

Population Survey for River Otters in the Rocky Mountain National Park

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By

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Abstract

Recently, reintroduction of river otters (*Lontra canadensis*) to the Grand Canyon was suggested. This, however, could result in the genetic swamping of endangered *L. c. sonora* in adjacent watersheds. A quantitative spatial model evaluating the potential of natural recolonization of the Grand Canyon by otters assumes dispersal of animals from a viable source population in the upper reaches of the Colorado River. We initiated population surveys of river otters in the Rocky Mountain National Park (RMNP) to identify latrine sites, monitor scat deposition as an index of population size, and evaluate seasonal changes in latrine use to determine preferred sampling periods. Our data indicated that use of latrines and latrine site selection by river otters in RMNP changed both seasonally and annually. A sharp decline in number of latrines per km of stream between spring and fall surveys occurred in all years, suggesting that otter behavior changes seasonally (2001: spring - 2.43 sites/km of river, fall - 1.41 sites/km; 2002: spring - 2.3 sites/km of river, fall - 0.6 sites/km; 2003: spring - 2.86 sites/km of river, fall - 0.22 sites/km; 2004: spring - 0.65 sites/km of river, fall - 0.12 sites/km). In 2004, latrine densities were significantly lower than in previous years in both spring and fall. The number of feces per site, a measure of otter activity, declined through time and between spring and fall in 2001 to 2003 (2001: spring - 10.4 feces per site, fall - 4.75; 2002: spring - 6.1 feces per site, fall - 1.9; 2003: spring - 4.4 feces per site, fall - 0.8), but was not different in spring and fall 2004 (spring - 4.08, fall - 4.33). Latrine density was unrelated to stream flow in the preceding month but exponentially declined with the cumulative stream flow in the preceding 3 months. It is possible that stream flow in the preceding 3 months influences the abundance, distribution, and availability of fish in the

stream, thereby affecting otter use of the river. Future surveys should also include an evaluation of fish abundance and distribution in the Colorado River.

INTRODUCTION

River otters (*Lontra canadensis*) are piscivorous predators, which forage near the apex of the trophic pyramid and readily accumulate high levels of pollutants (Clark et al. 1981, Halbrook et al. 1996, Duffy et al. 1994, 1996, Ben-David et al. 2001a, 2001b). Indeed, river otters in North America were reduced throughout much of their historic range by the early 1900s because of pollution, urbanization, and over harvest (Serfass et al. 1993, Larivière and Walton 1998). Consequently, numerous projects were initiated to reintroduce river otters to areas from which they were extirpated (Erickson and McCullough 1987, Polechla 1990, Ralls 1990, Serfass et al. 1993, Hartup et al. 1999).

Recently, a proposal to reintroduce river otters to the Grand Canyon was put forward. Although this proposal has large appeal, reintroducing river otters to the Grand Canyon has several limitations. The population status and current distribution of the subspecies that historically inhabited the Grand Canyon, *L. c. sonora*, is unknown. The source populations for reintroduction will likely be of different subspecies. Thus, a successful reintroduction in the Grand Canyon may lead to genetic swamping (Shields 1987, Avise 1994, Storz 1999) of the few remaining *L. c. sonora* in adjacent watersheds. In addition, such reintroduction effort will likely be costly and require numerous permits, health evaluations, veterinary care, and complicated logistics. Therefore, before such a project is initiated the feasibility of natural recolonization of river otters needs to be assessed.

Recently, N. Nibbelink, M. Ben-David (University of Wyoming), and G. M. Blundell (University of Alaska), developed a quantitative spatial model to evaluate the potential of natural recolonization of the Grand Canyon by river otters that may disperse from the upper Colorado River. The model is based on rates of dispersal, dispersal distances, and gender differences in dispersal patterns derived from DNA data collected from river otters inhabiting coastal environments in Prince William Sound, Alaska (Blundell et al. 2002). The model, using GIS coverages and individual-based rules is designed to provide the probability and time span of natural recolonization of the Grand Canyon. The basic model will be applied to different scenarios based on information provided by Melquist and Hornocker (1983) for otters inhabiting freshwater systems as well as permutations based on barriers to dispersal such as habitat quality and human disturbance.

The quantitative spatial model is based on the assumption that the source population of river otters inhabits the upper reaches of the Colorado River. Dr. J. K. Berg conducted surveys of river otters in the upper Colorado River between 1992-1997 (Berg 1999) and determined that the region was at carrying capacity and that successful reproduction was occurring. Because the spatial model assumes continuous reproduction and dispersal from the source population, it is important to establish that the trends in population levels of river otters in the Rocky Mountain National Park (RMNP) observed by Berg (1999) have not changed.

In this project, we initiated population surveys of river otters in the RMNP with the assistance of the Wyoming Student Chapter of the Wildlife Society. The goals of the surveys were to identify river otter latrine sites along the upper reaches of the Colorado

River, monitor scat deposition as an index of population size, and evaluate seasonal changes in latrine use to determine the preferred sampling period.

METHODS

Sampling design

Riverbank was surveyed for latrine sites upstream and downstream of Timber Creek Campground. Surveys were conducted by multiple observers from the Student Chapters of the Wildlife Society at the University of Wyoming and Colorado State University. Teams were led by experts and all participants were trained prior to the survey. Surveys were conducted over four years, in two sampling periods: spring (April 28-29, 2001; May 4-5, 2002; May 4-5, 2003; May 1-2, 2004) and fall (September 22-23, 2001; September 21-22, 2002; September 20-21, 2003, September 26-27, 2004). Total stream length surveyed in spring 2001 was 7.41 km and 8.49 km were surveyed in fall 2001. During the spring and fall surveys of 2002, 20.0 km of river were surveyed. Because of deep snow conditions spring surveys in 2003 covered 10.5 km. In fall 2003, 18.0 km of river were surveyed. In 2004, 20.0 km of stream were surveyed in spring and 25.0 km were surveyed in fall.

Data collection and analyses

Latrine sites of otters were identified by trails entering the water, tracks, and feces. The location of each site was determined using handheld GPS units and recorded. Each site was then characterized with respect to topography, composition of terrestrial vegetation, composition of river substrate, and presence of feces. Locations of otter latrine sites were plotted on a digital map of RMNP with ArcView 3.2 (Redlands, CA; Figure 1). Length

of stream surveyed was calculated by measuring distances between all sample locations using ArcView. Latrine density was calculated as the number of sites per km of stream. Latrine densities were then related to water flow of the Colorado River with non-linear regression (SPSS 11.5 for Windows). Water flow was adapted from measurements at Grand County, Colorado (Hydrologic Unit Code 14010001; Latitude 40°19'33", Longitude 105°51'22" NAD27; Drainage area 138.3 km²; Gage datum 2,667 meters above sea level), and converted to m³/s (http://waterdata.usgs.gov/co/nwis/monthly/?site_no=09010500).

RESULTS

The 2001 field season yielded 18 (2.4 sites/km of river) and 12 (1.4 sites/km) latrine sites for spring and fall respectively. In spring and fall of 2002, 46 (2.3 sites/km of river) and 12 (0.6 sites/km of river) latrine sites were identified, respectively. In spring 2003, we identified 13 latrines (1.24 sites/km of river). In addition, because snow conditions were perfect for tracking we were able to positively identify 17 slides, runs, and tracks. Therefore, the total density of otter sites per km of river was 2.86. Tracks indicated that at least 4 and possibly 6 animals inhabited the survey area at the time of our survey. At least one otter was observed and photographed during that time. In contrast, in fall 2003 we identified only 2 latrines and 2 sites with tracks for a density of 0.11 latrine sites per km and 0.22 total sites per km of river. In 2004, latrine numbers and densities in spring and fall were the lowest recorded for those seasons (spring – 13 sites and 0.65 sites/km; fall – 3 sites and 0.12 sites/km).

The number of feces per site, a measure of otter activity, declined through time and between spring and fall in 2001 to 2003 (ANOVA, $P = 0.014$; Fig. 2), but was not different in spring and fall 2004 (spring - 4.08, fall - 4.33). In spring 2001, 2002, 2003, and 2004 we collected a total of 1, 7, 41, and 10 fresh feces for DNA analysis respectively. In fall 2001, 2002, 2003, and 2004 we collected a total of 2, 2, 0, and 3 fresh feces respectively.

Latrine densities were not related to stream flow in the preceding month (Fig. 3A), but exponentially declined with increasing cumulative stream flow in the preceding 3 months ($R^2 = 0.598$, $P = 0.03$; Fig. 3B):

$$Y = 2.4 \times e^{(-0.421X)} \quad (1)$$

DISCUSSION

Our 2004 data further illustrate that use of latrines by river otters in RMNP changes seasonally and annually. A sharp decline in number of latrines per km of stream between spring and fall surveys occurred in all years, suggesting that otter behavior changes seasonally. Two factors may explain this seasonal change in otter use of latrines. First, it is possible that scent marking at latrines facilitates male-female communication during the breeding season. Our spring surveys were conducted at the end of April early May which correspond to the mating season in the region (Blundell et al. 2002). Such seasonal change in latrine use related to the breeding season has been documented in other studies (Humphrey and Zinn 1982, Kruuk 1992, 1995). Second, changes in stream flow, which likely influence the abundance and distribution of fishes in the Colorado River (Dibble and Harrel 2000, Berland et al. 2004), may have affected latrine use by

river otters. Indeed, we observed the lowest latrine densities in fall of 2003 and 2004 following high water flows in the preceding 3 months. This was especially true for fall 2003, when our surveys followed a flood event that washed many beaver dams earlier in the summer (T. Johnston and M. Daniel, Pers. comm.). Other studies identified prey availability as one of the most important factors regulating otter behavior and habitat use (Melquist and Hornocker 1983, Kruuk et al. 1993, Reid et al. 1994, Ruiz-Olmo et al. 2001).

That otter activity and potentially even seasonal abundance may be affected by the hydrology of the Colorado River is also evident from our previous results of the seasonal site selection models (Herreman and Ben-David 2002). Our analyses demonstrated that variables associated with preferred fish habitat such as stream shading, deep pools, and predominance of cobbles (Binns 1994, Grost et al. 1990, Meyer and Griffith 1997, Young et al. 1999), best separated otter latrine and random sites as well as accounted for seasonal changes in latrine use (Ben-David et al. 2003, Herreman and Ben-David 2002).

The low latrine densities in spring 2004, the declining trend in the fall surveys in all years, and the declining number of feces per site from 2001 to 2003, may raise concerns about the persistence of viable river otter populations in RMNP. Monitoring of otter activity and a concurrent evaluation of fish abundance and distribution in the Colorado River within the boundaries of RMNP should continue in the near future. Such surveys will likely encompass a wider range of stream flow measurements and provide better understanding to the behavior of otters in the region.

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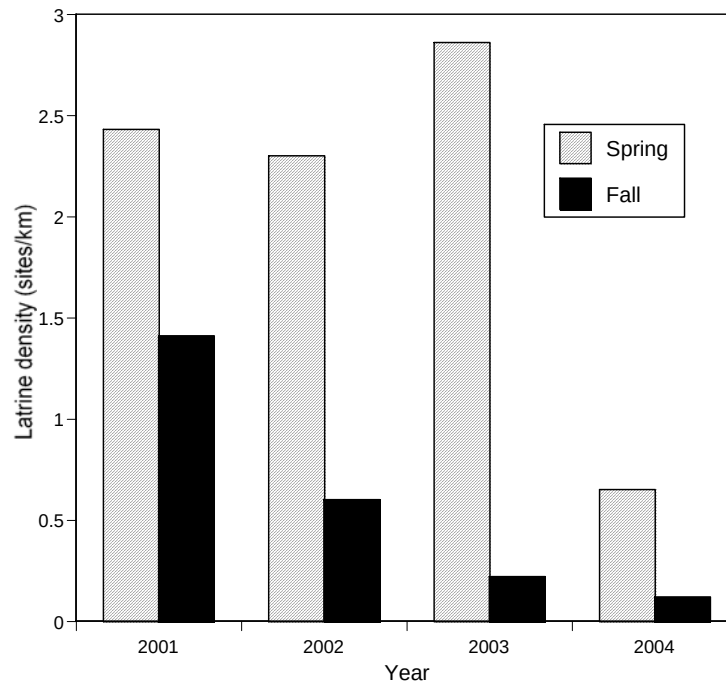


Figure 1. Number of river otter latrine sites per km of stream along the Colorado River within Rocky Mountain National Park (RMNP) in spring and fall 2001 – 2004.

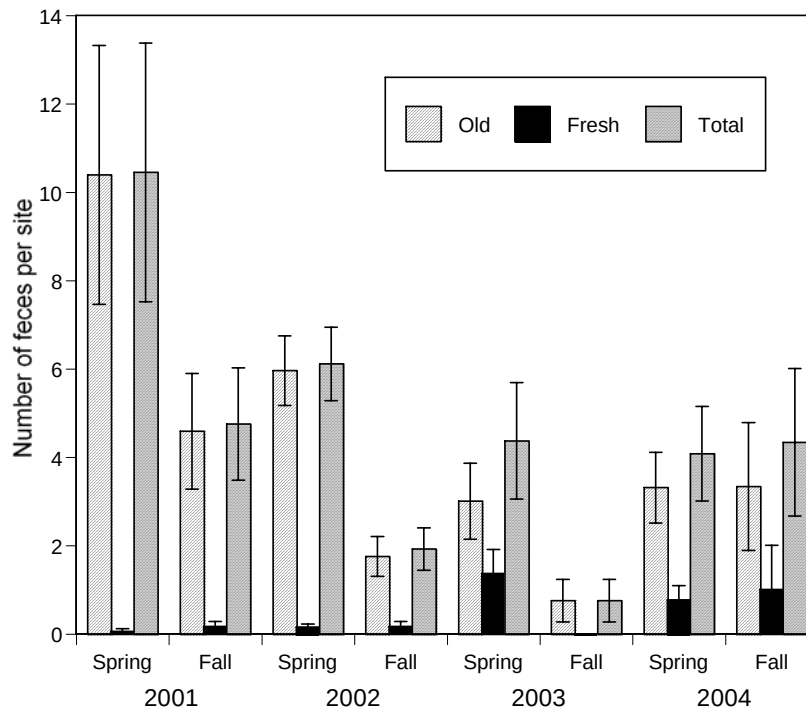


Figure 2. Number of feces per site (mean ± SE) counted at river otter activity sites in RMNP spring and fall 2001 - 2004.

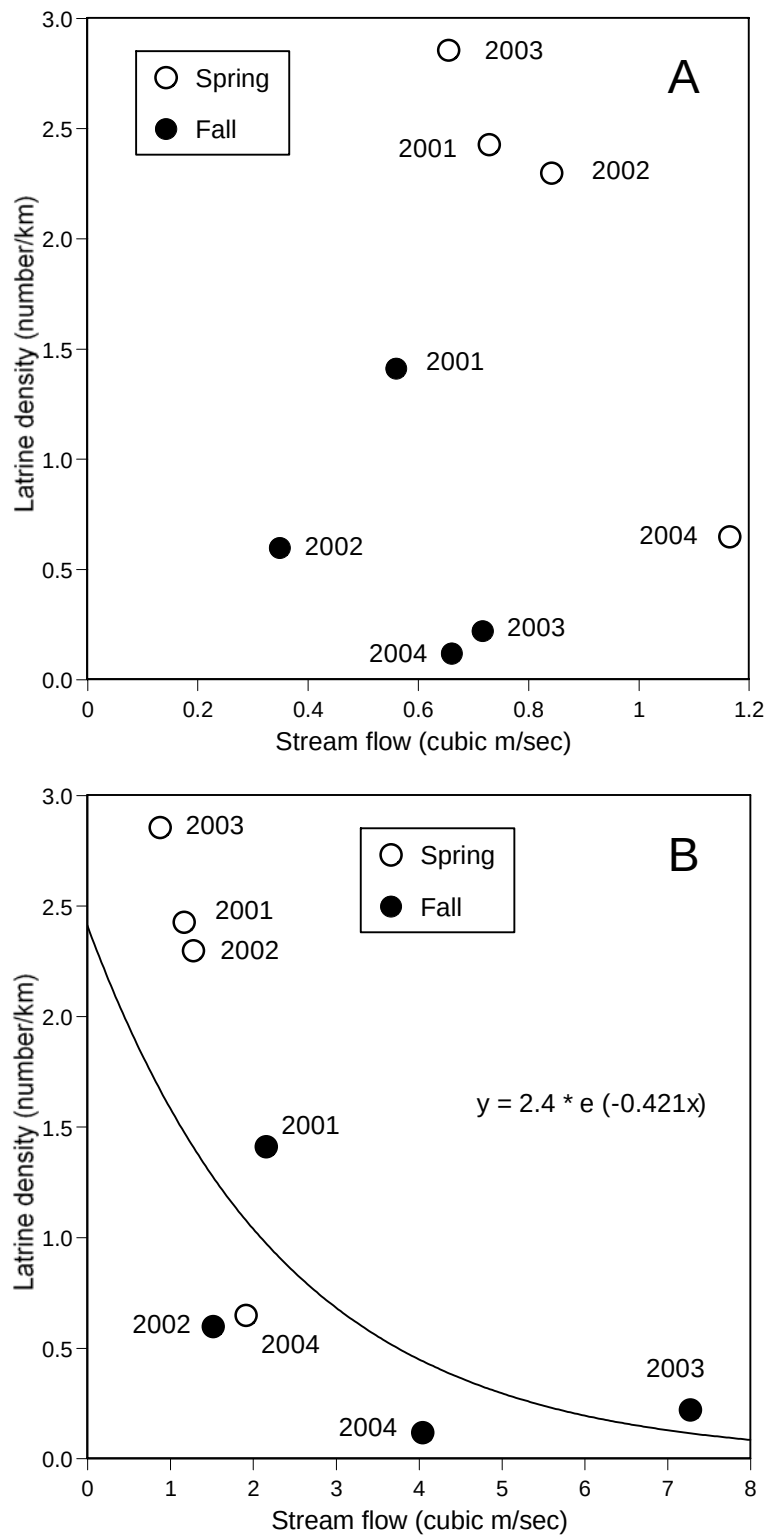


Figure 3. Latrine densities in relation to stream flow of the Colorado River in the month preceding the survey (A) and 3 months preceding the survey (B) in RMNP spring and fall 2001 – 2004.