (Appendix 2).

Activity 2: Determine release sites for depredating otters that are suitable for translocation based on results of South Dakota State Wildlife Grant Project 55-R-1. Encourage regional wildlife program managers to identify suitable sites until this project is concluded.

Outreach and Education

Objective 1. Improve public awareness of the population status and legal status of river otters by 31 December 2016.

Strategy 1. Provide information to the public about river otter population status and legal status (timeframe – ongoing).

Activity 1. Update website information as needed.

Activity 2. Use targeted information tools as needed.

Progress: A wildlife attitude survey of the general public was completed in 2012 (Gigliotti 2012). This survey included two questions specific to river otters in South Dakota. Thirty percent (30.4%) of the public was concerned about otters taking too many game fish if otter populations were to increase. Conversely, 30.5% were not concerned; 43.1% were neutral or had no opinion. Half (50.4%) of survey respondents supported reintroduction of river otters into suitable habitats in South Dakota. Eleven percent (11.3%) did not support reintroductions; 38.3% were neutral or had no opinion.

Progress: A harvest survey of furbearer license holders in 2011 requested information on river otter sightings (Huxoll 2011).

Activity 3. Solicit public input on draft management plan. Extend specific invitations to organizations in South Dakota that cater to furbearer trappers.

Objective 2. Improve staff and Commission awareness of the population status and legal status of river otters by 31 December 2016.

Strategy 1. Form River Otter Management Planning Team with participation of regional wildlife program managers and representatives of Wildlife Damage Management Program to provide input during preparation of river otter management plan.

Activity 1. Use necessary tools to assimilate information from management planning team.

Progress: Team has met twice in person and has also submitted feedback by email.

Activity 2. Solicit feedback on draft management plan from River Otter Management Planning Team.

Progress: Completed.

Activity 3. Solicit feedback on draft management plan from SDGFP staff.

Progress: Completed.

Activity 4. Finalize management plan.

Strategy 2. Provide update to the SDGFP Commission when management plan has been finalized or as needed.

Evaluation

Objective 1. Determine the feasibility and effectiveness of the river otter management plan by 31 March 2017.

Strategy 1. Conduct and summarize a mid-term plan evaluation by 30 June 2014.

Strategy 2. Conduct and summarize a final evaluation and determine need for a new or revised river otter management plan by 31 March 2017.

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Table 1a. Frequency of reported river otter observations in South Dakota watersheds from 1979 through 2011. An observation is based on a sighting of a live animal, incidental trapping catch, otter sign, or road kills. An observation can be an individual animal or a group of animals. Note: Not all observations have been confirmed by SD Game, Fish and Parks. Watersheds are hydrological unit level two subregions as defined by the U.S. Geological Survey National Watershed Boundary Dataset.

Subregion	**Frequency**	**%**
Missouri-Big Sioux	82	48%
Minnesota	32	19%
James	19	11%
Red	14	8%
Missouri-White	14	8%
Cheyenne	5	3%
Missouri-Oahe	4	2%
	170	

Table 1b. Frequency of reported river otter observations in South Dakota counties from 1979 through 2011. An observation is based on a sighting of a live animal, incidental trapping catch, otter sign, or road kills. An observation can be an individual animal or a group of animals. Note: Not all observations have been confirmed by SD Game, Fish and Parks.

County	Frequency	%
Moody	46	27%
Roberts	19	11%
Grant	16	9%
Brookings	8	5%
Marshall	7	4%
Minnehaha	6	4%
Hughes	5	3%
McCook	5	3%
Beadle	4	2%
Brown	4	2%
Codington	7	4%
Lake	4	2%
Lincoln	4	2%
Lyman	4	2%
Stanley	4	2%
Deuel	3	2%
Sanborn	3	2%
Bon Homme	2	1%
Custer	2	1%
Pennington	2	1%
Brule	1	1%
Buffalo	1	1%
Clay	1	1%
Day	1	1%
Haakon	1	1%
Hamlin	1	1%
Hanson	1	1%
Jones	1	1%
Kingsbury	1	1%
Meade	1	1%
Spink	1	1%
Sully	1	1%
Union	1	1%
Clark	1	1%
Yankton	1	1%
	170	

Table 2a. Frequency of reported incidentally trapped river otter observations in South Dakota counties from 1979 through 2011.

County	Frequency	%
Moody	25	38%
Grant	7	11%
Roberts	7	11%
Codington	6	9%
Brookings	5	8%
Minnehaha	3	5%
Lake	3	5%
Deuel	2	3%
Brown	1	2%
Clay	1	2%
Haakon	1	2%
Hamlin	1	2%
Kingsbury	1	2%
Lyman	1	2%
Marshall	1	2%
Union	1	2%
	66	

Table 2b. Frequency of reported incidentally trapped river otter observations in South Dakota watersheds from 1979 through 2011. Watersheds are hydrological unit level two subregions as defined by the U.S. Geological Survey National Watershed Boundary Dataset.

Subregion	Frequency	%
Missouri-Big Sioux	40	61%
Minnesota	18	27%
Red	4	6%
James	2	3%
Missouri-White	2	3%
	66	

Table 3. Trap-types used and species targeted when 66 river otters were incidentally caught in South Dakota from 1979 through 2011.

Trap-type	Beaver	Raccoon	Mink	Unknown	Total
Conibear	8	1	0	13	22
Foot(leg)hold	1	1	1	10	13
Hancock	1	0	0	0	1
Snare	7	2	0	3	12
Unreported	9	1	0	8	18
	26	5	1	34	**66**

Table 4. Number of river otters examined by county in South Dakota from 2004 through July 2011.

SD Game, Fish and Parks	County	# Otters	%
Region Three	Moody	17	45%
(southeastern South Dakota)	Brookings	4	11%
	Clay	1	3%
	Lake	1	3%
	Minnehaha	1	3%
Region Four	Grant	5	13%
(northeastern South Dakota)	Codington	4	11%
	Deuel	1	3%
	Hamlin	1	3%
	Marshall	1	3%
	Roberts	1	3%
Unknown	Unknown	1	3%
		38	

Table 5. Number of examined female otters by county with visible corpora lutea in the ovaries from 2004 through July 2011.

County	# Otter with corpora lutea	Total # female otter examined
Moody	5	5
Brookings	1	2
Clay	1	1
Codington	1	2
Grant	1	3
Deuel	0	1
Lake	0	1
Minnehaha	0	1
Total	**9**	**16**

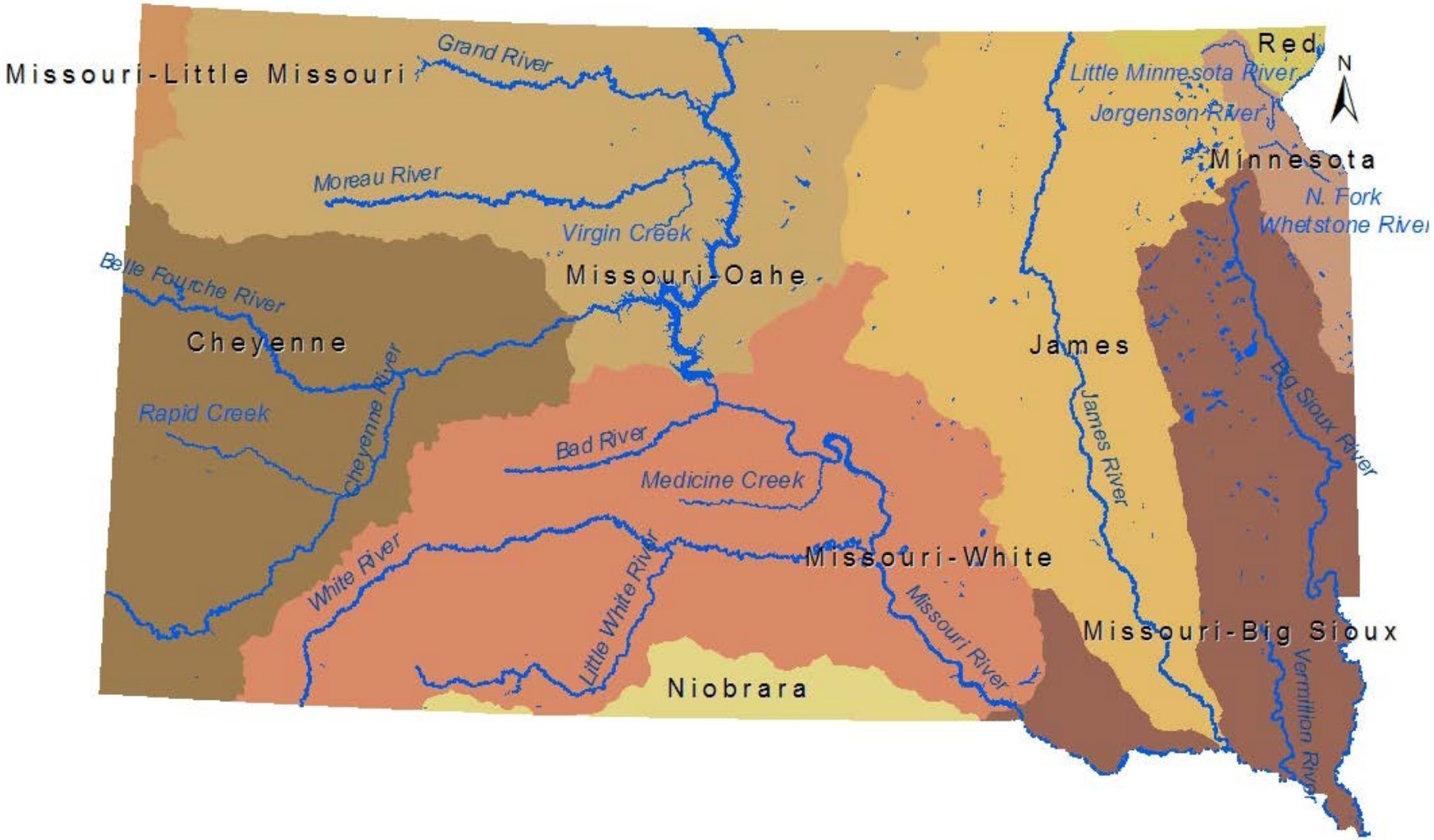

Figure 1. Map of South Dakota watersheds, rivers and creeks. Watersheds are hydrological unit level two subregions as defined by the U.S. Geological Survey National Watershed Boundary Dataset.

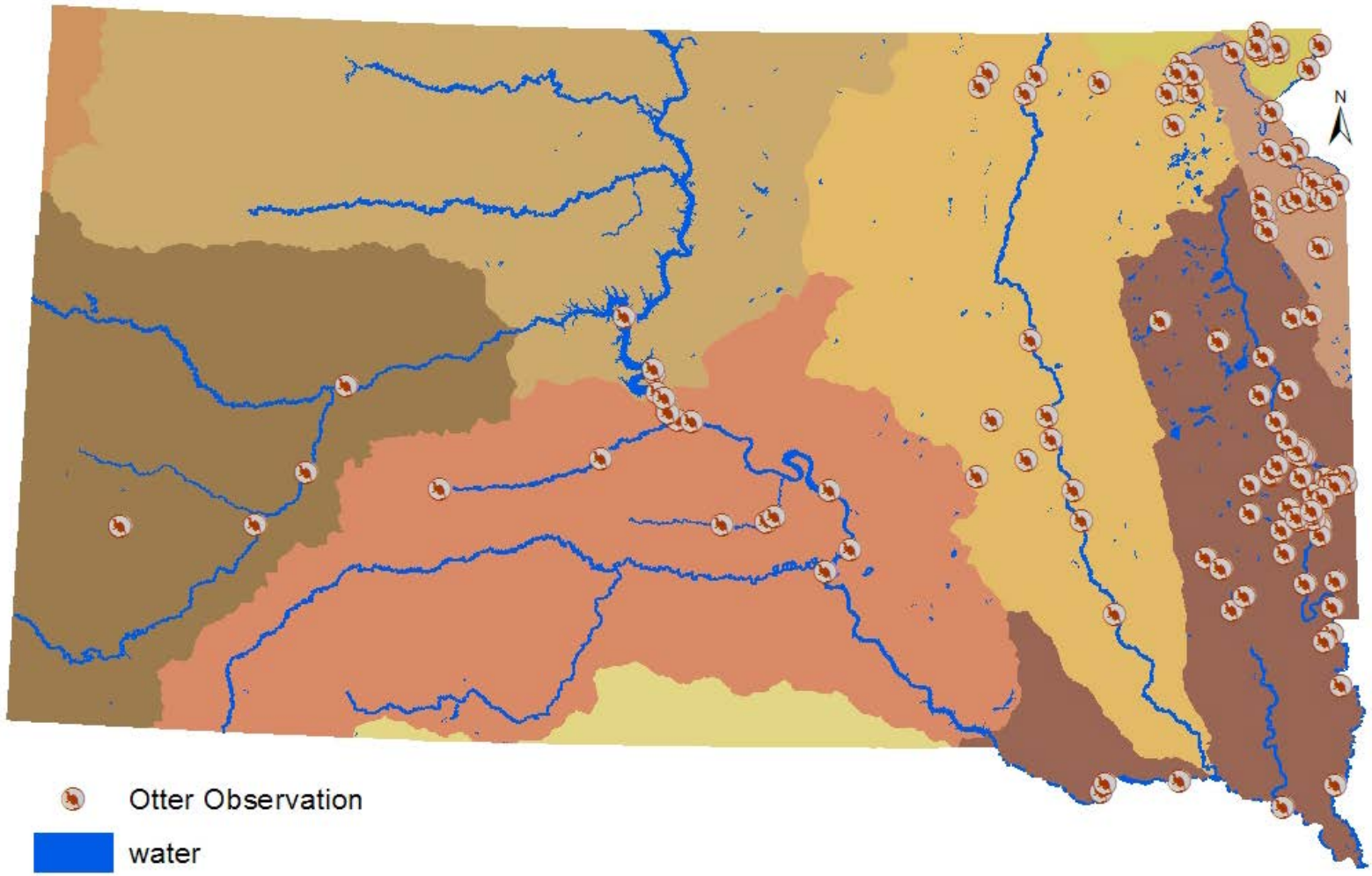

Figure 2. Location of 170 reported river otter observations in South Dakota watersheds from 1979 through 2011. An observation is based on a sighting of a live animal, incidental trapping catch, otter sign, or road kills. An observation can be an individual animal or a group of animals. Note: Not all observations have been confirmed by SD Game, Fish and Parks. Watersheds are hydrological unit level two subregions as defined by the U.S. Geological Survey National Watershed Boundary Dataset.

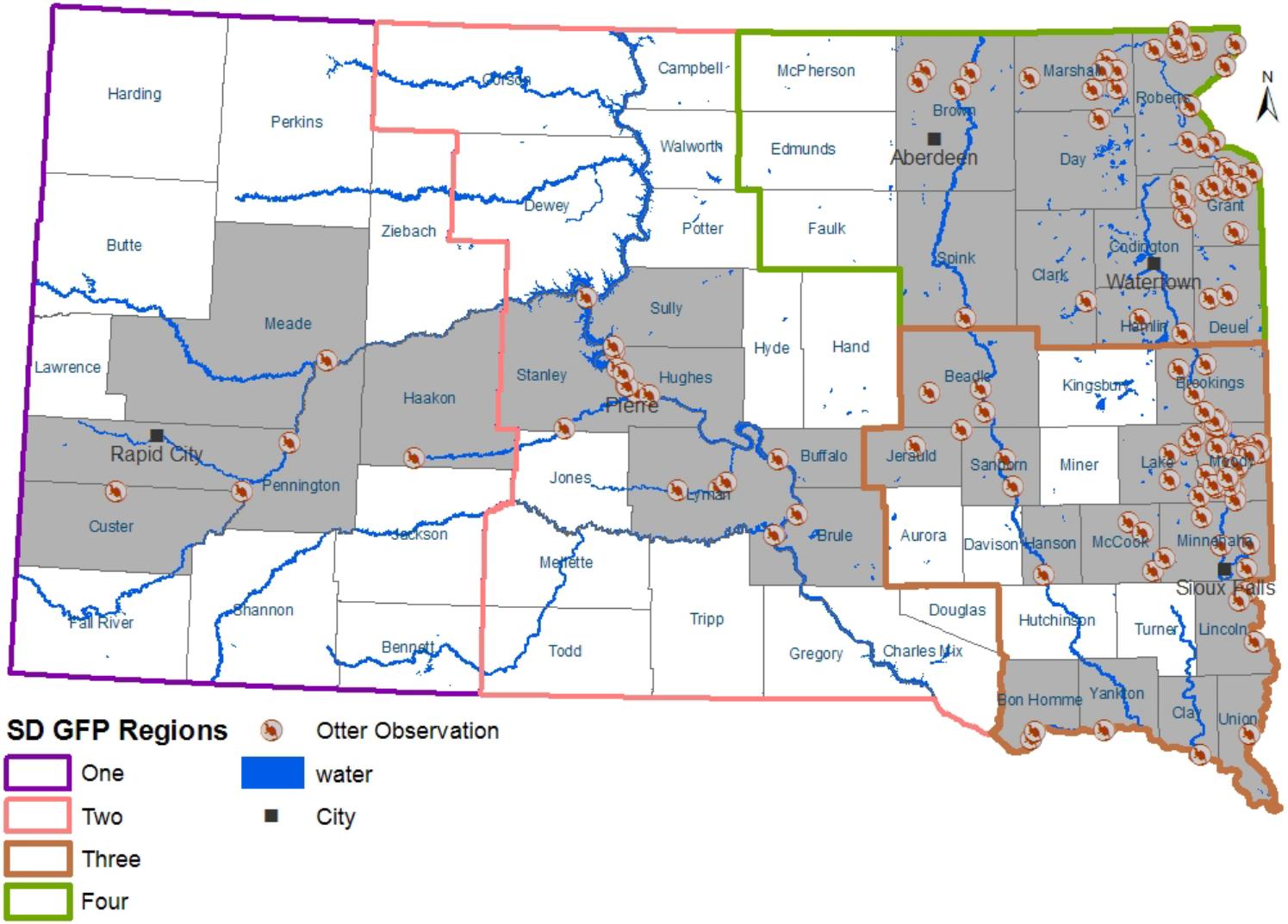

Figure 3. Location of 170 reported river otter observations in South Dakota counties and associated county distribution from 1979 through 2011. An observation is based on a sighting of a live animal, incidental trapping catch, otter sign, or road kills. An observation can be an individual animal or a group of animals. Note: Not all observations have been confirmed by SD Game, Fish and Parks.

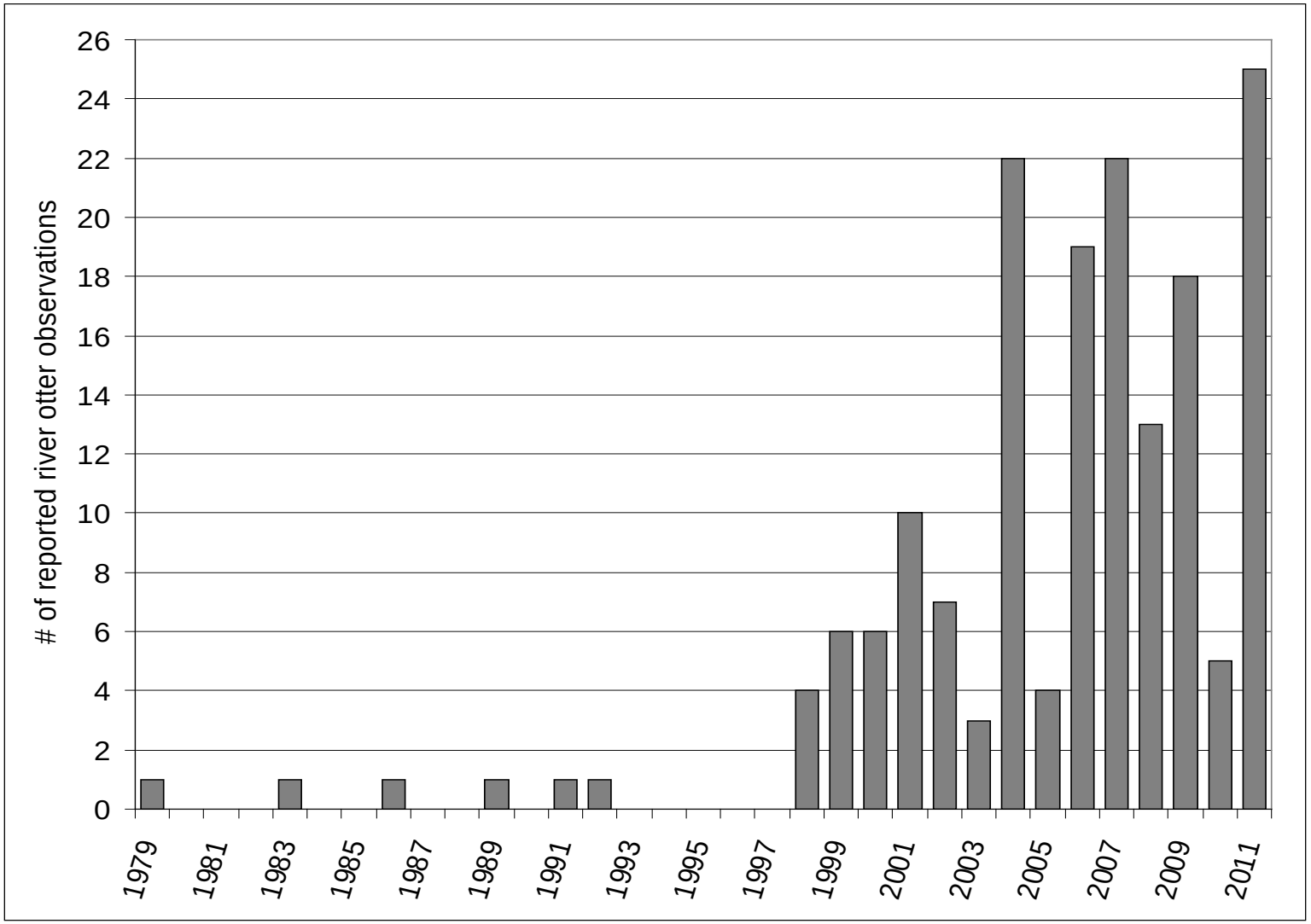

Figure 4. Frequency of reported river otter observations by year in South Dakota from 1979 through 2011. An observation is based on a sighting of a live animal, incidental trapping catch, otter sign, or road kills. An observation can be an individual animal or a group of animals.

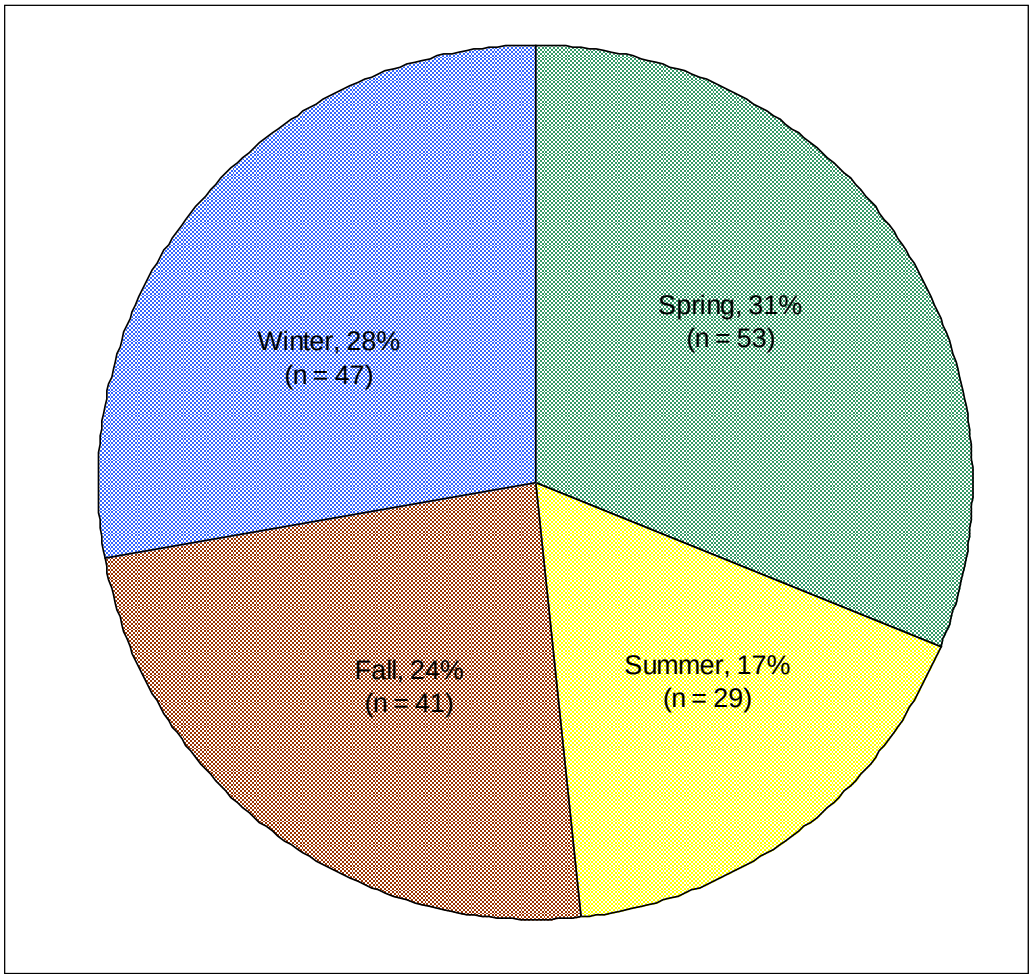

Figure 5. River otter observations (n = 170) reported by season in South Dakota from 1979 through 2011. An observation is based on a sighting of a live animal, incidental trapping catch, otter sign, or road kills. An observation can be an individual animal or a group of animals. Seasons are defined as follows: spring spans 20 March through 20 June, summer spans 21 June through 22 September, fall spans 23 September through 20 December, and winter spans 21 December through 19 March.

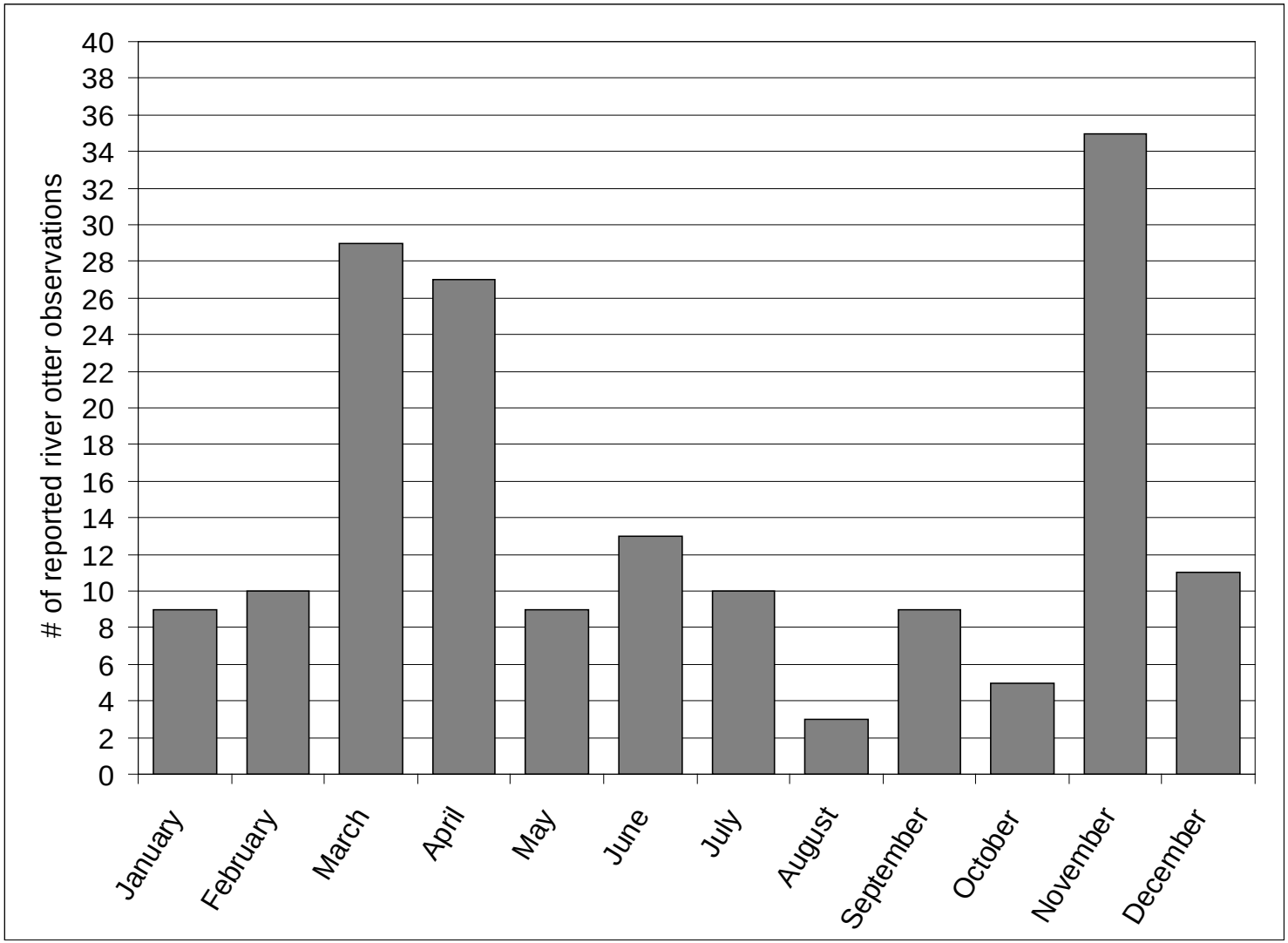

Figure 6. River otter observations (n = 170) reported by month in South Dakota from 1979 through 2011. An observation is based on a sighting of a live animal, incidental trapping catch, otter sign, or road kills. An observation can be an individual animal or a group of animals.

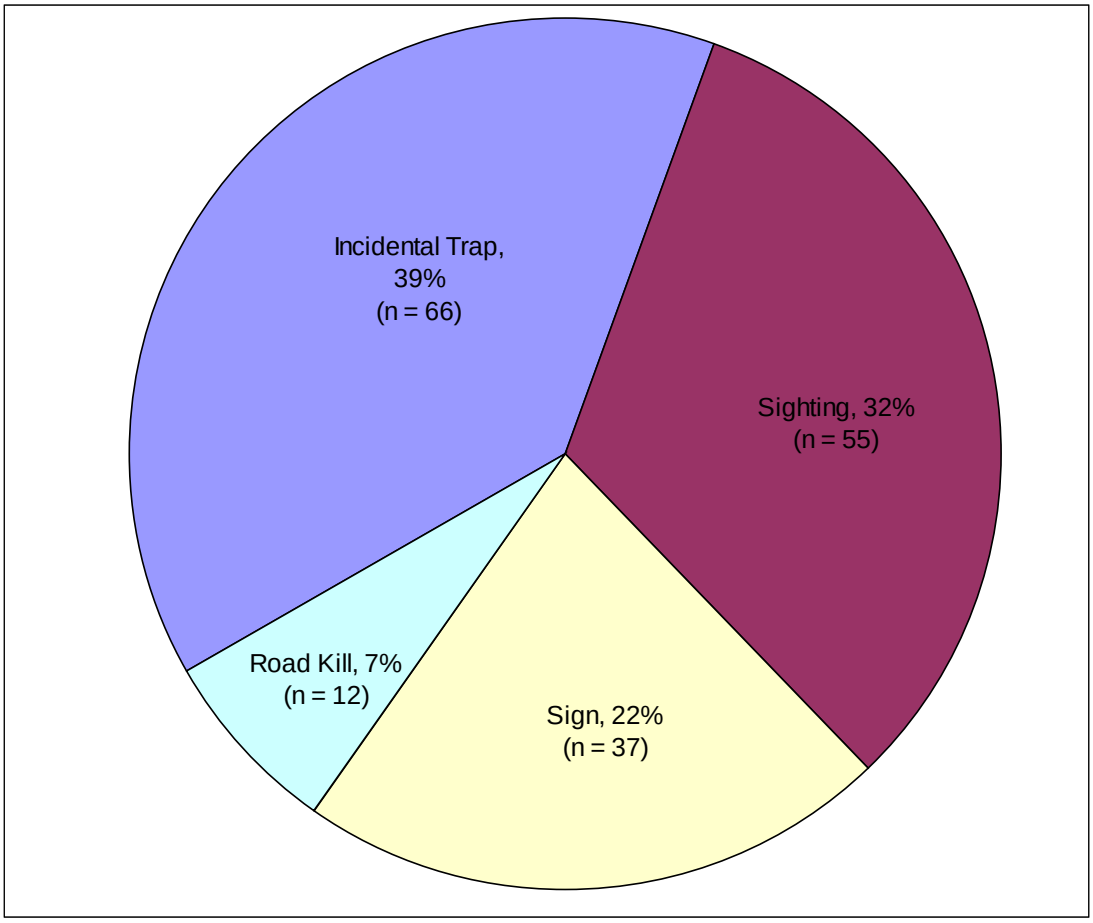

Figure 7. Composition of 170 reported river otter observations in South Dakota from 1979 through 2011. An observation is based on a sighting of a live animal, incidental trapping catch, otter sign, or road kills. An observation can be an individual animal or a group of animals.

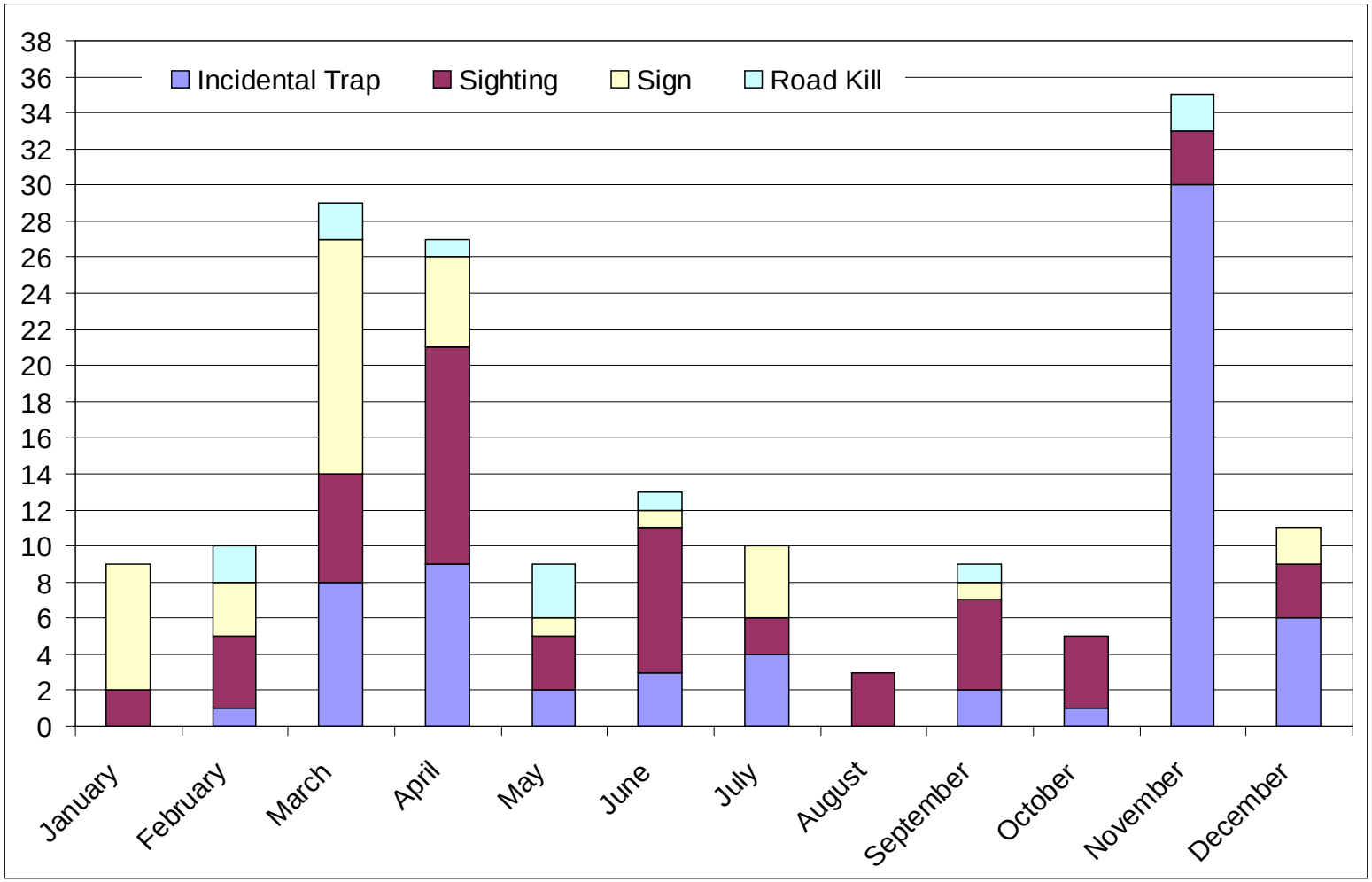

Figure 8. Frequency of reported river otter observations by month and type in South Dakota from 1979 through 2011. An observation is based on a sighting of a live animal, incidental trapping catch, otter sign, or road kills. An observation can be an individual animal or a group of animals.

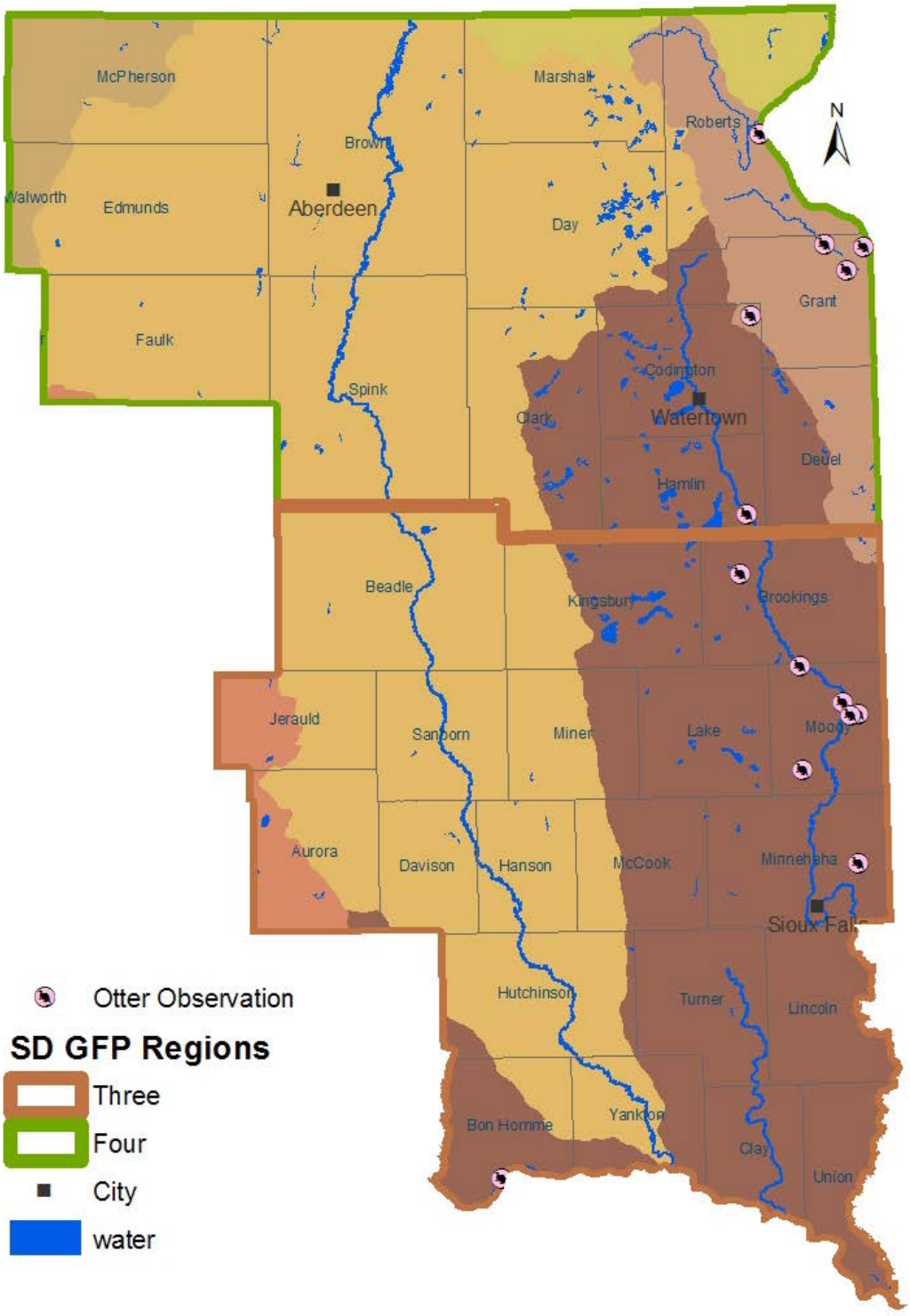

Figure 9. Location of 14 reported river otter observations with evidence of reproduction in South Dakota from 1979 through 2011. Evidence of reproduction is based on the observation of a family group, information collected from necropsy such as the presence of corpora lutea, age characteristics, credible observation of a young animal, or evidence indicating lactation. Watersheds are hydrological unit level two subregions as defined by the U.S. Geological Survey National Watershed Boundary Dataset.

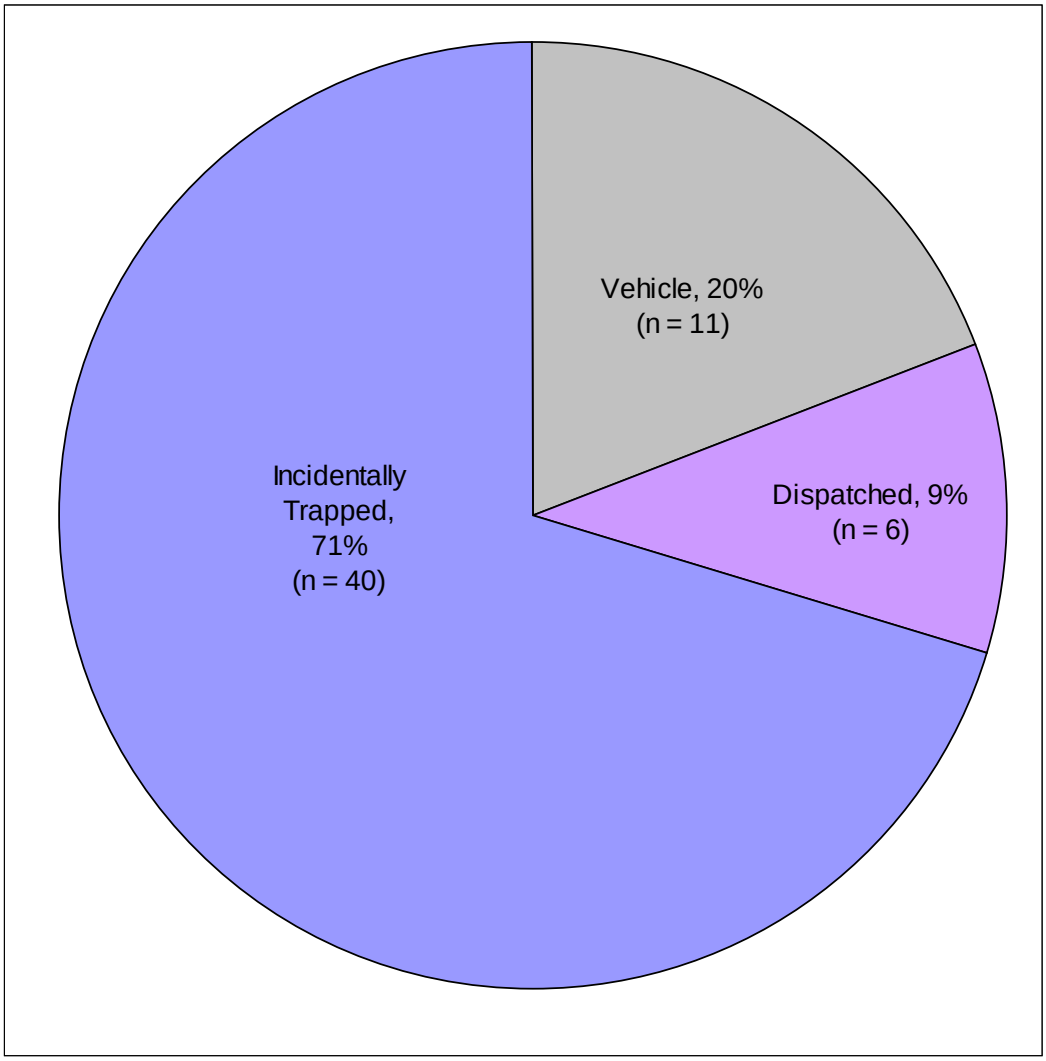

Figure 10. Confirmed sources of mortality for 57 river otters in South Dakota from 1979 through 2011. River otters were either found dead in a trap (Incidentally Trapped), dead on the road (Vehicle), or killed by the observer (Dispatched).

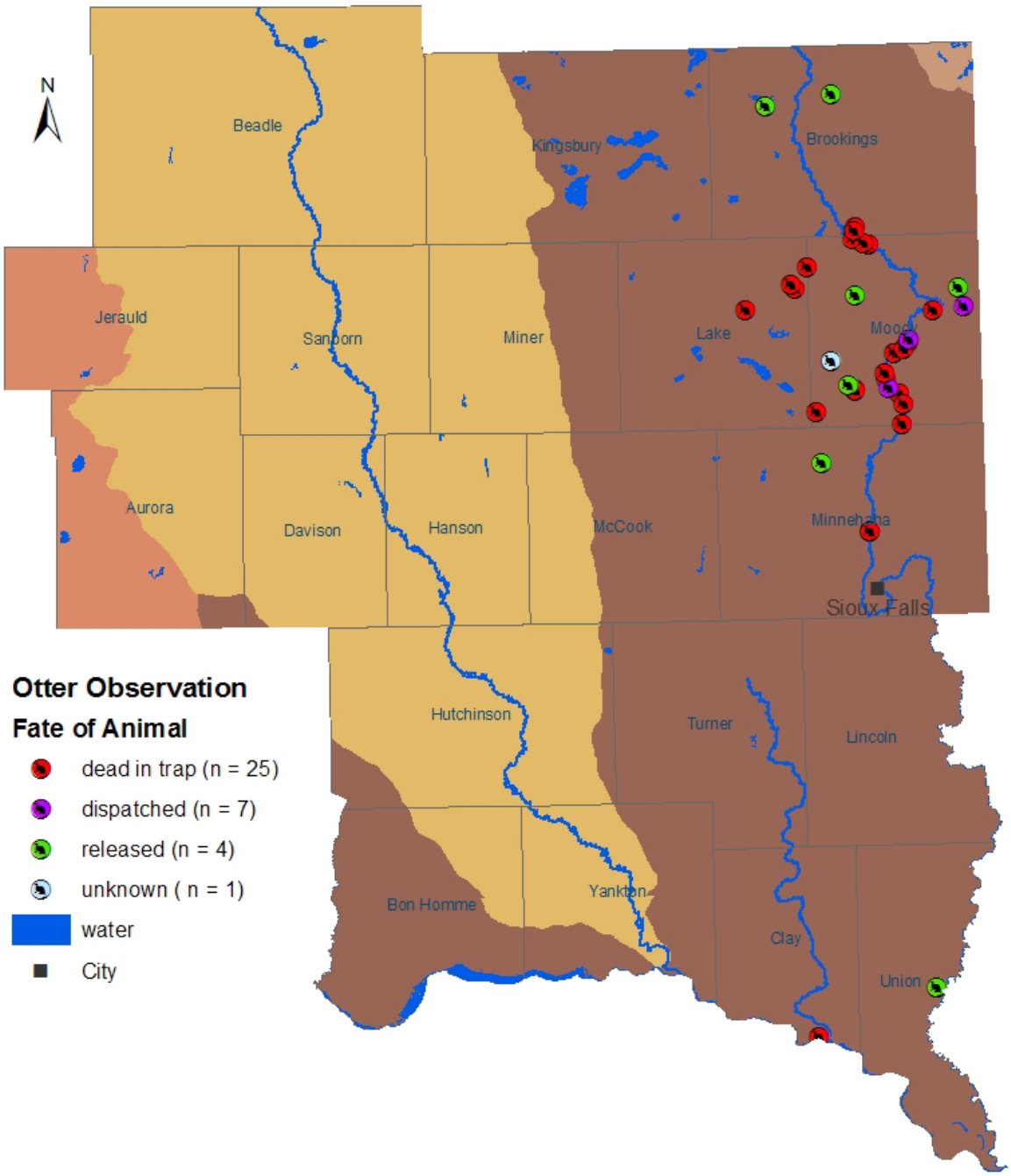

Figure 11. Fates of 37 reported incidentally trapped river otters in South Dakota Department of Game, Fish and Parks Region 3 from 1979 through 2011. Watersheds are hydrological unit level two subregions as defined by the U.S. Geological Survey National Watershed Boundary Dataset.

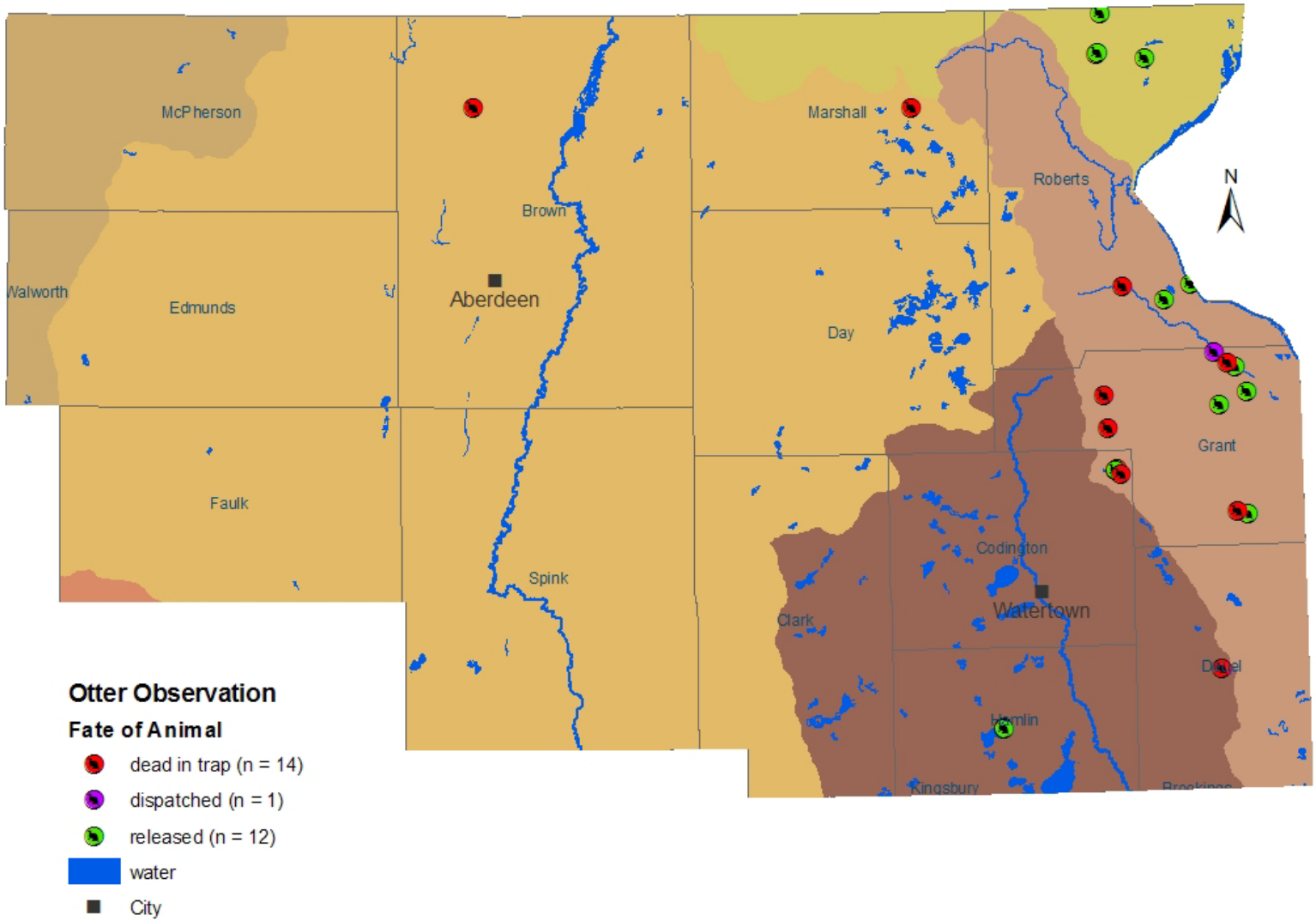

Figure 12. Fates of 27 reported incidentally trapped river otters in South Dakota Department of Game, Fish and Parks Region 4 from 1979 through 2011. Watersheds are hydrological unit level two subregions as defined by the U.S. Geological Survey National Watershed Boundary Dataset.

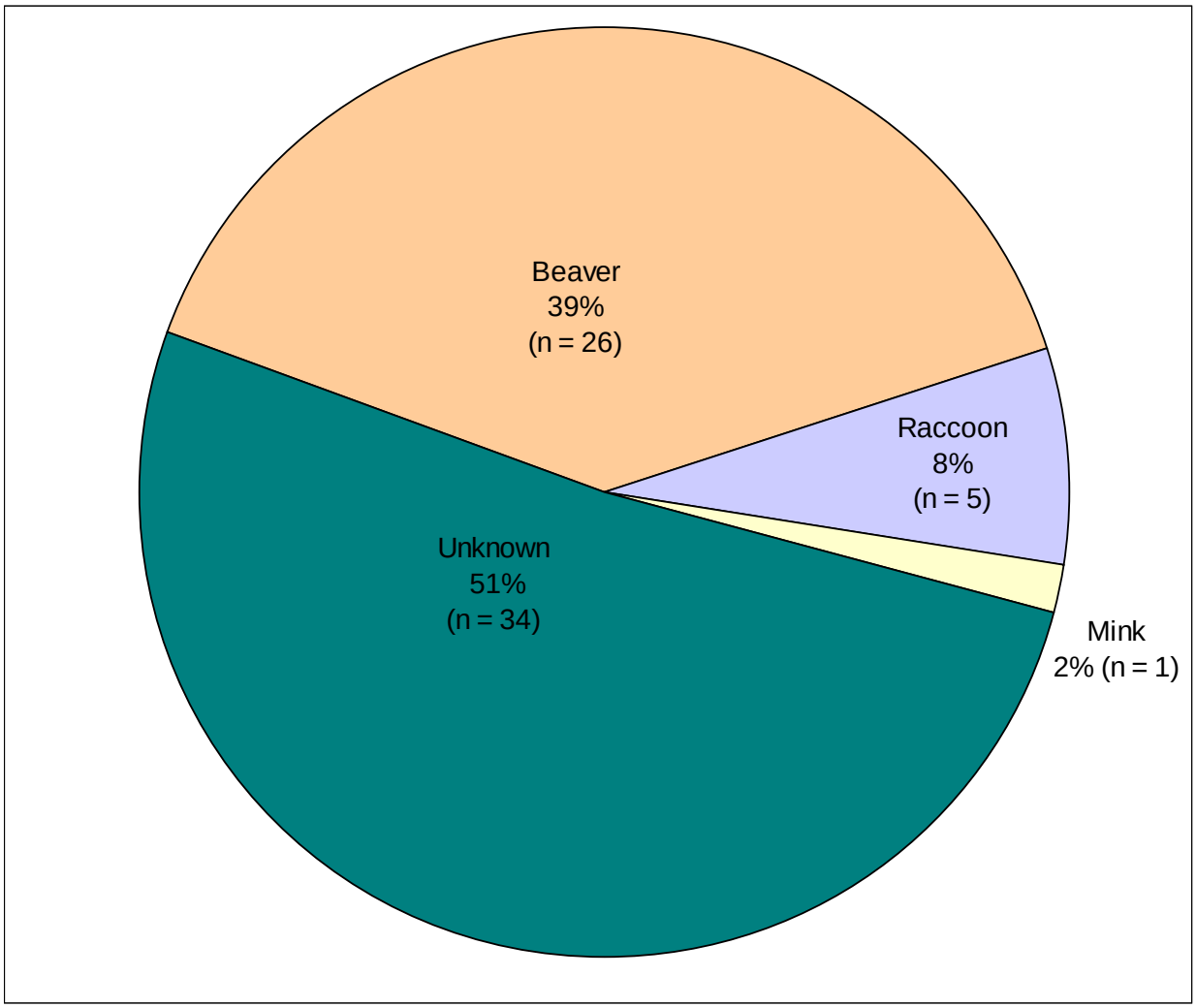

Figure 13. Species targeted when 66 river otters were incidentally trapped in South Dakota from 1979 through 2011.

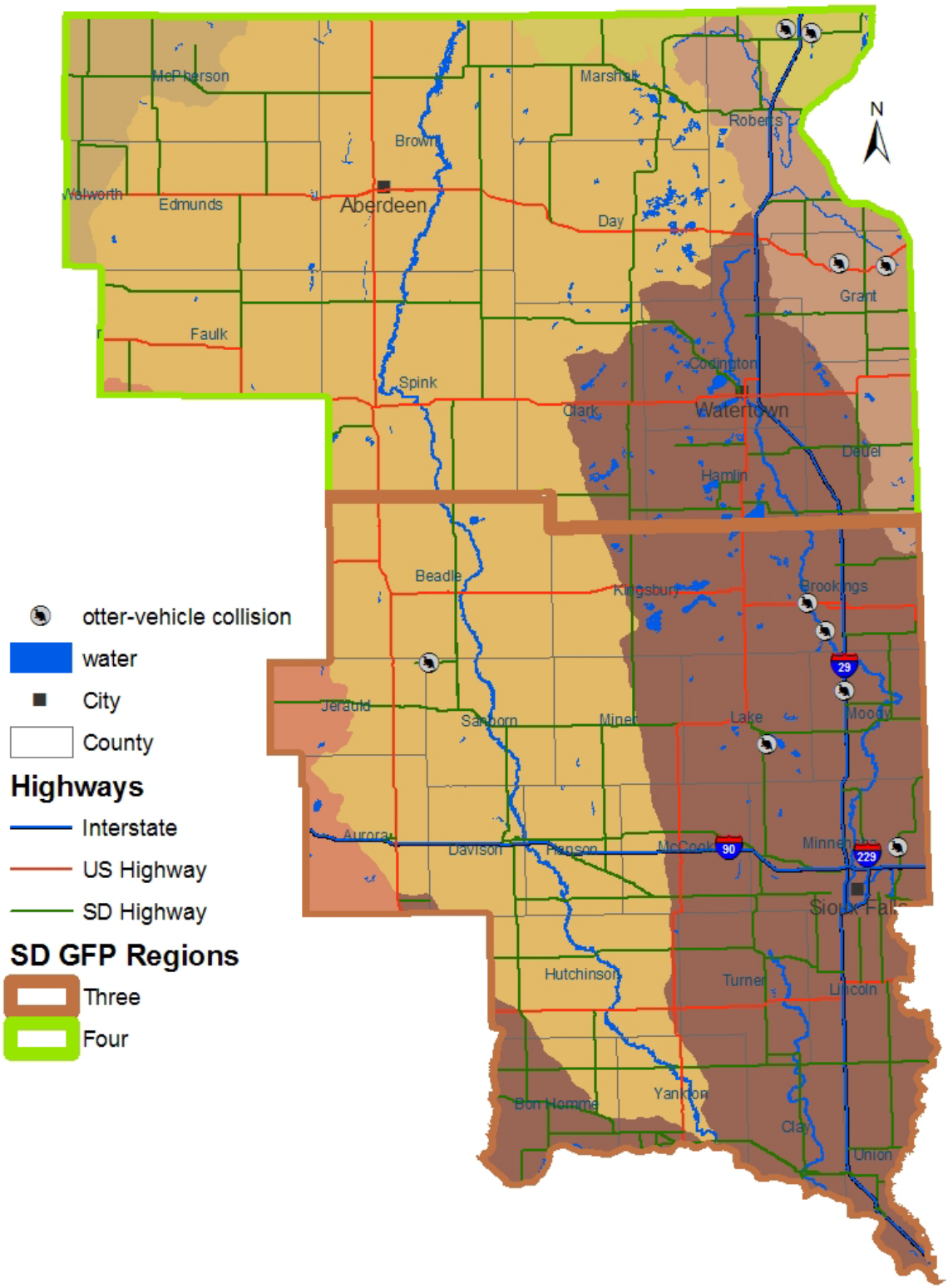

Figure 14. Location of 11 reported river otters killed by collision with a vehicle in South Dakota from 1979 through 2011. The collision in Moody County involved 2 otters. Watersheds are hydrological unit level two subregions as defined by the U.S. Geological Survey National Watershed Boundary Dataset.

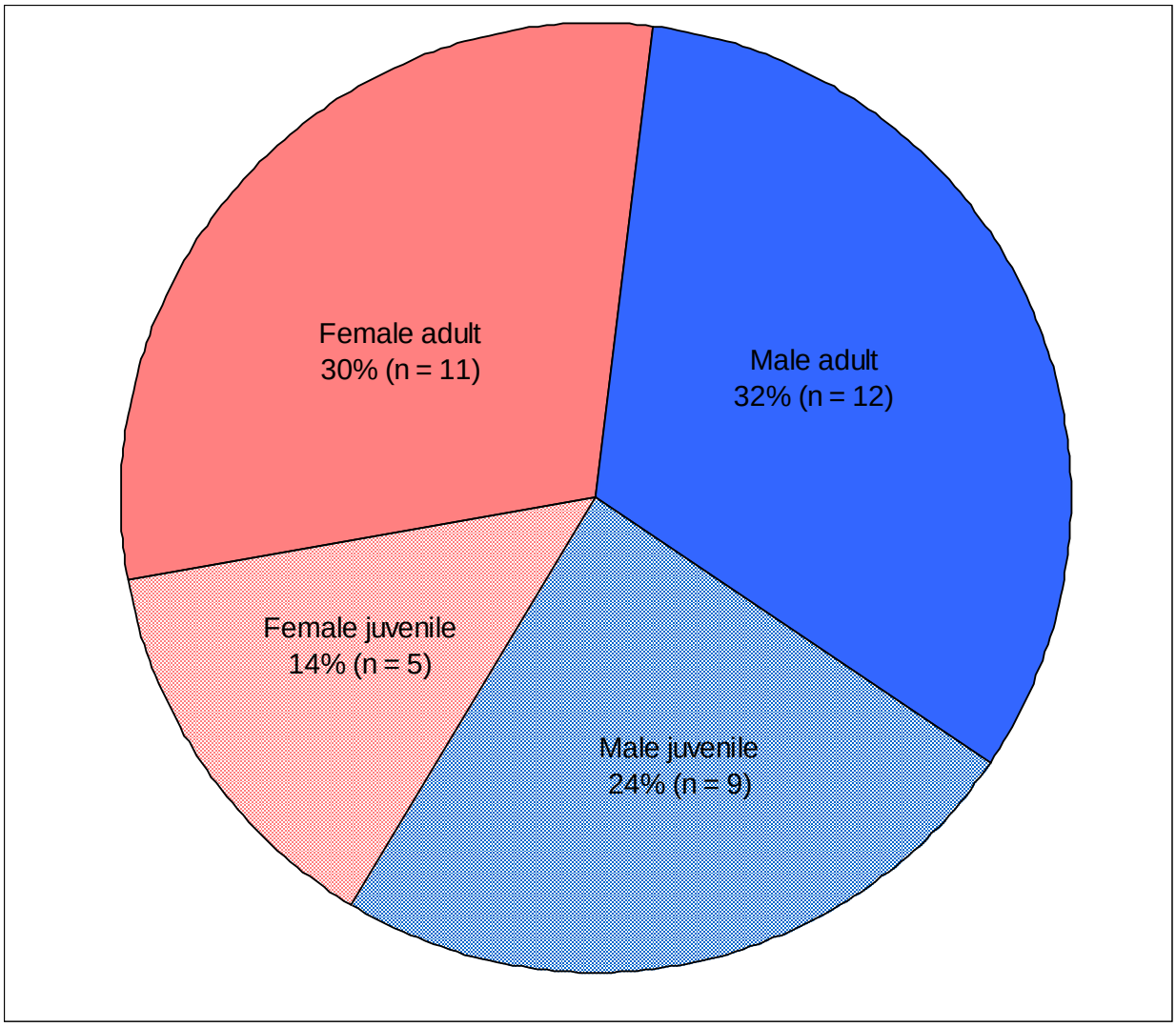

Figure 15. Sex and age of examined river otters in South Dakota from 2004 through July 2011.

Appendix 1. Implementation Schedule 2012-2016

Strategies and Methods	2012		2013		2014		2015		2016	
	Jan-June	July-Dec	Jan-June	July-Dec	Jan-June	July-Dec	Jan-June	July-Dec	Jan-June	July-Dec
Research and surveys										
Identify, locate, and describe den sites	X	X	X	X	X	X				
Determine current occupied range	X	X	X	X						
Site evaluation/suitable habitat		X	X	X	X	X				
Evaluate and select survey method(s)	X	X	X							
Management										
Specimen collection and necropsy	X	X	X	X	X	X	X	X	X	X
Collect reports of sightings	X	X	X	X	X	X	X	X	X	X
Determine delisting goal					X	X				
Determine harvest levels			undeterminable at this time							
Develop depredation protocol	X									
Implement depredation protocol	X	X	X	X	X	X	X	X	X	X
Reintroduction (if deemed necessary)							X	X	X	X
Determine release sites for depredating otter	X	X	X							
Tools										
Maintain and update website	X	X	X	X	X	X	X	X	X	X
Public involvement process	X	X	X	X	X	X	X	X	X	X
Distribute river otter brochure	X	X								
Public attitudes survey	X	X								
Commission and staff involvement	X	X	X	X	X	X	X	X	X	X
Trapping organization involvement	X	X	X	X	X	X	X	X	X	X
Completion of management plan	X	X								

Appendix 2. Draft River Otter Capture Protocol

This protocol was drafted by SD Game, Fish and Parks (SDGFP) staff to provide direction on the appropriate methods and procedures to address river otter depredation complaints or requests for service. This protocol should be reviewed and updated after it has been used in the field in a variety of situations. Specific problems should be documented to assist in refining the protocol. River otters are extremely strong and should be handled with great caution during capture, release, or other situations. Anyone handling captured river otters should take the necessary precautions and wear the appropriate Personal Protection Equipment (PPE). Ideally, responders should have prior experience in handling river otters.

Response to Complaints

Complaints involving a river otter should be forwarded directly onto the Regional Wildlife Manager or the respective Wildlife Damage Specialist. Staff knowledge and discretion will dictate how specific complaints are addressed. In general, SDGFP staff will respond to potential river otter complaints by investigating further, either by phone, follow-up or site visit. However, most complaints regarding river otters on public lands and public waters will not result in the removal of the river otter. There will be circumstances where removing and relocating a river otter is the most likely response by SDGFP. For example, 1) otter depredation on a public fishing pond, 2) a public pond that is being used as a fish rearing facility for SDGFP, 3) a private aquaculture facility, or 4) a state or federal fish hatchery. Regional wildlife staff will have primary discretion on how specific situations are handled within this overall framework and which specific capture methods are used.

Capture Methods

River otters may be live-captured utilizing many different techniques. One suggested method to live-capture river otter is the use of the Hancock trap or a modified Hancock trap. These traps have been used successfully to capture river otters in South Dakota.

Snares can also be successfully used to live-capture river otters in areas that are not conducive to Hancock traps. However, extreme caution should be used and snares should only be relied upon in areas that are free of trees or sticks as these features could cause the river otter to be killed by the snare.

Foot-hold traps may also be used to capture river otters in areas that Hancock traps are not usable. Foot-hold trap chains should have multiple swivels as well as offset jaws (i.e. space between the jaws) to minimize foot or leg damage.

All trapping equipment used to capture river otters should be checked daily, preferably in the early morning, to avoid potential injury to the animal. If there are cases where excessive physical injury has occurred, SDGFP staff will need to euthanize the river otter and submit the carcass for necropsy.

Processing, Transport, and Release

River otters that are live captured, in good condition, and are able to be released or relocated should be removed from the trap as soon as possible. Department personnel shall record the location of capture. If possible, SDGFP staff should also determine the sex and approximate age (juvenile or adult). This information shall be recorded on the appropriate data sheet. Once this information has been collected, the river otter should be placed into a transport tube or left in the Hancock trap. Both of these devices should be placed in a well ventilated area and stored at a moderate temperature. Excessive heat will need to be avoided and may require misting the river otter with cool water or the use of an additional vehicle with air conditioning. Transporting otters to established relocation sites should take place as soon as possible. Initial relocation sites should be identified by each respective Regional Wildlife Manager. Relocation sites should be selected to minimize impacts to state, federal, and private aquaculture facilities.