Recovery of the River Otter to Kentucky

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Abstract: Recovery efforts of river otters (*Lontra canadensis*) in Southeastern states that have implemented restoration programs are poorly documented in the published literature. The Kentucky Department of Fish and Wildlife Resources released 355 river otters among 14 sites during 1991–1994, and a statewide harvest was implemented in 2006. We used damage reports, sign surveys, and harvest data to evaluate the recovery and current status of the river otter in Kentucky. When all census data were combined, river otters were observed in each of the 12 major watersheds in the state. Our data indicate higher otter abundance in the Jackson Purchase and central reintroduction region of Kentucky, and lower abundance in the eastern plateau and mountain regions. Overall, these data indicate a successful reintroduction of river otters to the state. The small remnant population in the west appears to have expanded and be linked to the increasing numbers of otters in the reintroduction zone. The number of river otters harvested stabilized after a peak in 2006–07, indicating that the existing statewide harvest protocol (bag limit = 6) may be sufficient to maintain a stable population of otters in Kentucky. Further research, including reproductive and demographic analyses as well as the potential impacts on prey populations, is necessary to develop a more comprehensive understanding of the river otter population in Kentucky and its role in ecosystems to which it has been reintroduced.

Key words: distribution, river otters, *Lontra canadensis*, reintroduction, Kentucky

Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 64:112–117

Prior to European settlement, river otters (*Lontra canadensis*) were distributed throughout most major drainages in Canada and the continental United States, from the arctic in Alaska to Texas and Florida (Hall 1981, Mason 1990). The largest populations of river otters in the United States existed in areas with abundant aquatic habitat such as coastal marshes, the Great Lakes region, and glaciated areas of New England (Toweill and Tabor 1982, Melquist and Dronkert 1987). River otters were distributed widely in Kentucky (Barbour and Davis 1974, Toweill and Tabor 1982)

and were likely found in every major watershed in the state during the early 1800s (Cramer 1995). Otter populations declined during the early 1900s due to unregulated harvest and anthropogenic destruction of riparian habitat. Funkhouser (1925) recorded that "otters are rapidly being exterminated in all parts of the country and are getting very scarce in Kentucky," and only reported them in the Jackson Purchase Region, the extreme western portion of the state. This decline continued through the 1950s, and reports of otters from trappers and biologists in the state remained limited to the Jackson Purchase (Barbour and Davis 1974, Cramer 1995).

The Tennessee Valley Authority (TVA) and the Kentucky Department of Fish and Wildlife Resources (KDFWR) conducted an experimental restocking of otters in the Land Between-the-Lakes (LBL) area of western Kentucky in 1982 and 1983. Eight of the eleven otters released survived and were monitored for 9 months using radiotelemetry. The study revealed that otters were capable of repopulating and expanding their range in the Jackson Purchase (Cramer 1995). Reports of otter sightings, incidental trappings, and road kills indicated that a naturally occurring population existed prior to the LBL restocking effort (Cramer 1995).

In an effort to restore self-sustaining populations of river otters throughout suitable habitat elsewhere in Kentucky, the KDFWR released 355 otters among 14 sites in the central and eastern part of the state during 1991–1994 (Cramer 1995). In the 16 years since the restoration was completed, incidences of river otter sightings and reports of damage to personal property and state fish hatcheries have increased, including the areas where otters were reintroduced. Likewise, the remnant population in the western portion of the state appears to have become established without augmentation. In 2004, an experimental harvest season was opened and limited to the Jackson Purchase region of Kentucky with a bag limit of 5 otters per season. The increased frequency and quantity of reports of river otter occurrence and activity throughout the state continued and, in 2006, KDFWR implemented a statewide harvest season (bag limit of 6) to provide hunting and trapping opportunities to sportsmen and women of Kentucky. Increased frequency of sightings, incidental trappings, roadkills, and complaints of damage by otters throughout Kentucky during the past several years are indicative of increasing populations; however, a comprehensive effort to assess the population of river otters in Kentucky, before and after the reintroduction, is lacking. Our objective was to evaluate

the current status of the river otter throughout Kentucky, in order to facilitate appropriate management strategies for this species.

Study Area

Kentucky spans 105,148 square kilometers of land situated between the Cumberland Mountains to the east and the Mississippi River to the north and west. Based on geology and land surface, Kentucky is comprised of three primary regions: the Appalachian Plateau, the Interior Low Plateau, and the Coastal Plain (Fenneman 1938). These three regions are further subdivided into seven physiographic provinces (McGrain 1983, Palmer-Ball 1996), each of which is dissected by one or more primary watersheds. Elevations range from 1265 m above sea level on the top of Black Mountain in Harlan County, to a low of 84 m asl along the Mississippi River in Fulton County (Mengel 1965). The geology of Kentucky was largely affected in pre-historic times by changing sea levels; thus, most of the surface is comprised of layers of sedimentary rock, with hard limestone exposed at the surface in some sections of the Bluegrass Region in central portions of the state (McGrain 1983).

Braun (1950) described the vegetation of Kentucky as largely comprised of the mixed mesophytic forest in the Cumberland Plateau and Cumberland Mountain regions of the east and as western mesophytic forest in all regions west of the Cumberland Plateau. The vegetation and habitats across Kentucky have been highly altered from their original condition due to human settlement, and existing conditions are likely to affect reintroduced otters differently than those that were present pre-settlement. Native prairies and barrens, once typical of the Highland Rim in south-central Kentucky, and the open-canopy forest, once prevalent throughout the Inner Bluegrass in central Kentucky, are largely absent (Palmer-Ball 1996). Bottomland hardwood forest remains in the Jackson Purchase in far western Kentucky, but has been highly fragmented by row-crop agriculture (Palmer-Ball 1996). The eastern regions of the state remain largely forested, although loss of American chestnut (*Castanea dentata*) has impacted the composition of forest canopies, and surface mining has produced open habitats and alterations in land form that have negatively affected shape and form of drainage basins and water quality in some areas.

The USGS delineates watersheds using a nationwide system based on surface hydrologic features (Seaber et al. 1994). Based on these criteria, we stratified the state of Kentucky into 12 major watersheds using ArcMap (v 9.2, ESRI, Redlands, California) and digital hydrologic unit code maps provided by the USGS (Figure 1). The watersheds, with their total area relative to the size of the state are as follows: Big Sandy (6%), Green (22%), Kentucky (17%), Licking (9%), Lower Cumberland (5%), Mississippi (3%), Ohio (3%), Salt (10%), Tennessee (3%), Tradewater (6%), Tygarts (3%), and Upper Cumberland (13%). The Jackson Purchase region includes the Mississippi, Tennessee, and parts of the Tradewater and Lower Cumberland watersheds.

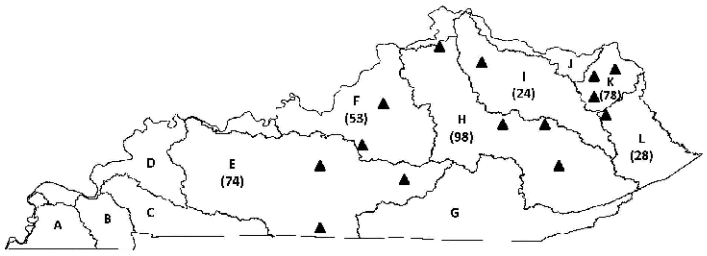

Figure 1. Watersheds and river otter release sites in Kentucky, 1991–1994. Triangles indicate release sites, with watersheds indicated as: A – Mississippi River; B – Tennessee River; C – Lower Cumberland; D – Tradewater River; E – Green River; F – Salt River; G – Upper Cumberland; H – Kentucky River; I – Licking River; J – Ohio River; K – Tygarts River; and L – Big Sandy River. Parentheses indicate number of otters released during reintroduction.

Methods

Researchers do not rely on any single method to census river otter populations (Melquist and Hornocker 1979), and most researchers (Zachheim 1982, Melquist and Dronkert 1987, Woolf et al. 1997) recommend using a combination of indices to monitor population status of otters (e.g. carcass collection, damage/sighting reports, sign surveys, population models, trapper surveys, etc.). We used damage reports, sign surveys, and harvest data to evaluate the status of the river otter in Kentucky. Data on damage caused by river otters were gathered from annual reports submitted to the KDFWR by permitted Wildlife Control Operators and from KDFWR biologists and conservation officers from 2004–2009. Data were tabulated as the total number of complaints/year.

Sign surveys used to monitor relative abundance of river otters include aerial-snow surveys, scent station surveys, and bridge-sign surveys (Clark et al. 1987, Reid et al. 1987). Aerial-snow surveys (Squires 2002, Kohn and Roth 2003, Martin et al. 2004) were not feasible given that Kentucky often lacks sufficient snow cover in winter months. Scent-station surveys, though widely used to monitor furbearer populations, are less efficient than bridge-sign surveys which can be conducted in a shorter amount of time and are more likely to detect otter presence (Robson and Humphrey 1985). Thus, we used bridge-crossing surveys to search for otter sign (Melquist and Hornocker 1983, Clark et al. 1987, Serfass et al. 1993, Shackelford and Whitaker 1997, Bluett et al. 1999, Gallant et al. 2008).

We used a stratified random sampling scheme for river otter sign surveys. We stratified the state by the 12 watersheds, with sampling intensity within each watershed proportional to the relative percentage of the state that each watershed comprised. We randomly chose bridge-crossings over streams as survey sites in

each watershed. A survey site was omitted if it was over a divided highway or within 8 km of another site that was selected for survey. We conducted surveys from May to October of 2006–2008.

Bridge-crossing protocol included walking 200-m transects of shoreline to search for sign of river otters (Melquist and Hornocker 1983, Clark et al. 1987, Serfass et al. 1993, Shackelford and Whitaker 1997, Hamilton 1998). Each side of a bridge contained two 200-m transects, one on each bank; thus, a maximum of four transects existed for each bridge survey. We randomly (coin flip) chose one of the upstream or downstream sections of stream for survey. If otter sign was detected, no additional transect was sampled at that bridge crossing. If otter sign was not detected on the first two transects (e.g., upstream), we automatically sampled the remaining two transects (e.g., downstream). We recorded the type of otter sign (e.g., sightings, scat, tracks, slides, den sites, latrines), as well as standard location and seasonal data (e.g., geographic coordinates, date, ambient conditions). We completed surveys within three days of a rainfall event in order to standardize the effect of weather on the detectability of otter sign. The number of scat and rolling places in an area is not always a good indication of how many otters are present, as a single otter may defecate and haul out many times in one area in few hours (Melquist and Hornocker 1979). Therefore, we used only presence/absence data in the analysis. A total of 65 surveys were completed. A subsample of sites ($n = 13$; 27%) where otter sign was not detected during the 2006 field seasons was selected and resurveyed during the 2007 field season to ensure that these could be reliably categorized as absent of otters.

Harvest data were gathered from a mandatory state telecheck system, in which trappers are required to call the KDFWR to report river otters hunted or trapped during the harvest season. The harvest data included the November–February 2004–05 and 2005–06 experimental hunting and trapping seasons held in the Jackson Purchase region of Kentucky, and the statewide hunting and trapping seasons for subsequent years from 2006–07 to 2009–10.

Results

A total of 149 damage complaints were reported to the KDFWR from 2004–2010. The majority of complaints reported were depredation of fish in farm ponds and damage to boats and docks. The number of damage complaints ranged from a high of 41 reports in 2005–06 to only 5 complaints reported in 2009–10 (Figure 2).

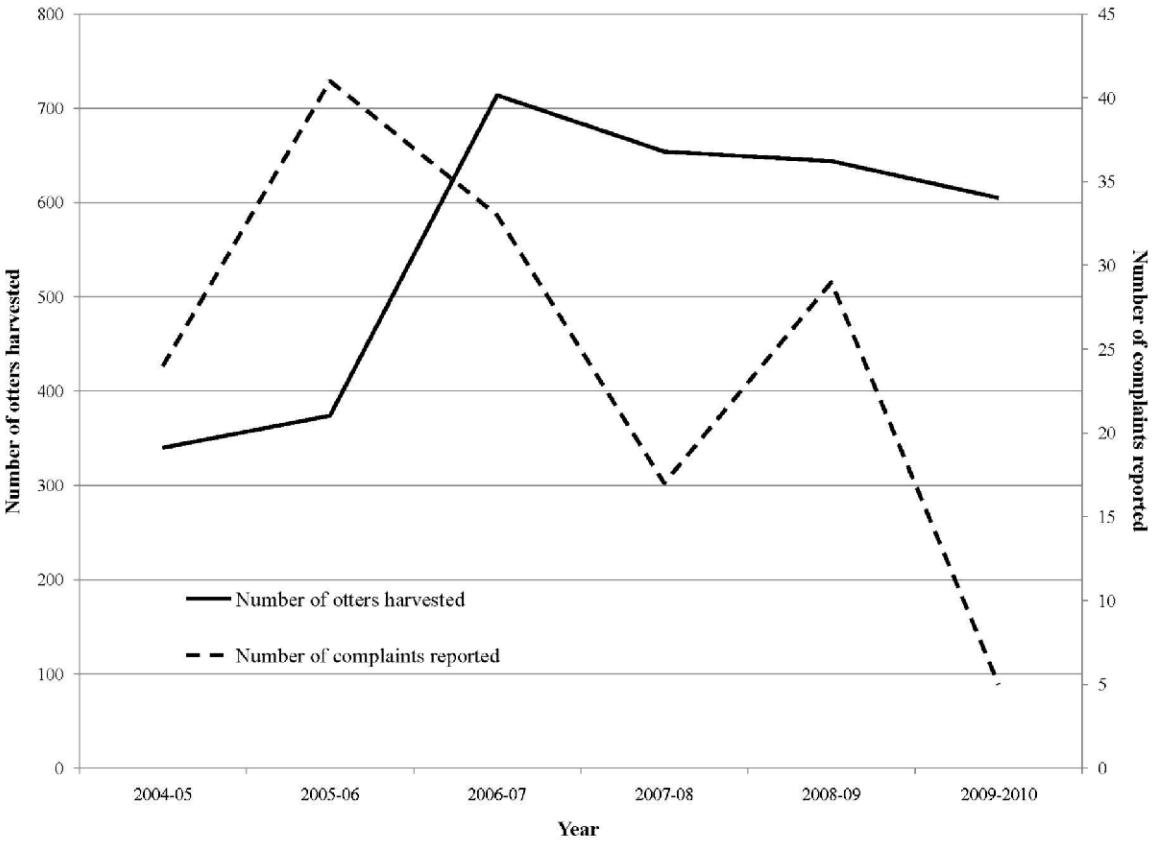

Figure 2. Total harvest of river otters during 2004–05 – 2009–10 hunting and trapping seasons compared with damage complaints reported to the KDFWR during the same time period.

Table 1. Sign survey effort and presence of river otter sign in Kentucky watersheds during 2006–2008 field surveys.

Basin	% of survey effort	Sign surveys *n* = 65	% positive sign *n* = 16
Mississippi	6	4	50
Tradewater	3	2	50
Licking	14	9	33
Lower Cumberland	5	3	67
Green	17	11	9
Tennessee	6	4	50
Kentucky	20	13	15
Salt	12	8	25
Upper Cumberland	9	6	17
Big Sandy	2	1	0
Tygarts	3	2	0
Ohio	3	2	0

Table 2. Relative area of 12 Kentucky watersheds and total harvest of river otters during 2004–05 – 2009–10 hunting and trapping seasons.

Basin	% of state	Total harvest *n* = 3331	% of total harvest
Mississippi	3	524	16
Tradewater	6	467	14
Licking	9	464	14
Lower Cumberland	5	433	13
Green	22	379	11
Tennessee	3	300	9
Kentucky	17	275	8
Salt	10	264	8
Upper Cumberland	13	157	5
Big Sandy	6	33	1
Tygarts	3	19	1
Ohio	3	16	0

Damage complaints decreased dramatically after the statewide harvest of otters in the 2006–07 hunting and trapping season.

River otter sign was found in 9 of 12 watersheds (Table 1). Otter sign was not found in the Big Sandy, Ohio, or Tygarts watersheds; all are located in the far eastern portion of the state. Relative to sampling effort, a disproportionately high abundance of otter sign was found in the Licking, Lower Cumberland, Mississippi, Tennessee, and Tradewater watersheds.

A total of 3331 river otters were harvested in Kentucky from the 2004–05–2009–10 hunting and trapping seasons (Figure 2). Of these, 2038 (61%) were males and 1293 (39%) were females. Harvest pressure was greatest in the Mississippi, Tradewater, Lower Cumberland, and Licking watersheds (Table 2). Moderate levels of harvest occurred in the Tennessee, Kentucky, Salt, and Upper Cumberland watersheds, whereas few otters were harvested from the Big Sandy, Tygarts, and Ohio watersheds. Relative to total area each watershed comprises in the state, a disproportionately high number of otters were harvested from the Mississippi, Lower Cumberland, and Tradewater watersheds, whereas relatively low harvests occurred in Green, Kentucky, and Upper Cumberland watersheds (Table 2).

Discussion

There are few formal studies, accompanied by published reports, which evaluate the status of reintroduced river otter populations (Hubbard and Serfass 2004). We summarized survey data through analysis of damage reports, sign surveys, and harvest data for otters in Kentucky from 2004–2010. When all survey data were combined, river otters occurred in all 12 major watersheds in the state. Data indicated that the reintroduction of river otters to Kentucky was successful. Otters are abundant in the Jackson Purchase in west Kentucky and in the central reintroduction region of the state. An explanation for the lower occupancy of river otters in the eastern region, including the Cumberland Plateau and the Cumberland Mountains, is not immediately clear. We offer three suggestions for this difference. (1) Habitats in the eastern region are furthest from the Jackson Purchase (i.e., remnant source population) and reintroduction zone, and dispersing otters should be expected to take a longer period of time to reach and inhabit available habitats in the east; thus, numbers of otters are likely to increase in future years in the east. (2) The Cumberland Plateau and Cumberland Mountains are largely forested landscapes with pronounced changes in topography, often exceeding 300 m. These landscapes possess fewer farm ponds and streams that are shallower in depth and lacking in deeper pools of water, thereby supporting less total acreage in available surface water. These differences result in habitat conditions supporting a lower potential carrying capacity of river otters than the fragmented and agricultural landscapes to the west; thus, numbers of otters are likely to remain at lower levels. (3) Watersheds in the eastern region are impacted in many stream reaches by resource extraction, particularly logging and/or surface mining. Resource extraction practices result in short and long-term changes in water quality and in landform following reclamation. These changes lead to degradation and loss of original habitats, ultimately limiting the establishment of river otters throughout the eastern region; thus, numbers of otters may be expected to remain at lower levels.

The small remnant population in the west has expanded and appears to have formed a contiguous population with the increasing numbers of river otters in the reintroduction zone. Populations of river otters in Kentucky are also likely to be affected by immigration of otters from surrounding states. Missouri (Beringer 2008), Illinois (Bluett et al. 1999), Indiana (Johnson et al. 2007) Ohio, and

Tennessee have implemented otter reintroduction programs, and dispersal of otters is likely augmenting the expanding population in Kentucky.

Data indicated that the annual number of river otters harvested stabilized or even slightly decreased over the past three seasons. This pattern suggests that the current statewide harvest program in Kentucky is moving toward a sustainable carrying capacity of river otters; however, several more harvest seasons are necessary to confirm this trend. Other explanations for the apparent stabilization include river otters being dispersed more uniformly across the state, or decreased harvest pressure due to lower pelt prices and trapping interest. The decrease in damage complaints after the harvest of otters in the 2006–07 season could be attributed to a decrease in trapping effort; a reaction to lower pelt prices on the fur market (NAFA 2010). Pelt value for river otters averaged approximately US$100 (NAFA 2010) during the season preceding the statewide expansion of harvesting in Kentucky. The stabilization and subsequent decline in harvest could be correlated with the decrease in market value of otter pelts since 2005–06. Harvest data gathered from several northeast states suggested that river otter harvests cannot be reliably predicted from otter management regulations or socioeconomic influence in the northeast (Chelelli et al 1996). It remains unclear whether these factors can be attributed to the decrease in otter harvest in Kentucky.

Damage and sighting reports can vary with the type and effort to collect them as well as changes in public sentiment (Bluett et al. 1999). It remains plausible that damage complaints decreased as river otters became more abundant and less of a novelty, or as the public became educated about options to control damage, such as Wildlife Control Operators or local fur trappers. The male-skewed sex ratio for winter-harvested otters is common (Chilelli et al. 1996) and likely due to increased trapping vulnerability of males. Male river otters travel more frequently in larger home ranges and exhibit increased movement during the breeding and whelping seasons (Hamilton and Eadie 1964, Lauhachinda 1978).

We recommend further research to develop a more comprehensive understanding of the ecology of the restored river otter population in Kentucky. Proper assessment of the status of this furbearer population will require data on age-specific fecundity rates, litter sizes, and survival rates (Dixon 1981). Knowledge of specific reproductive parameters is needed to derive reliable population estimates of river otters by region and watershed. Investigation into the relationship between river otters and prey populations, particularly sportfish, is also a consideration in setting goals for harvest levels. Of particular concern is the impact on Centrarchids, as this family includes many popular sportfish such as black bass (*Micropterus* spp.), rock bass (*Ambloplites rupestris*), sunfishes (*Lepomis* spp.), and crappies (*Pomoxis* spp.). The KDFWR has received reports from fisherman in northern Kentucky alleging decreased populations of bass where otter densities were high; however, no study has been conducted to verify whether this decrease is related to river otters or a combination of factors (J. Ross, KDFWR, personal communication). Missouri has reported a decreasing black bass population in Ozark streams due, in part, to river otter depredation (Beringer 2008). We suggest a comparable impact of river otters on sportfish numbers in Kentucky is plausible in some cases.

Acknowledgments

Funding for this project was provided by the Kentucky Department of Fish and Wildlife Resources and the College of Agriculture, University of Kentucky. Thanks to J. Branscum, E. Carlisle, A. Hood, and W. Ulrey for field assistance and to C. Soard, KDFWR, for assistance with damage report summaries. All methods used in this study were approved by the University of Kentucky Institutional Animal Care and Use Committee (IACUC No. 00992A2006). This paper is a product of the Kentucky Agricultural Experiment Station (KAES No. 10-09-064) and is published with the approval of the director.

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