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ASSESSING THE DISTRIBUTION OF REINTRODUCED POPULATIONS OF RIVER OTTERS IN PENNSYLVANIA (USA) DEVELOPMENT OF A LANDSCAPE- LEVEL APPROACH

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Abstract: Since 1982, 153 river otters have been reintroduced into central and western Pennsylvania. The reintroduction project is now in its final phase, but has largely seen the long-term survival of the reintroduced population. This research used indicators of otter presence (spraints and footprints), which have on the whole been successful in studying the distribution of the otter. A protocol based on an SIG has been developed to enable the changes in otter population to be followed, and this will continue to be used to monitor future population changes. This was achieved through collaboration with wildlife conservation officers (WCOs).

During the 1970s, improvements in furbearer management techniques and water quality coincided with increased concern about river otter (***Lontra canadensis*)** declines in North America (ENDANGERED SPECIES SCIENTIFIC AUTHORITY, 1978). Consequently, many wildlife management agencies conducted surveys to determine the status of river otters. Results of these surveys demonstrated that, in many cases, there was a need to implement conservation measures to restore or enhance river otter populations. Many of the conservation actions implemented were in the form of re-introduction projects (RALLS, 1990). The first river otter re-introduction project was initiated in Colorado during 1976 (TISCHBEIN, 1976). From 1976 to present, 21 states and 1 Canadian province (Alberta) have released >4,100 river otters through re-introduction projects.

Monitoring initial fates of translocated wildlife and subsequent long-term studies to determine if self-sustaining populations become established should be an important aspect of re-introduction projects (SERFASS, 1994; IUCN, 1998). Unfortunately, there have been few formal studies, accompanied by published reports or other external documentation, evaluating short or long-term status of re-introduced river otter populations. ERICKSON and MCCULLOUGH (1987), SERFASS et al. (1993a), and JOHNSON and BERKLEY (1999) reported favorable survival rates and persistence of river otters based on radio-telemetry studies conducted at re-introduction sites in Missouri, Pennsylvania, and Indiana, respectively. Pennsylvania developed survey strategies to enhance procedures to detect presence of river otter latrine sites for monitoring persistence of re-introduced river otter populations (SWIMLEY et al. 1998). However, there have been no other published informations regarding long-term monitoring of river otter populations in North America.

Since 1982, the Pennsylvania River Otter Reintroduction Project (PRORP) has applied an integrated, adaptive management approach to reintroduce 153 river otters successfully to seven water systems in central and western Pennsylvania. The project was comprised of five developmental and implemental stages: 1) site selection, 2) identification and selection of appropriate sources and numbers of animals, 3) veterinary care, captive management, and translocation, 4) public relations and education, and 5) post-translocation monitoring and evaluation, which resulted in a successful, ecologically based, and publicly supported reintroduction project.

PRORP is in the final phase of the reintroduction process and is focusing on the development and evaluation of long-term approaches for monitoring the reintroduced populations, as recommended by IUCN 1998 guidelines. Surveys to detect river otter sign (e.g., scats and tracks) have been demonstrated effective in determining the presence of river otters and will form the basis for the establishment and refinement of monitoring protocols. As part of the process of refining surveys, we

have been considering four specific questions regarding the use of scats for monitoring river otter populations:

- Are river otter latrines (areas along the shoreline where river otters defecate; locating these areas have been the focus of many studies to determine the presence or absence of river otters) associated with certain riparian habitat features?

Outcome: Certain habitat features (e.g. evidence of beaver activity, vertical banks, large rock formations, and backwaters) were more frequently associated with latrine than random sites and were therefore useful in predicting the location of river otter latrines (SWIMLEY et al., 1998; CARPENTER, 2001; MILLS, 2004).

- Does river otter marking intensity vary among seasons?

Outcome: These investigations demonstrated that river otters marked much more frequently during the spring and fall (CARPENTER, 2001; MILLS, 2004). From this information, we now conduct surveys almost exclusively during these seasons of peak marking activity.

- Can DNA be extracted from river otter scats and applied for determining the density of river otters in various wetland habitats?

Outcome: Initial research has resulted in the development of microsatellites markers specific for assessing genetic variability in river otters (BEHELER et al., 2004), was successful in extracting DNA can be extracted from scats collected from captive river otters, and demonstrated that river otters possess enough genetic variability to identify individuals. This approach is now being applied to river otter scats collected from reintroduction sites.

- Can cost effective landscape-level monitoring approaches be implemented to better represent and predict, respectively, the current and future distribution of river otter populations?

Outcome: This portion of the evaluation has been the focus of the senior author's (B. Hubbard) M.S. research in Wildlife and Fisheries Biology. The remainder of this articles focuses on what has been accomplished with the development of landscape monitoring protocols for river otters in Pennsylvania.

Landscape-level population monitoring: Europe had developed and implemented The Standard Method, a grid-based format for surveying otters at a landscape level (see REUTHER et al., 2000 for a detailed review of The Standard Method). This manner and place of its implementation across the continent is detailed in REUTHER et al., 2000. Unfortunately, no standardized methodologies have been developed for monitoring long-term trends in river otter distributions in Pennsylvania or elsewhere in North America. Consequently, we developed a GIS-based approach for application in monitoring the current and future distribution of river otters. Our initial efforts have focused on developing this landscape-level monitoring approach within the Allegheny River drainage, which comprises approximately the western third of Pennsylvania (Figure 1).

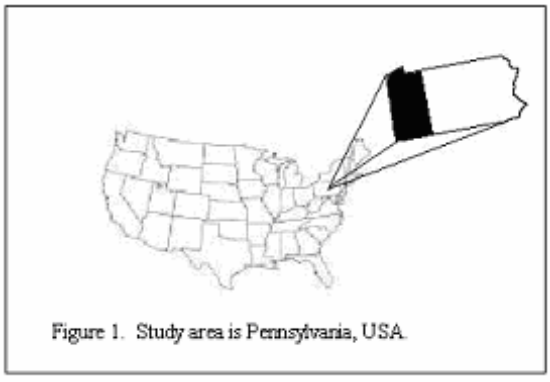

Figure 1. The state of Pennsylvania (expanded area of map) is located in the eastern United States. The study area for our landscape-level assessment of the distribution of river otters occupies the western portion of the state (in black).

Initially**,** interviews were conducted with Wildlife Conservation Officers (WCOs) of the Pennsylvania Game Commission (the agency responsible for the management of all avian and mammalian species in the Commonwealth) to determine the general distribution of river otters in the drainage. WCOs enforce wildlife laws in the state, are assigned to a specific district (usually 1-3 WCO districts for each county

in the state; Figure 2) and generally are well informed about the occurrence of most large or unique mammalian species in their districts. The opinions of WCOs traditionally have been used to monitor the occurrence of river otters at their district and county levels (SERFASS et al., 1999). However, this coarse-level approach considerably overestimates the actual distribution of a habitat specialist, such as the river otter. Consequently, we modified a GIS-based grid system developed in conjunction with the Pennsylvania GAP Project (PAGAP, 2004), resulting in the creation of a statewide electronic grid comprised of 1 km^2 cells. WCOs subsequently were interviewed and asked to evaluate the presence or absence of river otters within each grid cell occurring in their respective districts. This level of evaluation provides a more realistic assessment of the distribution of river otters and provides a standardized approach for assessing expansion or contractions associated with river otter populations over time. The ease in which the grid can be filled in with information provided by WCOs about presence or absence of river otters (assuming the information they provide is reliable) offers potential to reduce the time and costs associated with intensive field studies. Also, each grid cell represents a sample unit and, therefore, facilitates quantification of landscape-level habitat features associated with the presence or absence of river otters.

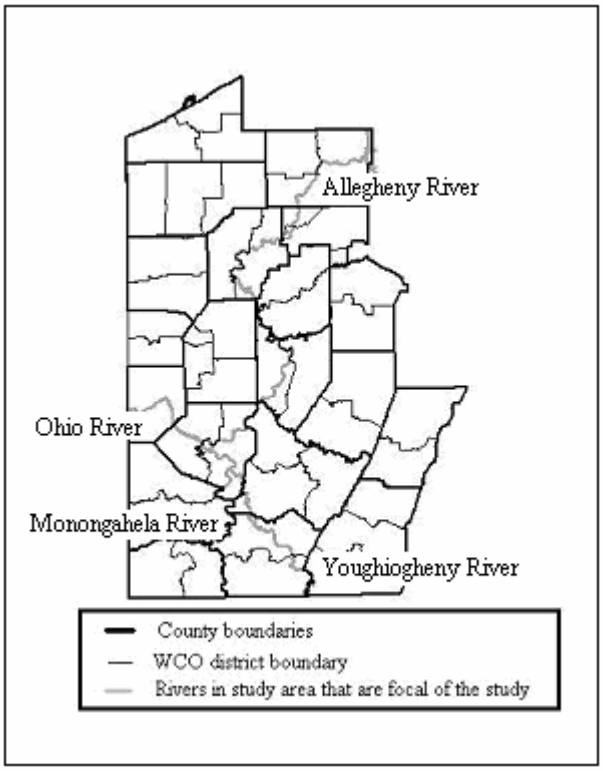

Figure 2. County boundaries (primary geopolitical units), Wildlife Conservation Officer districts, and location of major rivers in western Pennsylvania study area. River otters have been traditionally monitored at the county or WCO district levels in Pennsylvania.

We are in the final stages of assessing the validity of responses by WCOs for the presence or absence of river otters within each grid cell. The validation process involves searching riparian habitats for the presence of river otter sign (primarily scats) during periods of peak scat marking (spring and fall). For selecting grid cells for inclusion in the validation process, we took a stratified random sample of all cells identified by WCOs as positive cells (considered occupied or likely occupied) and negative cells (considered unoccupied) in the southern portion of the study area (which included 10% of the positive cells and about 2% of the negative cells occurring within 10 km of a positive cell). When completed, we will have assessed 130 grid cells for the presence or absence of river otters. The validation process will provide considerable insight about the ability of WCOs to reliably predict the presence or absence of river otters at the scale established by the grid (1 km^2 cells). The results will therefore indicate if a relatively quick and efficient approach for assessing the distribution of river otters (WCO surveys) can supplant or supplement more time and labor intensive approaches (riparian surveys). Regardless of the technique used to assess the distribution of river otters, representing presence or absence data at the scale of our grid-based approach provides a much more realistic appraisal of the distribution of an organism, especially in the case of a habitat specialist such as the river otter (Figure 3,4).

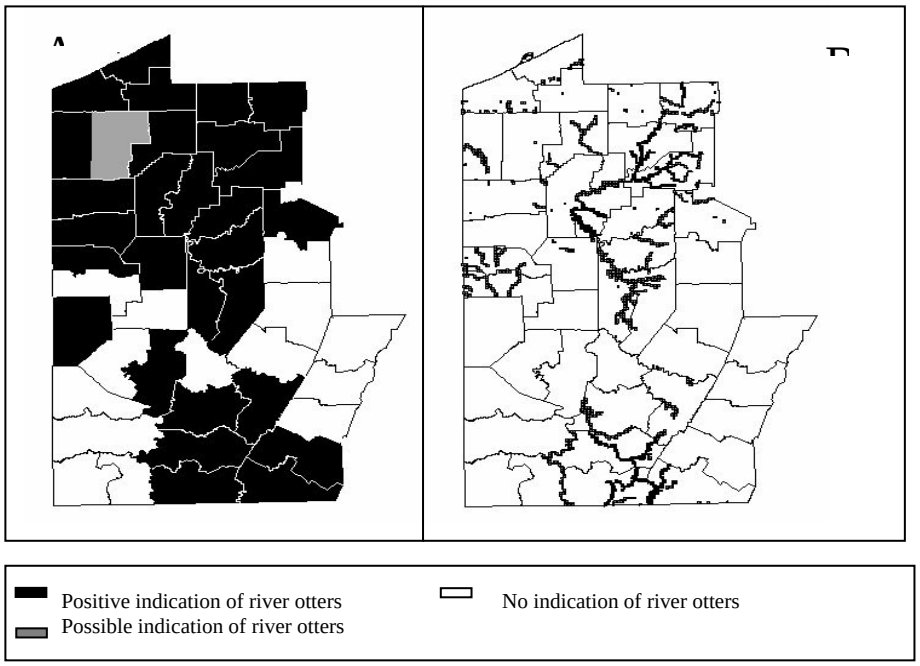

Figure 3. Distribution of river otters in western Pennsylvania based written surveys and interviews with Wildlife Conservations Officers (WCO) conducted during 2001-2004. The areas represented as being occupied by river otters differs dramatically when the information is portrayed at the WCO district-level (A) versus the 1-km^2 grid-level (B). The respective distributions are based on the opinions of WCOs and not actual field surveys.

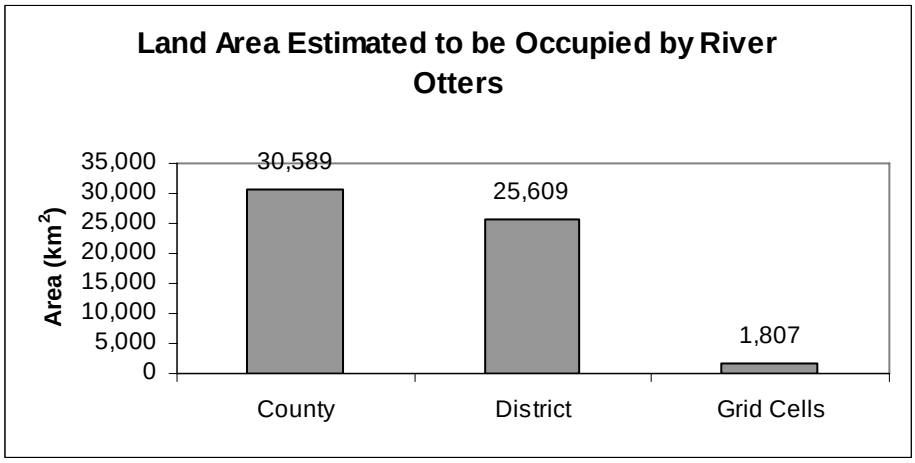

Figure 4. Land area estimated to be occupied by river otters based on Wildlife Conservation Officer's opinions when presented at the county, WCO district, and grid-cell-levels of assessment.

Results of our interviews with WCOs and associated riparian surveys demonstrate that river otters persist at all reintroduction sites in western Pennsylvania and that populations are expanding. Our goal is for the state natural resource management authorities (The Pennsylvania Game Commission and Pennsylvania Department of Conservation and Natural Resources) to adopt use of the grid-based approach described in this article for long-term monitoring of the reintroduced populations.

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RÉSUMÉ: Evaluation de la distribution de populations de loutres du Canada réintroduites en Pennsylvanie (USA): Développement d'une approche au niveau du paysage
Depuis 1982, 153 loutres de rivière ont été réintroduites dans le centre et l'ouest de la Pennsylvanie. Le projet de réintroduction est actuellement dans sa phase finale, soit principalement la mise au point d'un suivi à long terme des populations réintroduites. Celui-ci se fera à partir de la recherche d'indices de présence (épreintes et empreintes de pas), qui s'est avérée être un moyen efficace pour étudier la distribution de la loutre. Un protocole, basé sur un SIG, a été développé, afin de suivre l'évolution de la répartition de la loutre de rivière. Ce suivi est réalisé en collaboration avec les officiers de conservation de la faune sauvage (WCOs).

RESUMEN:
Desde 1976, 21 estados en los Estados Unidos y 1 provincia canadiense (Alberta) han liberado >4100 nutrias de río a través de proyectos de reintroducción. Desafortunadamente, pocos estudios se han realizado para monitorear el destino inicial de las nutrias de río translocadas y si las poblaciones pudieron establecerse. Como parte de la fase final del proceso de reintroducción, el Proyecto de Reintroducción de Nutrias de Río en Pennsylvania (PRORP) está enfocado en el desarrollo y evaluación de una encuesta para el monitoreo de poblaciones reintroducidas en el estado. Resultados de las entrevistas con Oficiales de Conservación de Fauna Silvestre (WCO) y reconocimientos de campo

en áreas ribereñas demuestra que nutrias de río persisten en todos los sitios de reintroducción en el oeste de Pennsylvania y que las poblaciones se están expandiendo. Nuestro objetivo es que las autoridades estatales de manejo de recursos naturales adopten la metodología de grilla propuesta en este artículo para el monitoreo a largo plazo de poblaciones reintroducidas.