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**OTTER SPOTTER: THE CREATION AND EVALUATION OF AN EDUCATIONAL
RESOURCE FOR THE ASSOCIATION OF ZOOS AND AQUARIUMS, ROCHESTER
INSTITUTE OF TECHNOLOGY, AND THE SENECA PARK ZOO**

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February 6, 2012**

A thesis submitted in partial fulfillment of the requirements
for the degree of Masters of Science in Environmental Science
at Rochester Institute of Technology
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ABSTRACT

Otter Spotter is an educational website providing information about otters found in Association of Zoos and Aquariums' (AZA) facilities. Though the site includes five species of otter it focuses primarily on the North American river otter. It was designed to meet the needs of AZA's Otter Species Survival Plan (SSP) committee, Rochester Institute of Technology's (RIT) Otter Research group, and the Seneca Park Zoo. This site helps fulfill the mission of modern zoos to become centers for conservation and education. Otter Spotter contains species information, photos, video clips, research summaries, teacher resources, and a blog with the latest news related to otters. Site statistics show that Otter Spotter is being used frequently with an increase in page views when social media tools are utilized. Evaluations show that the site is appealing and easy to navigate, useful to AZA educators, and will continue to be used as a resource for AZA facilities. Pre and post-testing of the lesson plans designed for the site also indicate that the lesson plans are a useful way to teach kindergarten through fourth grade students about otters and meet the standards of the New York State Core Curriculum. Overall, the site is a successful resource and by utilizing the findings of the evaluations it will continue to grow and extend its reach beyond the AZA community.

INTRODUCTION

Working Together to Help Otters

Otters are popular animals due to their charismatic and interesting behavior (Kruuk 2006). Otters often display play behaviors, such as sliding, that can endear them to children and adults alike (Stevens and Serfass 2005). Thus they are frequently housed in zoos and aquariums. North American River Otters are exhibited in 105 out of 225 accredited AZA facilities worldwide (David Hamilton, personal communication, January 10, 2012). Otters are also ecologically important due to their status as an indicator species (Kannan et al. 2002; Tabor and Aquirre 2004). The health of otter populations can indicate the overall health of the ecosystem due their sensitivity to pollutants in their aquatic environments (Kannan et al. 2002; Tabor and Aquirre 2004). For these reasons many different groups are interested in otters and their well being as a species; zoos, field scientists, universities, school-aged educators, and the general public all appear to have a vested interest in otters. However, up until this point there was no way to connect the interests of these groups and to share the work being done with the general public. In today's modern world, many people turn to the Internet to find current information and to connect with like-minded individuals. Therefore, the "Otter Spotter" website was created as a place to provide information about otters and teacher resources, connect interested parties, and share the work being done in Zoos and in the field to help otters.

The History of Zoos and the Association of Zoos and Aquariums

The Association of Zoos and Aquariums (AZA) states in its vision statement "We envision a world where all people respect, value and conserve animals in nature" (AZA 2011). However, this was not the vision for zoos in the beginning. Historically, zoos have been viewed as a place to observe animals on exhibit as a form of entertainment (Hyson 2004). Record of the

existence of zoos or menageries is found in the histories of ancient Egypt, Greece, and China (Baratay and Hardouin-Fugier 2004). These facilities were intended to display large, exotic animals as entertainment or a show of power (Baratay and Hardouin-Fugier 2004). Zoos continued to develop in Europe during the sixteenth and seventeenth centuries but were still designed only to impress and entertain upper-class visitors (Baratay and Hardouin-Fugier 2004). Exotic animals first began to be exhibited in America in the early 1700's typically through traveling shows with animals (Kisling 2001). The first official zoo to open in the United States was the Philadelphia Zoo opening in 1874 (Kisling 2001).

As recently as the early 1900s, zoos were still focused on displaying a wide variety of large, exotic species without considering conservation or education (Rabb 2004). Exhibits in early Zoos were barren places and were built of concrete slabs with iron bars and little or no attempts to make enclosures look naturalistic (Hyson 2004). However, today modern zoos have improved in many areas to provide better environments for the animals and a better experience for the visitor (Rabb 2004).

Modern zoos aim to create exhibits resembling animals' natural habitats. This naturalistic exhibit design is important for the health of the animals and the perception of the visitors (Rabb 2004). Zoos also aim to create a collection of animals to be ambassadors for species endangered or threatened in the wild (Rabb 2004). Modern zoo collections include not only charismatic megafauna but also smaller, less exotic species that are of special conservation concern (Rabb 2004). Native animals are also becoming popular exhibit animals in order to tell stories of local conservation efforts and increase an appreciation for our local habitats (Rabb 2004). Another improvement in modern zoos is animal care; over the last few decades zoos have been working cooperatively with other zoos, veterinary schools, researchers, and other animal

related facilities to share information on animal husbandry and veterinary treatments (Rabb 2004).

Accreditation by the AZA, which was established in 1924, maintains high standards in all of the areas that make up modern zoos such as exhibit design, animal care, conservation, and education (AZA 2011). The AZA began the accreditation process in the 1970s (AZA 2011). Accreditation is obtained through the AZA Accreditation Commission and only the facilities that meet the rigorous standards of the Accreditation Commission can obtain this mark of quality from the AZA (AZA 2011). The AZA provides professional support and development through training, committees, and conferences (AZA 2011). This group also enables virtual networking for the sharing of information with Zoo professionals in various fields through e-mails list-serves, on-line databases, message boards, and directories (AZA 2011).

Conservation Programs in Modern Zoos

Modern zoos serve as conservation centers by managing captive populations of threatened and endangered species, conservation education programs, and also by participating in ex-situ conservation (AZA 2011). AZA facilities spend about \$90 million per year on conservation projects and have funded almost 4,000 ex-situ conservation projects in more than 100 countries since 2006 (AZA 2011).

One of the most prominent conservation programs in the AZA is the Species Survival Plan (SSP). The primary goal of the SSP programs is to preserve a captive population of a specific species of animal that are, most often, threatened or endangered in the wild (AZA 2011). Genetic diversity of captive populations is a very important aspect of these programs and therefore the SSP committee manages studbooks to maintain healthy captive populations. Institutions must work cooperatively with all AZA-accredited Zoos and Aquariums and other

approved facilities to move animals based on breeding needs and genetic requirements (AZA 2011; Rabb 2004). These programs not only oversee the studbook of the selected animal to maintain diverse populations but also establish goals in animal management, research, and conservation, develop education strategies, and develop re-introduction strategies (if applicable for the species) (AZA 2011).

SSPs are subsets of Taxon Advisory Groups (TAGs). Unlike an SSP, TAGs cover entire taxas (i.e. Bat TAG, Felid TAG, etc.) and can recommend certain species for conservation programs and may encompass several SSPs (AZA 2011). TAGs are a forum for discussing husbandry, veterinary, conservation *in-situ* and *ex-situ*, ethical issues, and education initiatives for the taxa (AZA 2011). Both SSP and TAG committees are made up of professionals in husbandry, veterinary medicine, field research, and educators that specialize in the taxa or a specific species within the TAG.

Education in Modern Zoos

Education is an important component of the modern zoo; educational messaging is incorporated in signage, on-site programming, outreach programming, and on-line resources (Rabb 2004). Modern zoos consider education and conservation to be innately linked; in order to encourage visitors to conserve the natural world zoos must educate the members of their community (Clayton et al. 2009). Zoos and Aquariums are to provide the public an opportunity to develop a personal connection with the animals found within the facilities (AZA 2011). Nationwide visitor impact studies have shown that Zoos and Aquariums are enhancing zoo visitors' knowledge and understanding of wildlife and conservation (Falk et al. 2007). This can be done through the general viewing of animals but it often has more impact when memorable animal interactions occur (Hyson 2004). Educational programming is an effective way to

facilitate these memorable interactions (Hyson 2004). Educational programs, such as interpretive demos, can result in positive visitor perceptions of the facility and an increase in visitor agreement with pro-conservation messages (Swanagan 2000; Anderson et al. 2003).

Though most educational programming is for patrons visiting the zoo, educational materials can also be made available on the Internet. Websites can provide access to information for a much wider audience expanding the impact of zoos beyond just visitors coming through the gates (Rabb 2004). Websites can also extend your trip to the zoo after visitors return home. Webcams can provide visitors a way to see animals they maybe have not seen or allow them to see an animal that they would like to observe more frequently (Clay et al. 2011). Zoo websites also contain information about the animals, such as natural histories or endangerment status, so visitors can answer questions that may not have been answered during the trip (Clay et al. 2011).

AZA conservation programs also have an emphasis on education. Education Advisors are part of both SSPs and TAGs. Advisors help these groups to develop educational materials for zoos, teachers, and for educators working in countries where the animals are found. They also develop key conservation and educational messages to be used as guideposts for other zoos for on-site programming, community outreach, and to increase public awareness (AZA 2011). The AZA encourages Education Advisors to incorporate technology into their education and conservation efforts. Several Education Advisors maintain websites about their TAG or SSP species to provide reliable information and to connect zoo staff, teachers, field researches and other interested parties. Prior to this project there was no website for otters maintained by any AZA group.

The Seneca Park Zoo

The Seneca Park Zoo (SPZ) is a 15.5-acre AZA accredited zoo in Monroe County, NY (Seneca Park Zoo 2011). It is located within Seneca Park, a 297-acre park designed by Fredrick Law Olmstead, which opened in 1893 (Monroe County 2011; Seneca Park Zoo 2011). The first animals displayed at Seneca Park were a collection of local animals, deer and various birds, displayed near a trout pond in the northern section of the park in 1894 (Seneca Park Zoo 2011). In 1931, the main zoo building was completed and though slightly altered, still stands today. At that time the animal collection was a menagerie style collection with many of unrelated animals in a relatively small space (Seneca Park Zoo 2011). This type of building and animal collection was common with most zoos during this the era (Hyson 2004). In the 1970s SPZ attendance hit an all time low and Zoo visitors stated they were upset with the large animals kept in small spaces (Times Union 1973). In 1975 the SPZ began to upgrade some of the exhibits and this improvement continues today (Seneca Park Zoo 2011).

Education and conservation is also important to the mission of SPZ. SPZ provides various on-site and off-site educational programming for a wide variety of ages. Formal programs include classes, camps, outreach programs, school programs, and teen programs; in 2010, SPZ had over 27,000 participants in formal programming (Seneca Park Zoo 2011). The informal programming, which includes stage show, interpretive demos, outreach at local events, and on-site education events reached an estimate of about 80,000 participants, not including statewide TV spots (Seneca Park Zoo 2011). In 2010 SPZ spent and/or donated nearly \$15,000 to conservation projects and organizations (Seneca Park Zoo 2011).

Otter Species Survival Plan

There are currently five species of river otter that can be viewed in AZA zoos and aquariums; these species include Asian small clawed (*Aonyx cinereus*), giant (*Pteronura brasiliensis*), cape clawless (*Aonyx capensis*), spotted-necked (*Lutra maculicollis*), and North American river (*Lontra canadensis*). These species are part of the Otter Species Survival Plan (Otter SSP). The Otter SSP is a subgroup within the Small Carnivore TAG. The Otter SSP includes Studbook Keepers, Husbandry Advisors, Reproduction Advisors, Veterinary Advisors, researchers, and Education Advisors. Also, this group often identifies key research projects and assists researchers in obtaining grants. This group has helped researchers in Sri Lanka, Tanzania, and Peru receive funding through the Columbus Zoo conservation funds. The Otter SSP also provides a bi-yearly Otter Keeper Workshop for husbandry, has hosted Otter Education and Conservation Workshops, and participates in international otter summits with the International Union for Conservation of Nature (IUCN) Otter Specialist Group. Several of the individuals on the Otter SSP serve as species coordinators for IUCN.

Otter Exhibit at the Seneca Park Zoo

The SPZ currently houses two 8 year-old female North American river otters (*Lontra canadensis*). The river otter exhibit is directly outside the Kodak Eco-Center. The exhibit is viewable through the Northwest-facing window in the Kodak Eco-Center; this window provides zoo visitors with underwater viewing of the pool as well as a view of most of the dry land in the exhibit. There is a mix of artificial stone and natural ground with logs, branches, and a den for shelter. The otters also have an additional holding area behind the Kodak Eco-Center building. This holding area is not viewable by the public.

The otters are an important part of the conservation and education messaging. During the months of May through September the Zoo provides an Otter Training Demonstration five days a week for the public to share otter information and to explain the training process. The Zoo also employs the SSP Coordinator and Population Manager (David Hamilton) and the Education Advisor (Emily Coon-Frisch) for the North American river otter SSP.

North American River Otter Biology and History in Western New York

River otters live in waterways and coastal regions throughout North America where they feed on fish and other small animals (Blundell et al. 2002). River otters are social animals that use scent marking at latrine sites to communicate their species and their sex to other animals (Rostain et al. 2004). This scent marking may be done more frequently during mating season (Rostain et al. 2004). The otters breed in March or April and, due to delayed implantation, can give birth up to twelve months later (Thom et al. 2004). River otters can also travel over large distances and can have a home range of about 6 km to a maximum of 250 km of river, lake, or ocean shoreline (Kruuk 2006). The size of river otter home ranges vary by location, season, age, and sex of the animal with males typically having larger home ranges than females (Kruuk 2006).

Historically, river otters populated the waterways of Western New York but were extirpated, as they were in many other regions of North America, due to over-trapping for their thick pelts, water pollution, and urbanization in the 19th and 20th centuries (Blundell et al. 2002). In order to reestablish river otter populations in the area the New York State Department of Environmental Conservation (NYSDEC), in conjunction with the Seneca Park Zoo and several other organizations, reintroduced 279 otters between 1995 and 2000 (NYSDEC 2011).

Work at RIT

After the reintroduction of river otters in Western New York, little research was conducted to monitor the new otter populations. In 2002 a river otter research group was formed at the Rochester Institute of Technology (RIT) to monitor these new populations. This group was led by Dr. Lei Lani Stelle (RIT, 2002-2008, now at University of Redlands) and included several graduate students and undergraduate volunteers. To date this group has produced research for five Masters of Science theses on topics of such as diet, optimal foraging theory, distribution, enrichment, and genetics of river otters. These projects utilized data from research in the field, such as scat collection, as well as research at the Seneca Park Zoo observing the exhibit otters.

Objectives of Project

Otter Spotter was designed to be an educational website to support the AZA Otter SSP, RIT, and SPZ. The site is designed to increase public awareness of otters, share field research, and provide teacher resources for educators in classrooms and in zoos nationwide. Otter Spotter is also a way to connect zoo staff, teachers, field scientists, and other otter enthusiasts. The site includes reputable information about the five species of freshwater otters held in AZA zoos, with a primary focus on the North American river otter. Field research is shared by summarizing the research at RIT studying the results of New York State River Otter Project, research at SPZ, and research funded by other AZA organizations. One of the main objectives of this site is to provide educational resources for classroom teachers and zoo educators that were supported by New York State Learning Standards.

Prior to this project there was a lack of on-line resources associated with the AZA about otters. Therefore to fill this void I created Otter Spotter and predicted that a well designed

website including the resources mentioned above will be well used and readily accepted by the AZA community and members of the general public seeking otter information. I further predicted that lesson plans provided would increase students' knowledge of otters. The long-term goal for the site is to use otters as an ambassador to encourage conservation of their species and their wetland habitats by providing resources to both teach and connect site users with these charismatic animals.

MATERIALS AND METHODS

Website Design and Layout

Background graphic and heading graphic were designed by Joshua Coon of Blue Collar Comics. The website layout template is the "Twenty Ten" theme from www.wordpress.com.

Content Development

The type of content to be included in the site was determined by the needs of the Otter SSP, RIT, and SPZ. Content was discussed during the 2008 and 2009 AZA annual conference meetings as well as the 2011 Otter SSP Education and Conservation Strategic Planning workshop. The General Curator of SPZ, David Hamilton, and the Education Department also assisted with content decisions. Basic otter information was acquired from peer-reviewed sources and research synopses were summarized from thesis work and primary sources.

Curricula Development

Lesson plans were based on New York State Core Curriculum Learning Standards for the Living Environment. The New York State learning standards were selected over other state and national standards to meet the needs of teachers in the Greater Rochester Area. These lessons were designed to be used by classroom teachers or Zoo Educators.

In addition to using standards to develop lesson plans, a teacher focus group was established to help with curricula development. This group was made up of seven teachers from elementary schools within Monroe County, NY. The focus group met twice and discussed lesson plans as well as general website content to make the site appealing to teachers and students.

Other zoos were also used as a resource for curricula. During AZA conference meetings and the Otter SSP Education and Conservation Strategic Planning Workshop the curricula and content was discussed among Zoo Educators and Otter Education Advisors. These individuals also helped to critique and modify the lesson plans and other educational materials found on the website.

Webcam

A webcam was installed with the intention of broadcasting a live feed of the SPZ otters on the SPZ website with a link to Otter Spotter. The camera installed was a Foscam 8904 IP Camera. The camera can broadcast live feed as well as capture images with a motion detection feature. The camera can also be used to capture short video clips or images manually. The camera was installed on the outside of the Eco-Center building facing southwest. The placement was intended to capture footage of both the land and water aspects of the exhibit and the area where most otter training and feeding demonstrations take place.

Lesson Plan Evaluations

To evaluate the lesson plans available on Otter Spotter, two workshops for children were offered at SPZ. The groups that took part in the workshop were comprised of past participants of other programs such as summer camps. The workshops were designed to evaluate the following science lesson plans on the website: “Exploring River Otter Habitats”, “Otter Adaptations”, and

“Web of Life”. Participants were required to be in second, third, or fourth grade. Participants were also asked to take a pre-quiz before the workshop to determine their prior knowledge about the subject. The workshops were held at the Zoo on November 13th, and 23rd from 1-4pm. Sixteen different children participated in each workshop. After the workshop, participants were asked to take the same quiz again and the results were compared. During the workshop participants were asked for a show of hands as an informal method of evaluation before and after certain activities.

The pre and post quizzes were made and distributed using www.Surveymonkey.com. The quiz was 10 questions and was intended for a 2-4th grade reading level. The questions were determined by the content of the lesson plans and the learning standards the lessons were designed to meet. Parents were encouraged to assist their child to fill out the quiz but not to assist them with answering the questions or researching answers. For the statistical analysis, averages for pre and post-tests were compared using the paired Student *t* test in GraphPad Prism, Version 5.0b (GraphPad Software). Statistical significance was established at *P* less than or equal to 0.05.

AZA Educator Evaluation

To evaluate the usefulness for Zoo and Aquarium educators, an evaluation was sent via the e-mailed Educators List Serve sent out by the AZA to subscribed zoo educators. This evaluation consisted of 9 total questions. Of those questions, 7 ranked categories of the site on a scale of 1 to 5. The categories ranked in the evaluation were: visual appeal, ease of navigation, usefulness of overall content to AZA facilities, usefulness of teacher resource section, likeliness to use as an information resource, likeliness to use the lesson plans, and likeliness to follow the blog. There was also a question regarding what resources on the site were the most useful

including the following items: research and conservation stories, lesson plans, blog, fact sheets, and photos. The final question was a comments/suggestion field. There were also comments sections available for each question if the respondent needed to expand upon their answer.

Wordpress Information and Statistics

Statistics of site use were gathered using the statistics tools at www.wordpress.com. Wordpress tracks the number of page views, referrers from other sites, and the search engine terms that direct traffic to the site. It also provides insights into which pages on site are viewed the most and what documents were downloaded. These statistics enable us to view trends over time and overall totals.

RESULTS

Website Content

The site consists of a static homepage with the following tabs: otter diversity, blog, otter photos and videos, otter research and conservation, otter news, teacher resources, and links. These tabs represent the primary objectives of the project. Under each tab there are links to the related pages. Otter diversity and photo pages are split up by species and these sections currently feature the five species of freshwater otter found in North American zoos and aquariums. The conservation and research section is divided between research at RIT and international research. Subject matter divides the teacher resource section. There are no divisions currently for the otters in the news and links. The blog is compiled of recent posts and many of these posts link back to other sections of the site. Figures 1-4 show selected screen capture photos of the site. Please refer to www.otterspotter.com for full content of the site or appendix A for full text without graphics.



Figure 1: Screen capture of home page

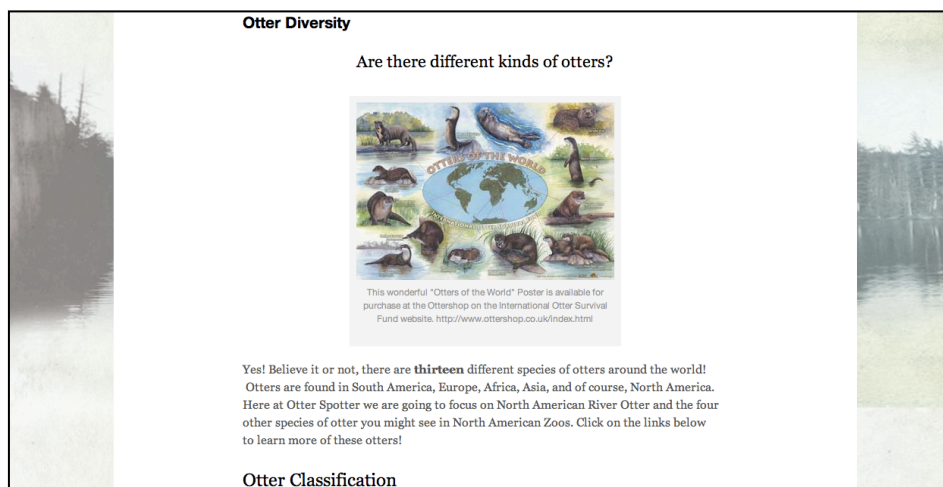


Figure 2: Screen capture of Otter Diversity page



Figure 3: Screen capture of Otter Research and Conservation page

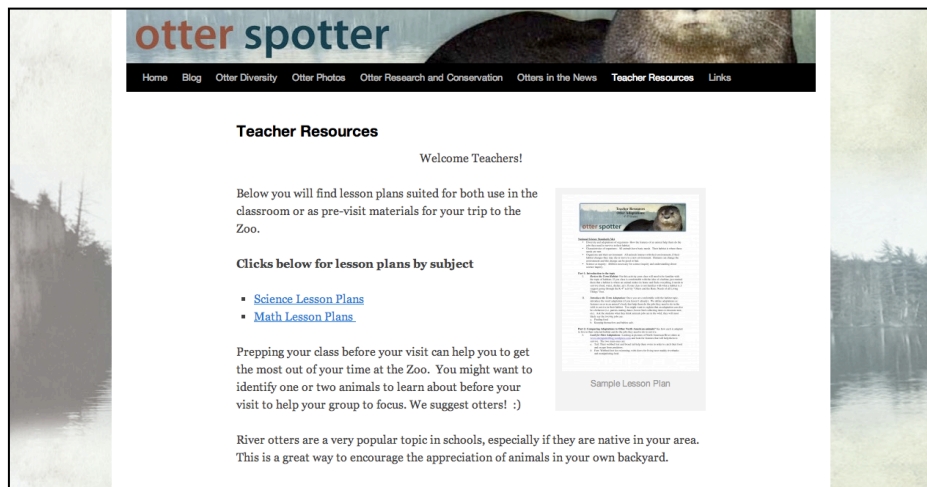


Figure 4: Screen capture of the Teacher Resources

Lesson Plans

The Teacher Resource section is split into three sections: Science Lesson Plans, Math and English Language Arts (ELA) Lesson Plans, and Playful Otters. The following lesson plans were developed for the Science Lesson Plans page: “Exploring River Otter Habitat”, Otter Adaptations”, and “Web of Life”. There is also a section on this page for visual tools. These include “Otters and Friends Matching Game”, “Teeth and Tools Matching Game”, and “Lend a Paw: Comparing Otter Feet Cards”. The visual tools can be used independently or with one of the lesson plans provided. Figures 5 & 6 show samples of some of the visual tools. All lesson plans were designed to meet New York State Learning Standards. Table 1 lists the learning standards met in each lesson plan. Please refer to appendix B for full lesson plans. The New York State Living Environment Core Curriculum and 3rd grade Math Standards referenced in the lesson plans are listed in appendix C.



Figure 5: Sample Otter and Friends Matching Game

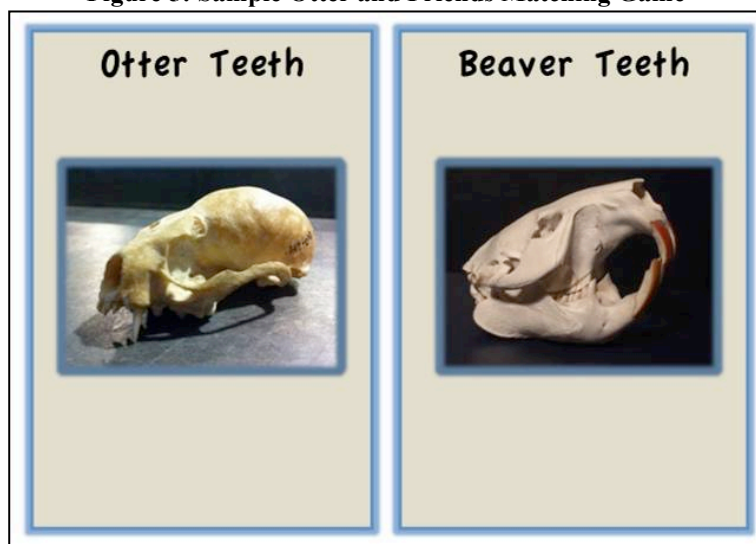
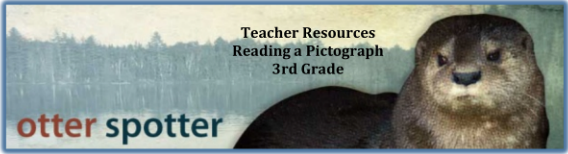


Figure 6: Sample Teeth and Tools Matching Game

Table 1: The grade level, subject, and NYS learning standard met for each lesson plan provided on OtterSpotter (NYS Elementary Core Curriculum)

Lesson Plan	Grade Level	Subject	NYS Learning Standards Met
Exploring River Otter Habitats	K,1,2,3	Science, ELA	LE 1.1a; LE 3.1a;LE 5.1b,
Otter Adaptations	2,3,4	Science	LE 3.1a & c; LE 5.1 b; 5.2e & g
Web of Life	4,5	Science	LE 6.1a,b,&c; LE 7.1 b&c
Otters and Friends Matching Game	K,1,2,3,4,5	Science	LE 1.1a; LE 3.1a;LE 5.1b,5.2e & g
Lend a Paw Cards	2,3,4,5	Science	LE 1.1a; LE 3.1a;LE 5.1b,5.2e & g
Teeth and Tools Matching Game	2,3,4,5,	Science	LE 1.1a; LE 3.1a;LE 5.1b,5.2e & g
Reading a Pie Graph: Zoo Otter Diets	3	Math	3:PS.6, PS.7, S.8
Reading a Pictograph: Fish eaten by Zoo Otters	3	Math	3:PS.6, PS.7, S.8
A Day in the Life of an Otter Keeper	3	Math, ELA	3.CN.6,3.M.9

A Math and English Language Arts (ELA) Lesson Plans page was also developed to allow teachers to use Otter Spotter with a multidisciplinary approach. The three lesson plans provided here are Reading Pie Graphs: Zoo Otter Diets, Reading a Pictograph: Fish Eaten by Zoo Otters in a Week, and A Day in the Life of an Otter Keeper, which includes both math and ELA. Each provides a series of questions for the student to answer in the form of a worksheet. Figure 7 shows a sample math worksheet. The “Playful Otters” section contains non-learning standard based resources such as coloring sheets, word searches, and mazes.







Name: _____

Date: _____

Directions: ZooKeepers keep track of how many fish each otter eats in a week. Use the pictograph below to answer the questions:

Fish Eaten by Otters in a Week

Sarah		<div style="border: 1px solid black; padding: 5px; display: inline-block;"> KEY  = 5 fish </div>
Heather		
Admiral		

- 1.) How many fish did each otter eat?
 - a. Heather: _____
 - b. Sarah: _____
 - c. Admiral: _____
- 2.) How many fish were eaten all together? _____
- 3.) Which otter ate the most? (Circle one)
 - a. Heather
 - b. Sarah
 - c. Admiral
- 4.) What was the **least** amount of fish eaten by an otter in a week? (Circle one)
 - a. 5
 - b. 25
 - c. 15
 - d. 3

Figure 7: Sample math worksheet

Wordpress Statistics

Wordpress results were tallied on December 14, 2011. Figure 8 shows the number of page views by month in 2011. There were a total of 4,474 page views in 2011 by December 14th. The highest month was November with 2,299 page views and this was most likely due to sending out the survey to AZA educators in November and the resulting publicity.

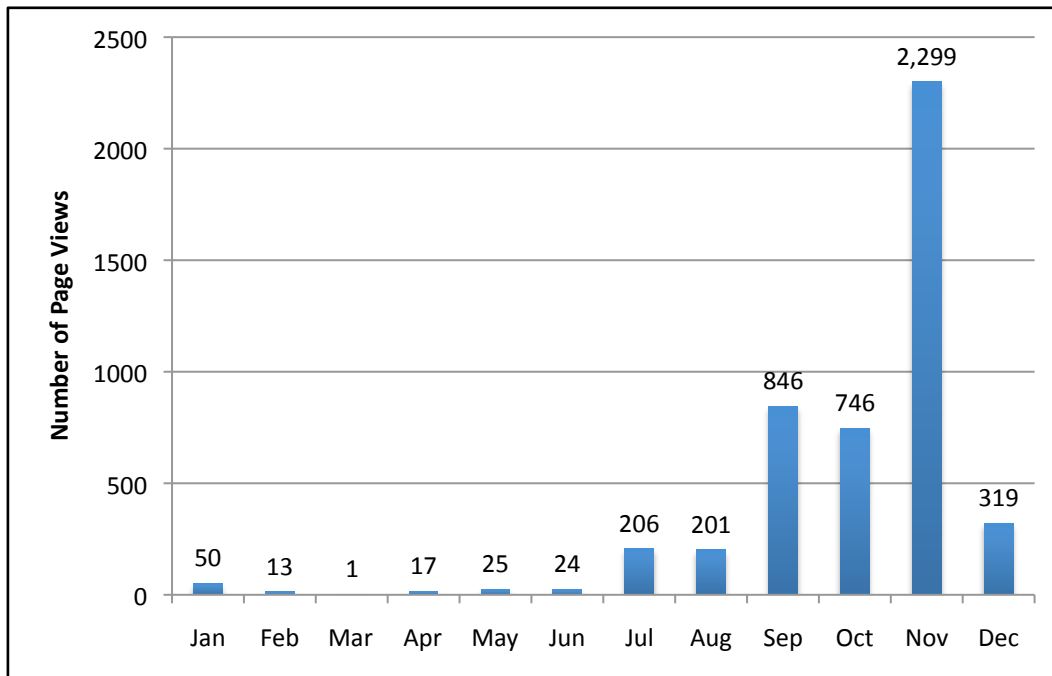


Figure 8: Page Views by Month in 2011

I was also able to determine which pages were viewed most often (figure 9). The homepage had the most page views with 1,688. However, this number was left out of figure 9 due to the assumption that it was not being viewed by choice but rather since it is the default page for the site. Science lesson plans was the second highest with 222 followed by giant otters with 172. 4 out of the 10 most viewed pages were related to the teacher resource section.

Wordpress also provides a record of search terms resulting in a click onto the site. Figure 10 shows the top ten search terms resulting in a visit to Otter Spotter. The search term “giant otter” was the highest and this term resulted in 80 visits to Otter Spotter followed by “otter” with 46, and “otter spotter” with 42. It should also be noted that related search terms were added together i.e. giant otter and giant otters were combined, otter and otters were combined, and otter spotter was combined with www.otterspotter.com.

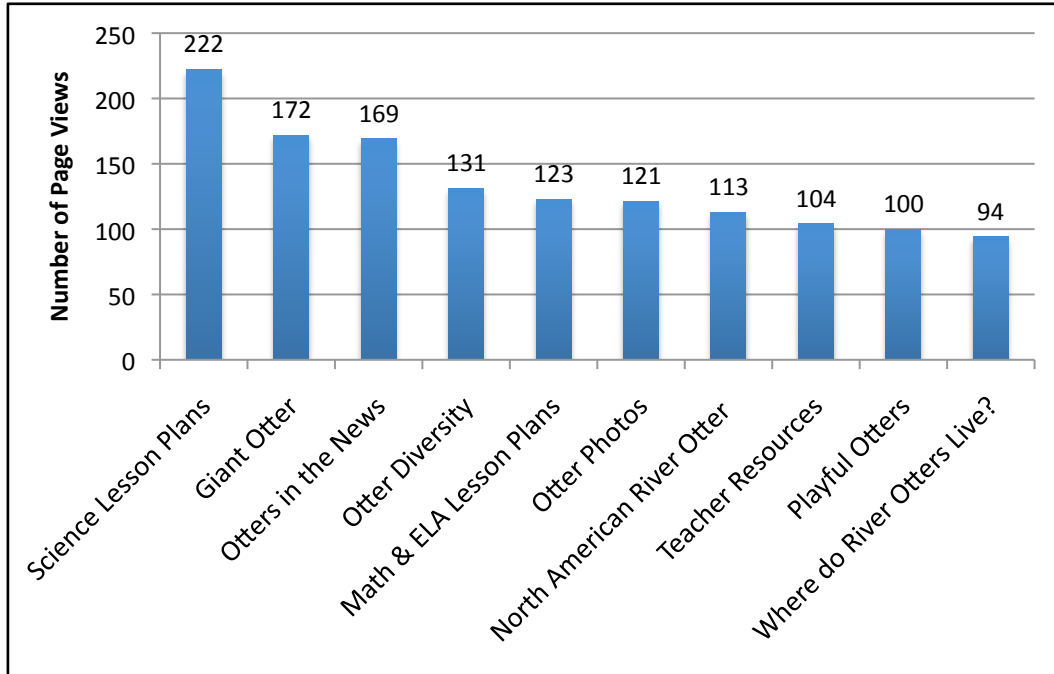


Figure 9: Top ten most viewed pages (not including the homepage)

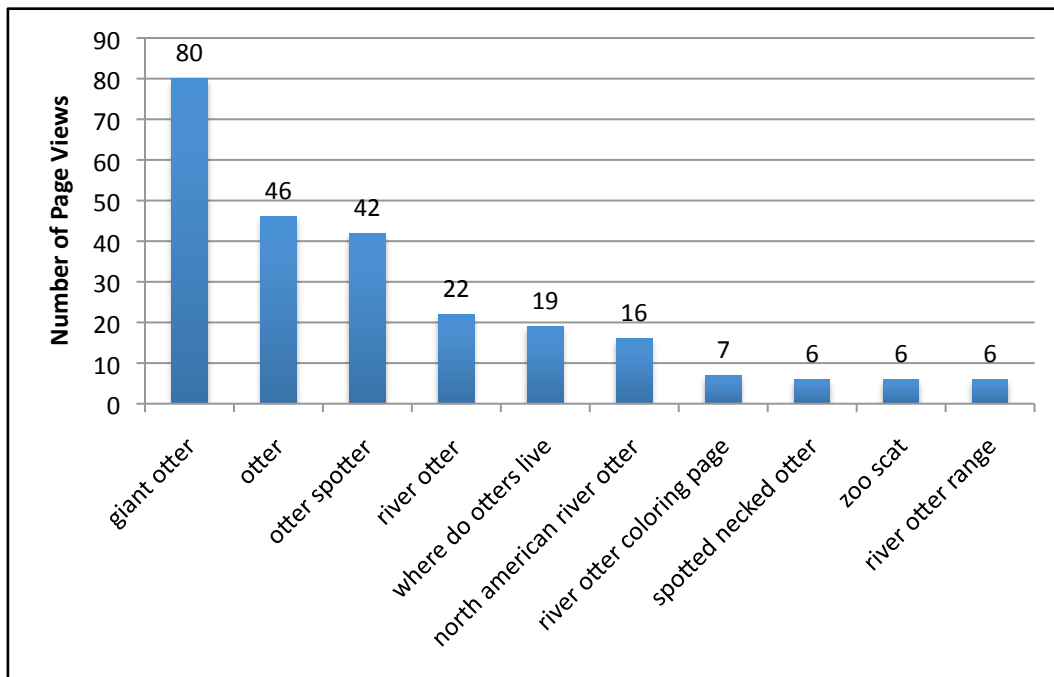


Figure 10: Top ten search engine terms resulting in a page view

AZA Educator Survey Results

Figures 11 and 12 show the results of the electronic survey sent out to AZA educators who subscribe to the Educators Listserv e-mail. There were 36 responses to the survey collected between November 10 and December 12, 2011. The results are split into two figures below, figure 11 and figure 12. Figure 11 shows results for visual appeal of the site, ease of navigation, usefulness of overall content, and likeliness to follow blog. Each question could be answered as extremely, very, moderately, slightly, or not at all.

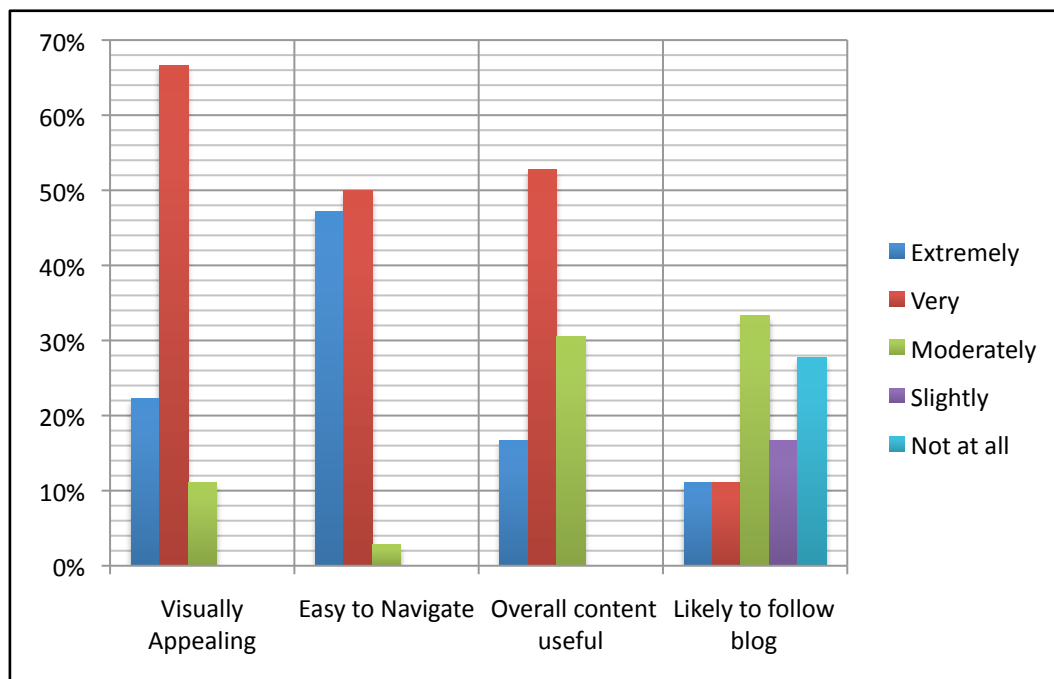


Figure 11: AZA Educator survey results n=36

The results of the survey showed that at least 89% thought that the site was very or extremely visually appealing and 97% thought it was very or extremely easy to navigate. 70% thought that the overall content of the site was very or extremely useful. For the three questions mentioned above 0% answered the questions with slightly or not at all. The results for “likeliness to follow the blog” were more evenly distributed for all possible responses with 22%

answering very or extremely, 33% for moderately likely, and 45% responding with slightly or not at all.

Figure 12 shows the results for questions regarding how AZA educators could use the site. These questions include the usefulness of teacher resources, likeliness to use as a resource at their facility, and likeliness to use lesson plans. The questions in figure 12 could be answered with extremely, very, moderately, slightly, not at all, or not applicable. These questions included a response option of not applicable for zoos that do not hold otters.

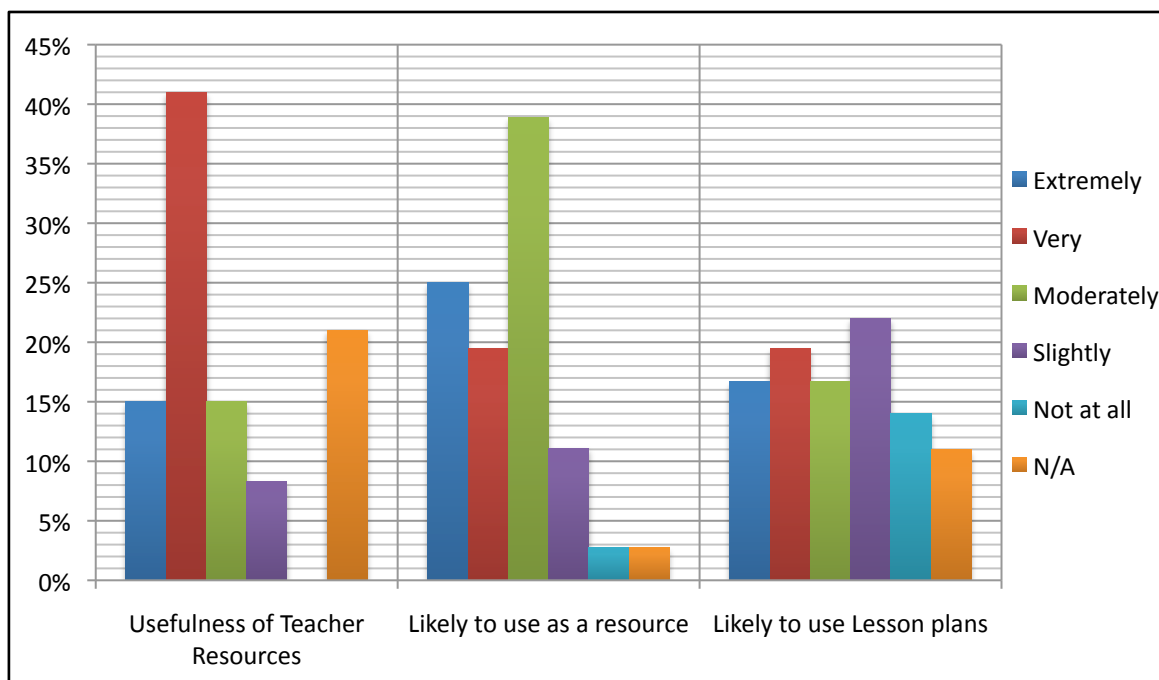


Figure 12: AZA Educator survey results 2, n=36

For the usefulness of the teacher resource section of the site 56% responded with very or extremely useful, 23% with moderately or slightly, 0% with not at all, and 19% with N/A. When asked how likely AZA Educators were to use the site as an information resource for their facility 44% answered extremely or very likely, 39% moderately likely, 14% slightly or not at all, and 3% N/A. In regards to the likeliness to use the lesson plans, 36% responded they were extremely or very likely to use lesson plans, 17% were moderately likely, 36% were slightly or not at all likely, and 11% responded with N/A.

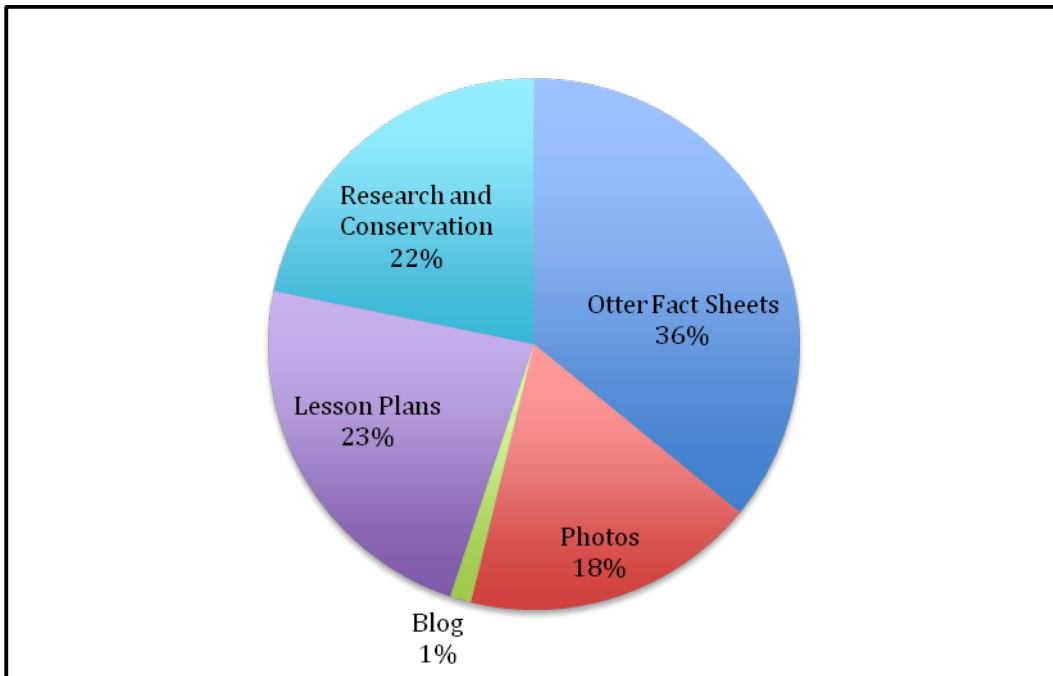


Figure 23: Results for what resource on the website was found most useful by AZA Educators.

The question represented in figure 13 allowed responders to select what resources on the site are most useful. The most useful section appeared to be the fact sheet pages with 36% followed by lesson plans with 23%, which was closely followed by the research and conservation section with 22% and photos with 18%. The blog had the fewest responses with only 1%.

The last question included in the AZA Educator Survey was a write in field for suggestions and comments. Responses from this section are found in table 2. Out of the 36 responders to the survey 15 left written answers for the comments/suggestions question. There were also write-in comments for each multiple-choice question and the responses are found in Appendix D.

Table 2: Write in comments and suggestions from AZA educator survey

Awesome site...very concise and easy to use. Great job!
I love the pictures and the site is easy to navigate. Adding more advanced lesson plans would be nice.
I think it is fantastic! Hopefully multiple facilities will contribute. Sea World has Asian small claw otters in a show which is a unique situation. Great job overall, keep up the work!
Would like more information on the conservation and research papers, contact info for those students.
The activities are good for using in camp activities.
Fast Facts were hard to find
This is great! Wish we had similar websites for other species. Liked having quick access to recent research! Will work great for getting new educators up to speed.
IT would be nice to have some material there for use by older students. My high school volunteers teach on zoo grounds, so it would be great if there was something I could teach them that is appropriate for their age, and that could be used with visitors
It is a great site and informative for all ages!
Our zoo is along a major river in which otters frequent. This will be a great resource for teaching about local wildlife!
Nice website. Easy to read and to find things. It has a nice balance of text and photos to each page and is not busy. I really appreciate that.
Awesome job! I love otters, and it was a nice surprise to see that someone took so much time to put together such a wonderful site! I hope that this sparks other projects in the future, for additional species!
I think the idea for the page is wonderful. There are a few typos and grammar mistakes though that take away from the credibility and professional look of the site. Good luck!
I wish the fact sheets were drop-downs, rather than opening entirely new windows. Also would be nice to see photos/images of different otters to compare side by side, rather than being on a new page for each species.
Nicely done. This is a great user-friendly resource.

Otter Spotter Workshop

The pre and post-tests for the Otter Spotter Workshop resulted in a pre-test average of 75% and the post-test average of 95%. Table 3 shows the results for each question and the overall averages for both pre and post tests. Figure 14 shows the results of the paired Student t test. The analysis showed that the post-test results were significantly higher than the pre-test with a t value of 15.32 and p-value of less than 0.0001.

Table 3: Pre and post-test results for Otter Spotter Workshop (n=32)
Answers bold and italics are correct

Q1: What type of otters are housed at Seneca Park Zoo	Pre	Post
Sea Otters	34%	0%
<i>North American River Otters</i>	66%	100%
Giant Otter	0%	0%
Spotted Necked Otter	0%	0%
Q2: Where does an animal find everything it needs to survive?	Pre	Post
Home	0%	0%
Land	0%	0%
<i>Habitat</i>	100%	100%
Shelter	0%	0%
Q3: What type of Habitat do North American River Otters live in?	Pre	Post
Rainforest	0%	0%
<i>Wetland</i>	100%	100%
Desert	0%	0%
Jungle	0%	0%
Q4: Do we have River Otters here in Rochester, NY?	Pre	Post
<i>Yes</i>	34%	75%
No	66%	16%
We did but they are extinct now	0%	9%
Q5: What do River Otters eat most of the time?	Pre	Post
Birds	0%	0%
Bugs	0%	6%
<i>Fish</i>	100%	94%
Seaweed	0%	0%
Q6: North American River Otters are...	Pre	Post
<i>Carnivores</i>	47%	91%
Omnivores	38%	9%
Herbivores	15%	0%
Q7: What type of feet do North American river otters have?	Pre	Post
Opposable Feet	0%	0%
<i>Webbed Feet</i>	69%	100%
Prehensile Feet	16%	0%
Grasping Feet	15%	0%
Q8: What feature on an otter's body does NOT help it to swim in the water?	Pre	Post
Webbed Feet	0%	0%
Tail	0%	0%
Fur	25%	0%
<i>Sharp Teeth</i>	75%	100%
Q9: Do river otters hibernate?	Pre	Post
Yes	41%	6%
<i>No</i>	59%	94%
Q10: What might hurt otters?	Pre	Post
Loud Noises	0%	0%
<i>Pollution</i>	100%	100%
Too many people	0%	0%
Too many otters	0%	0%
Total Overall Average	75%	95%

Webcam

The webcam was physically installed in the otter exhibit at SPZ, but due to networking issues it will not broadcast live on the webpage at this time. The camera is visible to all computers on the Seneca Park Zoo Society's network. It also has the capabilities of capturing still images and short video clips. These clips are located on the "Video Clips- Otters in Action" page of the site. This page is found under the "Otter Photos and Videos Tab".

DISCUSSION

Layout and Design

The overall design and layout of the website has been well received. 89% of AZA educators ranked the site as very or extremely visually appealing (figure 11). The other 11% ranked it as moderately appealing (figure 11). 97% of AZA educators ranked it as very or extremely easy to navigate with only 3% ranking it as moderately easy to navigate. Studies have shown that visual appeal and ease of use is crucial in making a website useful for audiences seeking educational information (Lin and Gregor 2002). A well designed website captures a user's attention initially and then allows them to concentrate on the information without too much distraction (Pace 2004). Also, it has been shown that the easier an educational site is to navigate, the more likely users are to return (Pace 2004). With more return visits to the site there is an increased chance that the visitor will learn and retain information (Pace 2004).

Otter Spotter Usage Trends and Increasing Page Views

The information collected by the Wordpress Statistics tools indicates that the site is gaining popularity of the site as an information resource. There were a total of 4747 page views on the site by December 14, 2011 (figure 8). There is a large jump from June to July from 24 to 206 views respectively (figure 8). This is mostly likely do to the completion of the site in July. Though the blog page was created on Wordpress in January of 2011, the site was not completed

until July of 2011. There is another large jump from August, with 201 page views, to September, with 846 page views (figure 8). The jump can be attributed to the purchase of the domain name; in September it became www.otterspotter.com instead of www.otterspotterblog.wordpress.com, which was the Wordpress owned domain name the site was given. At this time the link began to be shared with SPZ employees, members of the otter SSP, and several other groups.

When analyzing the search terms leading viewers to Otter Spotter there are a relatively high number of page views resulting from general search terms such as “otter”, “giant otter” or “river otter” (figure 10). However, the overall page views for the entire site is larger than the number of page views resulting from the search engine terms, suggesting that once at the site visitors are looking at more than one page. As previously mentioned, if visitors arrive at the site and are met with an appealing and user-friendly site they will tend to stay longer and learn more (Pace 2004). One large challenge is getting viewers to the site initially. Understanding what information our visitors are seeking will help us to tailor our content to meet the needs of this audience and therefore increase hits to the site. In the future it will be useful to use simple titles and key words for blog posts to direct traffic to the site for those using very general search terms.

Another way to increase traffic to the site is to link to other otter information resources. Due to Otter Spotters connection with the AZA and the Otter SSP the site has been added as a link to several other otter related sites, such as SPZ’s website, Minnesota Zoo’s website, and www.otterkeeperworkshop.org. Otter Spotter has also been added as a reference on Wikipedia’s otter page. The site address has been added to these sites without solicitation and Otter Spotter is receiving an increased number of hits due to the links. This suggests that partnering with more AZA facilities and affiliated organizations would be beneficial for the site.

The most significant jump is seen in November. Page views went from 746 views in October to 2,299 in November. This jump is the result of social media and the survey sent out to Zoo Educators. The survey was sent on November 16th and it resulted in the highest number of page views in one day with 407. After the survey began to circulate, Otter Spotter was featured on the AZA's Facebook page on November 18th resulting in 312 page hits, which was the second highest page hits in one day.

This type of networking and social media usage will be extremely valuable in getting visitors to the site initially and increasing the number of return viewers. Looking at the page view trends it is apparent that directly exposing more people to the site will increase viewership. Since it will not always be necessary or time effective to send out surveys or e-mails, I believe that social networking sites will be the most useful tools to increase and retain viewers. A study by the Pew Research Center shows that in 2010 73% of on-line teens, 72% of young adults (ages 18-29) and 52% of on-line adults (ages 30 and older) used social networking sites in the U.S. (Lenhart et al. 2010). Based on the large percentage of people using social networking sites and the successful results of Otter Spotter being posted on the AZA Facebook page the evidence suggests this is an efficient and effective way to reach interested parties. Therefore in the future I plan to use the Facebook page associated with Otter Spotter to increase the number of hits to the site. I will also post more frequent blog posts to provide new links for the Facebook Page and keep the content of the website fresh. I would also like to consider exploring avenues of social networking such as Twitter and utilizing mobile phone devices.

Otter Spotter as a Resource for AZA Institutions

The AZA Educator's survey also showed positive results as to the usefulness of site as an otter information resource. 90% of participants said that the content of the site was at least moderately useful with 70% of those believing it to be very or extremely useful. 83% of zoo educators that took the survey said that they were at least moderately likely to use the site as a resource for their facility. The comments and suggestions from the last question of the AZA Educator's survey also indicate that the site will be used as a resource (table 2). Comments like "It is a great site and informative for all ages", "This is a great user-friendly resource", and other quotes from table 2 help to show that the site is being well received by the AZA community as a resource.

The otter species fact pages were selected by AZA Educators as the most useful resource with 36%, but based on some of the comments it appears the fact sheets will only be used to supplement already existing animal fact sheets that most institutions have created for their staff (Appendix D). This is most likely because the fact sheet pages are not new or novel; much of the information in them can be found on other zoo's websites or other resources. However, the comments for the AZA educators and the survey results indicate that they are excited about the lesson plans and research stories as new resources for their facility. Lesson plans were ranked as the second most useful resource on the site and comments suggest that the plans will be used by AZA educators in their camp and school programs. One responder even commented that some of the activities could be adapted to other animals if the institution does not hold otters.

Responses regarding the "Research and Conservation" section are also positive and imply that AZA educators will continue to use this resource. One response was "Liked having quick access to recent research! Will work great for getting new educators up to speed" and another

said “would like more information on the conservation and research papers, contact info for those students” (table 2). These comments and the fact that the research and conservation section was ranked as the third most useful resource, only 1% behind lesson plans, indicates that AZA educators will use this section to connect their audiences with the research happening in the field. Maintaining the “Teacher Resources” section, the “Research and Conservation” section, and the blog will be crucial in maintaining AZA educators usage of the site.

Otter Spotter as an Educational Resource

AZA educators also indicate that they plan on using the teacher resources found at Otter Spotter. 72% of AZA educators ranked the teacher resource section as at least moderately useful, 57% of those ranked it as very or extremely useful. 53% of AZA educators indicated that they are at least moderately likely to use the lesson plans provided. Lesson plans were also ranked as the second most useful resource on the site with 23% of responders choosing it as the most useful (figure 13).

Of the respondents, 36% said they were slightly or not at all likely to use the lesson plans. However, this question also included a write in comments section so participants could expand upon their answers. Several responders indicated that although they are AZA educators, they do not teach classroom exercises and therefore the lesson plans would not be useful. Also, several of the write in comments indicated that they did not teach at an elementary level and therefore the lesson plans were not applicable to them. Therefore, I can conclude that while the teacher resources, including lesson plans, are useful it may be helpful for AZA educators to provide some other types of programs such as activities for on-site zoo tours, potential outreach programs, and on-site demonstration scripts to better suit the needs of the AZA audience

working with the public outside the classroom. Also, expanding the age range of the lesson plans provided may help educators working with teens.

The number of page views to the various educational resources on the site also gives us an indication of the usefulness of these resources. The “Science Lesson Plans” page was the most viewed page, aside from the home page, with 222 hits. “Math and ELA lesson plans” page was the 5th most popular page with 123 hits and the main teacher resources section was the 8th most popular with 104 hits. Additionally the “playful otter” section, which also falls within the ‘teacher resources’ section, was the 9th most popular page with 100 hits. These four pages combined make up all the teacher resources available on the website. Since all four of these pages were ranked in the top ten most popular pages, with “science lesson plans” being the most popular page over all, I can infer that the lesson plans are being utilized. Based on the popularity of this section and also the comments from AZA educators I plan to add more science lesson plans, more resources to be used on zoo grounds, and resources for a wider range of ages.

Effectiveness of Otter Spotter lesson plans

Based on the results of the pre and post quizzes from the Otter Spotter Workshops it appears that the lesson plans are an effective way to teach elementary students about otters. For the 32 students participating in these workshops the average scores on the pre and post-quiz were 75% and 95% correct respectively, and the differences in overall averages from the pre-quiz compared to the post-quiz were statistically significant (figure 14).

One potential problem with the workshops was that several of the questions received 100% correct answers in both the pre and post quiz (table 3). This indicates that the students knew more about otters coming into the workshop than expected. One possible reason for this is that these students were selected from past Summer Camp participants at SPZ. Therefore, they

may have a greater knowledge of the animals held at SPZ than the general public. In the future, I would like to include students outside of the SPZ community by partnering with teachers willing to take the pre and post-quiz in addition to implementing the lesson plans. These teachers could report back their results to the quiz to be added to our sample size in order to have a more varied group of participants.

Another problem observed with the workshops was that it appeared the multiple choice options on the survey may have allowed students to pick the correct answer through the process of elimination without actually knowing the answer. For example, the question “Where does an animal find everything it needs to survive?” was answered correctly with 100% of students selecting the answer “habitat”. However, during the workshops an informal poll of students showed they were not able to articulate what a habitat was. Therefore, it can be assumed that perhaps they recognized the word and thus could select it as the right answer but did not actually know the definition. Similar results were found with the word “pollution”, “carnivore”, “omnivore”, and “herbivore”. All the students had heard these terms but were unable to correctly define them during the workshop. In addition to the process of elimination, participants may have gone to their parents or the Internet for help. Unfortunately, using an on-line multiple-choice quiz it is difficult to ensure that the students actually know the definitions of their selections and they are answering the questions themselves. It might have been more effective if I could have verbally quizzed the students individually before and after the workshop.

One of the most interesting results was from the question “What type of otters are housed at the Seneca Park Zoo?” 66% responded with North American river otter and 34% responded with sea otter (table 3). This is most likely due to a lack of interactive information at SPZ about the otters. Studies have shown that while signs at zoos can be useful tools for some, most

people, especially children, learn more from interactive media components at zoos (Kleiman and Thompson et al.2010). This emphasizes the need for a website like Otter Spotter to provide a place for zoo visitors to compare species of otter and understand that not all otters are the same. The post-quiz did result in 100% of students choosing North American river otter as the type of otter at SPZ after participating in the workshop. This result also supports studies showing that the most effective interpretive tool at zoos is people; visitors who talk with zoo staff or volunteers learn more than from those who just read signs and interactive elements (Swanagan 2000; Kleiman and Thompson et al.2010).

The only question that saw a decrease in correct answers was “What do River Otters eat most of the time?”. This question went from 100% to 94% (table 3). I believe that this was due to confusion during the “Web of Life” lesson plan. In this lesson plan we created a ‘web of life’ using yarn and each student was assigned an organism that may be present in a wetland such as plants, bugs, fish, and otters. During the workshop it appeared some students were becoming confused believing the otters ate all of these items. This was explained to the group but due to the timing of this activity, the last item in a very busy agenda, some of the students may have left the workshop without fully understanding the concept.

This confusion caused by the “Web of Life” activity was also apparent in the responses to “Do we have River Otters here in Rochester, NY?”. In the pre-quiz 34% of student responded with yes, 66% responded with no, and 0% responded with we used to but they are extinct now (table 3). For the post-quiz, 75% of students responded with ‘yes’, 16% with ‘no’, and 9% with ‘we used to but they are extinct now’ (table 3). Here there is an increase in the correct answer but also an increase in the response to ‘we used to but they are extinct now’. The topic of the otter reintroduction was also introduced at the end of the workshop during the “Web of Life” activity.

This concept may have been too advanced for the younger participants of the workshop. In future programs, I would eliminate this activity for younger students. It was included in the workshop because it is listed as a 4th-5th grades, and there were 4th graders present, but normally it would not be used for 2nd and 3rd graders. Due to time constraints and the nature of the mixed age group I utilized all of the lesson plans for all the students present.

Our belief that the otter's extirpation and reintroduction is too advanced for young children is supported by the writings of David Sobel (Antioch New England Institute) who studies age appropriate environmental literacy. Sobel believes that children today are being inundated with images and ideas of "doom and gloom" which includes overwhelming topics like endangered species, loss of habitats, and pollution (Sobel 1996). These topics can create a sense of helplessness and can actually make children less interested in protecting the natural world (Sobel 1996). Sobel recommends that children under 10 years old (or roughly 4th grade) should not be exposed to "doom and gloom" messaging as part of their environmental education (Sobel 1996). In addition to being an overwhelming topic, the concept of an animals being extirpated appears difficult for children to understand; many students are taught that "extinction is forever" and cannot fully grasp the idea that an animal can be extinct from an area and come back. It is contradictory to the concept of extinction commonly seen in educational materials and the media. In the future, I would not attempt this lesson with any child younger than 4th grade.

Making Connections

One of the goals of this project was to create a place for multiple parties interested in otters to connect and share information. Thus far it has been an effective tool. The otter SSP plans to use this site as their main website, making Otter Spotter the official informational website about otters for the AZA. Otter Spotter was also recently approached by Frog Watch, an

amphibian conservation program through the AZA, to partner with the site to promote clean water for otters and amphibians. Additionally I have received several e-mails from other AZA institutions offering to provide content for the site or asking for permission to use certain elements of the site for their own institutions. This helps to bring otters to the forefront of conservation education in zoos and helps to connect multiple organizations with similar goals for a more powerful effect.

Using the statistics from the site can also help to provide more information for the interested parties about the needs of their audiences. For example, after seeing that the giant otter was the top search engine term and the giant otter page was the third most visited page on the site I contacted the giant otter Education Advisors to discuss future blog posts that could focus on giant otters (figures 9 and 10). The interest in the giant otter is most likely due to their size. Many studies have shown that children and adults find larger animals more appealing and even spend more time watching them at a zoo (Ward et al. 1998). Giant otters are also an endangered species which can also increase the value and appeal of a species (Jakobsson and Dragun 1996). Knowing that visitors to the site have an interest in this species can help to tailor our content to meet the needs of our audience and also may increase visits to the site.

By connecting with field researchers Otter Spotter is able to post photos, videos, and information directly from the field. I have made contacts with researchers in Tanzania, Sri Lanka, Brazil, Peru, and of course, RIT, who have either provided or will be providing content to the site. The ‘Research and Conservation’ section of the site was ranked as the 3rd most useful resource with 22% (figure 13). There were also several comments about how useful this section is for connecting educators with current research in the field (table 2).

The site is also helping us to connect with members of the general public with an interest in otters. Otter Spotter have received several e-mails from individuals who have found the site and would like to know more about how they can get involved in their local otter research. One individual reported an otter sighting in Monroe County to Otter Spotter. Therefore, I will be adding a sightings page in order to encourage citizen science and to provide interested researchers with this valuable information.

Challenges and Rewards

Throughout the course of this project I faced several stumbling blocks. Since I lacked web design skills and software, I was initially forced to depend on others to build, design, and maintain the website. New content or edits needed to go through my volunteer web-designer, which made making changes difficult. However, once I started using Wordpress I was able to update and maintain the site on my own. This was extremely helpful in allowing me to add and edit content in a timely fashion. Also, over time I will be able to keep the content on the website fresh by frequently adding blog posts and resources. This will be key in increasing traffic to the site. In addition to being easy to use, Wordpress is also inexpensive and I believe it could be a great tool for many environmental education websites.

Another challenge was the webcam. Initially this was designed to be a much larger part of the project providing a live feed of the otters at SPZ. Unfortunately, the technology at SPZ could not handle broadcasting this footage. The camera was installed and will be useful in capturing short videos, but overall, it is not being used as intended. However, one positive result is that due to the dialogue about the webcam with management at SPZ, they are now considering the possibility of increasing their bandwidth to be able to handle webcams and distance learning programs.

A third challenge I faced was support from the associated institution. Otters are not currently a focus for the SPZ Public Relations and Education Departments. Therefore, it was difficult to convince certain parties that this site was worthwhile and should be allowed. In order to use footage and images from SPZ, I needed their support. However, my involvement with the AZA and the Otter SSP helped to make this site a possibility. As the creator of Otter Spotter, the Otter SSP appointed me as the Education Advisor for the North American river otter and I am charged with creating education materials for zoos and aquariums across the country. Having this title and being actively involved in an AZA committee reflects well on my employer, the Seneca Park Zoo Society. Therefore SPZ became more willing to participate in the Otter Spotter project. This title is also an excellent opportunity for me to network with the AZA community. I would not have received this title if it were not for the Otter Spotter site.

For future projects I would advise anyone interested in creating a website like this to first, make sure they have buy-in from all partnering organizations and a promise for long term support. Second, the resources needed, such as bandwidth capabilities, should be determined and it should be verified that the supporting institutions can support these needs. Finally, I would suggest using a tool like Wordpress to create the site to due to the ease of use and low cost.

CONCLUSIONS AND FUTURE WORK

There are a few changes I would like to make to the site in the future. Though overall the lesson plans are an effective way to educate children about otters, further work evaluating each lesson plan individually could be helpful to determine their effectiveness. It would be useful to test each lesson with a group of students comprised of only the intended age group for which it was designed. In the future, it may be preferable to utilize a more random selection of students,

not past participants of SPZ programs, and to test their base knowledge of the subject before designing the pre and post-quiz. Also, the workshop could have been more effective if it were made up of several shorter one-hour workshops to avoid the group being overwhelmed with such a busy agenda in a three-hour workshop.

The site will continue to be maintained and expanded by myself and other members of the Otter SSP. More lesson plans and other teacher resources will be added over time based on the needs of AZA educators and teachers. I will also be adding a page for all thirteen species of otter rather than only the five species of river otter found in AZA facilities.

There are several more advanced components I would like to add as well. First, I want to begin to include guest posts from other zoos and field researchers. I would also like to add a video blog section with tours of otter exhibits and habitats, interviews with otter keepers, interviews with researchers, and footage of training demos from zoos and aquariums across the country. Another possibility is to implement an “Otter Awareness Day” for students and zoo visitors to get involved with otter programming at AZA facilities. Otter Day could potentially include a river clean up component to make this an exciting citizen science and habitat restoration project. There are examples of other animal awareness days, such as International Vulture Awareness Day, Orangutan Mom’s Day, and World Turtle Day, which I could use as templates. Another citizen science element that could be incorporated into this project is the addition of a sightings page as a place to report possible otter sightings. This could be done through a simple form on the website and could potentially include GPS coordinates. This would help students at RIT conducting otter research as well as the conservation team at Seneca Park Zoo and perhaps researchers in other areas.

The data from Wordpress, the AZA educator survey results, and the results of the student workshop confirm our hypothesis that Otter Spotter is an effective and useful tool for environmental education regarding otters, especially for the AZA community. Based on the statistics and evaluations I can determine that Otter Spotter is a well-used and well-received resource. With the changes suggested, I aim to increase site usage and continue to make the site a more impactful resource to encourage awareness and conservation of otters.

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APPENDICES

APPENDIX A: Website text without photos and graphics

Welcome to Otter Spotter!

Otter Spotter is your source for otter information, teacher resources, and otter news. This is a collaborative project with the Seneca Park Zoo, Association of Zoos and Aquariums (AZA), and the Rochester Institute of Technology (RIT).

North American River Otters are incredibly interesting animals that are fun to watch and found in zoos all over the country! What is even more fun, is that otters most likely can be found in the wild in your local rivers and wetlands!

Explore our site to learn more about North American river otters and other otter species you might see in Zoos. We also have a teacher resource section with lesson plans to be used in the classroom!

We hope you enjoy your visit to Otter Spotter! Please if you have any questions, comments, or ideas for new content please contact us at OtterspotterNY@gmail.com. Content is compiled by Emily Coon-Frisch who currently works as the On-Site Education Coordinator at the Seneca Park Zoo, serves as an Education Advisor for the AZA's Otter Species Survival Plan Committee, and is a graduate student at RIT.

Otter Classification Page:

“What are they related to?” This is probably one of the most common questions heard in zoos about almost any animal. Below you will find a summary of the taxonomic classification of otters, photos of otter relatives, and a list of all thirteen species of otters!

Class: *Mammalia*

Order: *Carnivora*

Family: *Mustelidae* -*Largest family in the order Carnivora*

***Mustelidae* also includes:** Click through slideshow below to see common mustelids

Stoats

Subfamily: *Lutrinae*

Genus: 6 separate otter genera

Species: 13 species of otter

North American Species

[North American River Otter](#)*

Sea Otter*

South American Species

[Giant Otter](#)*

Neotropical Otter

Marine Otter

Southern River Otter

African Species

[Spotted Necked Otter](#)*

[Cape \(African\) Clawless Otter](#)*

Congo Clawless Otter

Eurasian Species

[Asian Small Clawed Otter](#)*

Eurasian Otter

Hairy Nose Otter

Smooth Coated Otter

**Denotes otters you can see in an AZA Zoo or Aquarium*

Species Fact Sheets: *North American River Otter (Lontra canadensis)*

Body length: 1.25m both males and females (Kruuk 2006)

Weight: Males 9 Kg and females 8 Kg (Kruuk 2006)

Color: Dark brown with a slight variation from upper side to underside with larger nose than some other otters (Kruuk 2006)

Lifespan: About 10 years in the wild and up to 20 years in captivity (Sacramento Zoological Society 2011)

Feet: Fully webbed feet with small circular scent glands on the middle pads of the inner toes (Kruuk 2006)

Range: Historically, in most major waterways in the US and Canada. Currently in Canada as far north as trees grow, Alaska, California, Utah and the all of the East Coast from New Foundland to Florida (Kruuk 2006)

Home Range: Have a home range of about from 6km to a maximum of 250km of river/lake/ocean shoreline (Kruuk 2006)

Habitat: Rivers, streams, bogs, and lakes in undeveloped forests or developed towns. Also can be found in rocky sea coasts. (Kruuk 2006)

Behavior/ Social Structure: North American river otters can be found living alone but often live in family groups of one or two mothers with cubs or in groups of unrelated males. (They live in larger groups at sea). They have been knows to hunt cooperatively within these groups. Males and Females live independently of each other for the most part, with some overlap in home ranges. Can be both diurnal and nocturnal and are active year round (Kruuk 2006).

Communication: Communicate through scent marking at latrine sites through feces, urine and anal gland secretions (Ben-David). Also have scent glands on the feet for marking soil and piles of debris (Kruuk 2006). They also communicate vocally with whistles, grunts, chuckles, snorts, chirps, and growls (Kruuk 2006)

Diet: Mostly fish, but also occasionally frogs, crayfish, small mammals, birds, and small reptiles (Kruuk 2006)

Reproduction: Typically have one to three cubs but can have as many as five. Gestation is about 60 days but they can have delayed implantation Stay with mothers for 10 month or more.

Conservation Status: Listed as Least Concern. Though it is not threatened/endangered, trapping for pelts eradicated river otters from much of their historical range. CITES Appendix II (IUCN 2011).

Species Survival Plan (SSP) Status: Green (captive population can maintain 90% gene diversity for 100 years) (AZA 2011).

Asian Small Clawed Otter (Aonyx cinereus)

Body length: 80cm (Kruuk 2006)

Weight: Less than 3.5kg (Kruuk 2006)

Color: Dark brown with white throat and sides of mouth (Kruuk 2006)

Feet: Fully webbed feet with small claws and small circular scent glands on the middle pads of the inner toes (Kruuk 2006)

Lifespan: ~15 years in captivity (Lariviere 3).

Range: Throughout Southeast Asia, southern India, southern China, Malaysia, Indonesia, and into the Philippines. (Kruuk 2006)

Habitat: Rivers, streams, rice paddies, marshes, costal areas, and mangroves (Kruuk 2006).

Behavior/ Social Structure: Live in social groups of 5-15 otters. Groups most likely made up of one female with offspring of one or more years. Do not appear to hunt cooperatively. (Kruuk 2006)

Communication: Scent mark with spraints (Kruuk 2006)

Diet: Crabs and other invertebrates (Kruuk 2006)

Reproduction: Can have up to 7 cubs in one litter. (Kruuk 2006)

Predators: Mostly humans (Lariviere 3)

Conservation Status: Listed as CITES Appendix II. IUCN listed as Vulnerable with a need to control fur poaching in order to maintain and increase populations. Also, more research is needed to monitor populations is needed (IUCN 2011).

Giant Otter (Pteronura brasiliensis)

Body length: 2m (Kruuk 2006)

Weight: 32 Kg (Kruuk 2006)

Color: Dark brown with white/yellow throat patches, which are unique to each individual (Kruuk 2006)

Feet and tail: Fully webbed feet and along broad, flat tail (Kruuk 2006)

Lifespan: 10-15 years (Kruuk 2006)

Range: Inland of South America, mainly in the Brazilian Amazon (Kruuk 2006)

Habitat: Dense forests with slow moving rivers, oxbow lakes along the river, and small creeks. They are strictly diurnal or active during the day (Kruuk 2006).

Behavior/ Social Structure: Live in groups of about 10 or fewer animals. Groups are made up of a male and female pair and their young from several generations. One female will breed and other members of the group will provide food and protection (Kruuk 2006).

Communication: Vocal communication between otters and scent communication with latrine sites where vegetation has been removed and the otters spread scent marks through feces, urine, gland secretions, and rolling. (Kruuk 2006)

Diet: Primarily Fish (Kruuk 2006). Consume about 3kg per day, about 10% of their body weight (Kruuk 2006).

Reproduction: Normally have two cubs. (Kruuk 2006)

Predators: Humans. Young may be attacked by Jaguars and caimans. They are also effected by habitat destruction and water pollution (IUCN 2011).

Conservation Status: Endangered with less than 1000 left in the wild. The endangered status is due to habitat loss (rainforest destruction), hunting for pelts, and pollution. (Kruuk 2006). Listed as CITES Appendix I.

Species Survival Plan Status: Red (AZA 2011).

Spotted-Necked Otter (Lutra maculicollis)

Body length: >1m (Kruuk 2006)

Weight: 3-6 kg (Males slightly larger than females) (Kruuk 2006)

Color: Dark brown on back with irregular patches of white underneath (Kruuk 2006)

Feet: Large webbed feet with claws (Kruuk 2006)

Lifespan: ~ 8 years in the wild (Lariviere 2002)

Range: Most of Africa South of the Sahara and North of the Zambezi River with a few exceptions in areas of Eastern South Africa (Kruuk 2006).

Home Range: ~ 5-16km² , typically larger for males than females (Lariviere 2002)

Habitat: Open lakes, rivers, and dams with rocky shores, dense shrubbery and forest. Do not travel far from the water because they are not well adapted to moving on land (Kruuk 2006).

Behavior/ Social Structure: Do not hunt cooperatively but live in groups of about five individuals. Groups can be made up of all males or a female with her offspring. Social living may help to prevent predation from crocodiles and eagles who share their habitat (Kruuk 2006).

Communication: Two main vocalizations: a high pitches whistle for play-fighting and aggressive repeating shrill chatters when threatened (Lariviere 2002)

Diet: Feed mostly on fish, but also eat crabs, frogs, and insects. In Lake Victoria and Lake Malawi they feed almost exclusively on cichlid fish (Kruuk 2006).

Reproduction: Mating occurs in July and gestation last 2 months and litters can consist of 1 to 3 pups; young stay with mothers for up to one year (Lariviere 2002)

Predators: Crocodiles and humans (Lariviere 2002)

Conservation Status: Listed as Least Concern and CITES Appendix II (IUCN 2011). Numbers are declining due to pollution, unsafe fishing practices, and habitat destruction. Also they often hunted for furs and food (IUCN 2011).

Cape Clawless Otter (Aonyx capensis)

Body length: 95 cm (Lariviere 2001)

Weight: up to 18kg (Lariviere 2001)

Color: Brown with white underbelly and white below eyes just above the nose (Kruuk 2006)

Feet: Large forefeet with no webbing or claws and long fingers (Kruuk 2006)

Lifespan: ~13 years in captivity (Lariviere 2001)

Range: Throughout Africa south of the Sahara Desert, with the exception of the Congo Basin (Kruuk 2006)

Home Range: 50km. Males home ranges can overlap the ranges of several females. Females have smaller home ranges, which can overlap with their offspring (Kruuk 2006).

Habitat: Wetlands, lakes, rivers, and streams; also found in suitable coastal regions, where fresh water is available (Kruuk 2006)

Behavior/ Social Structure: Can live in groups/families up to eight individuals but hunt individually (Kruuk 2006)

Communication: Communicate through toilet sites and scent marking through urine, rolling, scraping, and rubbing. Also communicate through vocalizations such as whistles, huffs, growls and screams. (Kruuk 2006)

Diet: Mostly crabs, fish (mostly bottom feeders) and mollusks. Use long clawless toes to forage for food in substrate (Kruuk 2006)

Reproduction: Breeding occurs throughout the year with a gestation of 63 days. They do not have delayed implantation. Produce 1-3 cubs per year and the young will leave the mother after one year (Kruuk 2006)

Predators: Crocodiles, fish eagles and humans (Lariviere 2001)

Conservation Status: Have been hunted for fur and are losing habitat due to destruction. However, some research shows they may actually benefit from human encroachment because eutrophication of waterways lead to an increase in crabs, their primary food source (Kruuk 2006). Listed as CITES Appendix II, though the population in some areas is listed as Appendix I (IUCN 2011).

Research and Conservation Section:

Research at RIT

A research group at the [Rochester Institute of Technology\(RIT\)](#), led by [Dr. Lei Lani Stelle](#) (University of Redlands), began researching the [re-released otter populations](#) in Western New York in 2002. Links to more information about the research produced by the RIT otter group is below.

Prey Preference and the Optimal Foraging Theory with Zoo Otters

- Prey preference of the North American River Otter (*Lontra canadensis*), evaluated based on optimal foraging theory
- A thesis by Leslie Thompson, 2011

Prey preference of the North American river otter (*Lontra canadensis*) was studied in a captive population and evaluated according to optimal foraging theory. Optimal foraging theory can provide explanations and help make predictions about prey preferences based on the theory that animals should maximize their caloric intake and minimize energy output while foraging.

To determine how otter prey preferences match up with this optimal foraging models an RIT graduate student, Leslie Thompson, released Live sunfish, brown trout, and crayfish into the otter exhibit pool. The otter's search, chase, and handling/eating times were recorded.

When provided with choice of sizes (size trials), otters showed a significant preference for catching and eating large prey first. When given a choice of species (species trials), otters significantly preferred to catch and eat brown trout first. Also, when given dead food items on land the brown trout remained the favorite.

The preference for brown trout was expected as the prey provided significantly more energy per unit time spent catching it. Though the brown trout did not have significantly more calories than the sunfish, they did require significantly less energy to catch and consume.

Therefore, preferences for brown trout matched Thompson's predictions for all the size trials and for all species trials.

Captive river otters exhibit prey preferences that match with predictions based on optimal foraging theory, which can provide insight into dietary habits of wild otter populations. Once again, research with valuable implications for wild animals comes from researchers and Zoo staff working together.

Distribution of Otters in Monroe County, NY

- Distribution Patterns of River Otters, *Lontra canadensis*, within Monroe County, NY
- A thesis by Darren Doherty, 2010

A recent article on the [National Wildlife Federation Blog](#) discusses the importance of water quality for river otter survival. This topic has also recently been investigated by graduate students at [RIT](#). A thesis project by Darren Doherty completed in 2010 was designed to determine what factors affected habitat selection in North American river otters and how water quality may play a role in this selection.

In his thesis, *Distribution Patterns of River Otters, Lontra canadensis within Monroe County, New York*, Doherty studied the water quality along several creeks within Monroe County, New York. Doherty compared water quality (determined through macroinvertebrate sampling and water chemistry analysis) between sites with known otter latrines and sites without known otter latrines to determine if there was any correlation between water quality and otter habitat selection. Otter latrines/spraint sites were mapped using Geographical Information Systems (GIS).

Doherty's statistical analysis did not show a significant correlation. However, due to a small number of known otter latrine sites it may be difficult to determine a statistically significant difference between locations.

Studies like these are extremely useful for other otter researchers in the field. Doherty's mapping of latrine sites (see above) is a tool that can be used for others to track and monitor otter populations. Also, if further steps are taken future studies like this may help researchers to more closely monitor otter populations and be more prepared for future reintroduction programs.

Environmental Enrichment with Zoo Otters

- Environmental Enrichment Effects on the Activity of a Nearctic River Otter
- A thesis by Kenny Nelson, 2009

A masters thesis completed by Kenny Nelson at RIT was designed to determine how environmental enrichment affected the behavior of a [Seneca Park Zoo](#) North American River Otter. Enrichment is regularly used in Zoos to change a behavior in a captive environment. This can improve animal welfare by bringing out natural behaviors and combating stereotypic behaviors. A stereotypic behavior is the loss of naturalistic behaviors in captive animals, which are replaced by abnormal behaviors such as pacing. For the otter in the study, the ZooKeeping staff was seeing a repetitive swimming behavior.

Enrichment can be adding objects, smells, or food to an animal's exhibit or even modifying enclosure design in an attempt to increase naturalist behaviors in a captive environment. For his work, Nelson presented four enrichment initiatives to the otter. These items included live fish, frozen fish, a swim tube, and PVC pipe scent tubes. These items were giving in a random order and placed throughout the exhibit.

The results showed that food (i.e. live fish and to a lesser degree frozen fish) was most effective in deterring a stereotyped swimming pattern. Nelson also observed a pattern of where and when the otter spent most of his time; data showed that the otter preferred to spend mornings in the lower level of the exhibit and the afternoons in the upper level. Food enrichment was more effective when given in the afternoon suggesting that the otters stereotypic behavior was occurring out of a lack of ability to forage.

Results like these can be an enormous help to animal husbandry staff at Zoos and Aquariums all around the country. Looking at these results the animal husbandry staff can create more opportunities for the animal to forage (by adding enrichment) and therefore increase the

animal's welfare (by decreasing stereotypic behaviors). Studies like this can determine which kind of enrichment works best for a specific species. Projects like these are exciting ways for researchers and Zoo staff to work together to better the lives of animals.

River Otter Genetics in Monroe County, NY

- The Use of Molecular Scatology to Study River Otter (*Lontra canadensis*) Genetic
- A Thesis by Barbara McElwee, 2008

As we have learned in the [Otter Research and Conservation](#) section, North American river otters were extirpated throughout all of Western New York due to habitat loss, pollution, and trapping. We also know that river otters were released into the waterways of Western New York. In [Distribution of Otters in Monroe County, NY](#) we learned that RIT researchers surveyed three local creeks to record data on toilet site locations and collect feces in order to determine distribution, as well as perform dietary and genetic analyses.

For her thesis, Barbara McElwee of RIT used molecular scatology to extract DNA from feces in order to determine the amount of genetic diversity of the reintroduced river otter population. McElwee also analyzed otter scat samples from British Columbia and the Thousand Islands. McElwee used a Stool Mini Kit to extract mitochondrial DNA from 177 samples.

About 16% of which were successfully amplified and sequenced. The sequenced scat samples identified two otter, 14 raccoon, one beaver, one coyote, and three fish (common carp, golden redhorse, and shorthead redhorse).

After using mitochondrial DNA to determine the species, McElwee utilized microsatellite DNA to help determine the genetic variance between individuals.

Microsatellite DNA is located on chromosomes within the nucleus of the cell and is inherited from both parents. This should enable identification of individuals from microsatellite DNA, but may not necessarily enable determination of species. McElwee used this method to analyze the

otters scat samples and included a raccoon sample as well. Though it was not expected, the river otter microsatellite primer successfully identified microsatellite DNA from the raccoon DNA sample, despite the genetic difference between the two species.

Therefore, the results suggest that the microsatellites, that were thought to be otter specific, were not and thus skewed the results. After trying different primers, McElwee determined that out of ten river otter microsatellite primers: three river otter primers do not work with raccoons, five primers produced identical or nearly identical sequences, and two primers need more research to determine if they work with raccoons. These results stress the importance of confirming species identification from fecal samples using mitochondrial DNA prior to the use of microsatellites to avoid misleading results.

Diet of Otters in Monroe County, NY

- Food Habits of a Re-Introduced River Otter (*Lontra canadensis*) Population in Western New York-Annual Diet, Temporal and Spatial Variation in Diet and Prey Selection Conclusions:
- A Thesis by Melissa Skyer, 2006

You may have learned in another recent post, [Scat Happens](#), about the importance of scat in researching otters. The thesis research of Melissa Skyer at the [Rochester Institute of Technology](#), *Food Habits of a Re-Introduced River Otter (Lontra canadensis) Population in Western New York-Annual Diet, Temporal and Spatial Variation in Diet and Prey Selection Conclusions*, used scat to determine the types of prey items being eaten by the [re-introduced river otters from the New York River Otter Project](#). Skyer filtered scat samples through a filter small enough to retain fish scales and crayfish parts.

Skyer was able to determine crayfish sizes (by measuring claw size), fish type (by identifying scales), and fish age (by looking at the annual growth rings on the scales). The scales were analyzed underneath a microscope in order to determine their identity and age.

After analyzing 71 scat samples from 3 different creeks within Monroe County, New York Skyer determined that sunfish was the most common fish found in otter scat, followed by carp and brown trout. Crayfish was also a common food item, occurring in 54% of the scat samples.

What is interesting about this research is there is often concern that otters will be competing with fisherman for game fish. However, because Skyer was able to determine prey type and size, it appears that otters are eating smaller sunfish, crayfish and carp. None of which are highly sought after by game fisherman. Some research even shows that otters may benefit fisherman by eating the smaller fish that compete with larger game fish.

Also, based on the prey analysis of other successful otter re-introduction projects we are seeing similar patterns in the otters released in Western New York. Therefore, this implies that the otters here have enough prey and the appropriate types of prey items to maintain healthy populations!

So there you have it, just one more example of the importance of scat!

International Research and Conservation

In addition to the otter [research at the Rochester Institute of Technology](#) there are many exciting research and conservation projects happening around the world. Many of these projects are funded and supported by [Association of Zoos and Aquariums](#) Zoos. Click on the links below to learn more about these projects.

Protecting Otters in Rubondo National Park, Tanzania

Since 2007, otter researcher Jan Reed-Smith's work with the East African Otter Project (EAOP) has concentrated on a little-known park located in the southwest corner of Lake Victoria. Rich with elephants, giraffes, chimps, hippos, crocodiles, and otters-Rubondo National

Park is one of the few places where the historic Lake Victoria shoreline forests still exist.

As fish poaching has increased over the past two years due to poverty, poor land management, and an increase in fishermen from other areas-the East African Otter Project has stepped up efforts to work with local communities on protecting natural resources on Rubondo Island. With support from the Columbus Zoo, the EAOP provides books in Swahili and organizes field trips to Rubondo Island for members of local Conservation Clubs. Tanzanian Hobokela Mwanjengwa received a scholarship from the Columbus Zoo to attend one year of training at the African College of Wildlife Management- training that will help her work effectively with local communities on sustainable use of their natural resources and an improved quality of life.

Article provided by [Columbus Zoo and Aquarium](#), from their 2010 “Commitment to Conservation” report, edited by Rebecca Rose.

Teaching Local Biologists in Asia to Track Otters

A Zoology professor at the University of Peradeniya in Sri Lanka, Dr. Padma de Silva has served as the chairperson of the IUCN Otter Specialist Group and currently serves as the Asian Coordinator for this group. From Nepal to Thailand, Sri Lanka to Cambodia, Dr. de Silva has traveled the world to study otters, educate children and adults, and organize otter experts for in-country workshops on otter survey techniques.

Dr. de Silva notes that in many parts of Asia, people are not aware of the existence of otters in their wetlands. Since Otters are excellent indicators of healthy wetlands and people depend on clean, functioning wetland ecosystems for their survival, conservation of otters and their habitat is imperative. After organizing successful surveys of otters in India, Sri Lanka, Thailand, Indonesia, Vietnam, and Bangladesh, Dr. de Silva turned her attention to training local

biologists on otter survey techniques. In 2008, a workshop held in Cambodia taught participants how to identify otters from specimens, skins, and photographs from camera traps and how to carry out surveys for otters using direct and indirect evidence. Scroll through the slideshow below to see photos of biologists learning new tracking techniques in Dr. de Silva's workshops.

Article provided by [Columbus Zoo and Aquarium](#), 2010 "Commitment to Conservation" report by Rebecca Rose.

Otters in the News Section:

Old Otters, New Tricks

The [Seneca Park Zoo](#) is proud to house the oldest otter in captivity! Admiral the North American river otter celebrated his 21st birthday on January 29th of this year. This is really a milestone for him and for the Zoo! High standards in animal husbandry and veterinary care are crucial for the longevity of the Zoos animals and Admiral's longevity is just one example of this accomplishment. In the wild North American River Otters live to be about 10 years and about 20 years in captivity (at max!) but Admiral is still going strong!

In fact, just a few years ago Admiral entered a training routine with his ZooKeeper Catina learned many new trained behaviors that were used in the [Seneca Park Zoo's](#) Summer Animal Demonstrations. Admiral has been impressing crowds for the past two years with his behaviors like his high dive off the waterfall, target training, and even recycling!

Of course, these are not "tricks" Admiral is doing but trained behaviors that contribute to his healthy life. Training is a form of enrichment that helps to keep animals in conservation care mentally and physically active. Training also helps him to form bonds with his keepers and mimic some of the behaviors he would do in the wild. Training is a win-win for both the animals and the Keepers!

We hope for Admiral (or Ady as his Keepers like to call him) has many more years to come!

Speak up for Otters and Clean Water!

A recent blog post from the [National Wildlife Federation](#) explains how important clean water is for otters (and for us!) and how possible cuts threaten otters and wetland habitats. In the post [Weakening the Clean Water Act Would be Otter Nonsense: A Wildlife Promise](#) author Anne Bolen outlines the history of the otter decline and reintroduction. Anne reminds us that there is still a chance we could lose otters if we don't keep our waterways clean.

We need to continue to protect otters and our wetlands. So be sure to click on the link at the end of the article to send a letter to your politician and spread the word to all your friends!

Speak up for Otters!

Will Brake for Otters!

While searching for some fun new otter photos, which you will find under the [Otter Photos](#) section of the blog, I came across the above photo. This is an otter crossing sign found in the United Kingdom (UK). The UK is home to the Eurasian river otter (*Lutra lutra*), which is a one of the 13 otter species and is listed Near Threatened with [IUCN](#) Red List. According to IUCN one of the many reasons for the decline of the Eurasian river otter is car strikes. This is a good thing to remember if you live in river otter habitat. As successful reintroduction projects bring otters back to areas populated by humans we must remember to brake for otters!

Why We Love Otters: Part 2

Check out this [wonderful video](#) taken at the San Diego Zoo. You may remember one of our first posts about [Why we love otters](#), where we discuss Zoo visitor's fascination with these amazing animals, and some reasons why we are all so fascinated. This video is one of the best examples of that I have ever seen. ([Video of boy racing an otter at the San Diego Zoo](#)). Do you think this little boy and his family will ever forget this encounter? And now that this video has been shared across the globe, we can all share in that memory and we can all understand a little better just why we love otters!

Teacher Resources Section (All Lesson Plans found in APPENDIX B):

Welcome Teachers!

Below you will find lesson plans suited for both use in the classroom or as pre-visit materials for your trip to the Zoo.

Clicks below for lesson plans by subject

[Science Lesson Plans](#)

[Math Lesson Plans](#)

Prepping your class before your visit can help you to get the most out of your time at the Zoo.

You might want to identify one or two animals to learn about before your visit to help your group to focus. We suggest otters! :)

River otters are a very popular topic in schools, especially if they are native in your area. This is a great way to encourage the appreciation of animals in your own backyard.

Not only are these fun, energetic, and adorable animals easy to admire but river otters also fill a valuable niche in their habitat and are very important indicators of the health of the ecosystem. Another plus, North American River Otters are very common in Zoos and chances are you local Zoo houses them!

Science Lesson Plans (Full lesson plans in APPENDIX B)

Lesson Plans

- [Exploring River Otter Habitats](#): **K-3rd grades** (can be modified for any age)- This lesson leads you through an exploration of river otter habitat to help further your group's understanding of the term habitat and how otters use their habitat to survive.
- [Otter Adaptations](#): **2nd-4th grades**- This lesson explores North American River otter adaptations and compares them with other Northeastern animals, as well as other species of otters. Full of interactive and easily recreated activities to use right in the classroom.
- [Web of Life](#): **4th-5th grades**- The Web of Life will help your group to discover the

interconnectedness of plants and animals within ecosystems and how human actions can sometimes have a devastating effect. This lesson also provides ideas for your group to take action and help protect native habitats.

Visual Tools

- [Otters and Friends Matching Game](#): This matching game can be used in conjunction with [Exploring River Otter Habitats](#), [Otter Adaptations](#), or as a lesson plan on its own. This game allows students to match up otters (and friends!) with photos of their appropriate habitat, shelter, food, etc. This can be used as a group activity using the “Who am I?” cards, as a small group, or independent project.
- [What you Otter Know Species List](#): A wonderful resource provided by the [Wave Foundation](#) at the Newport Aquarium providing a quick description of all thirteen species of otter with illustration of each species.
- [Teeth and Tools Matching Game](#): Visual tool to be used with the [Otter Adaptations](#) lesson plan.
- [Lend a Paw: Comparing Feet](#): Use this visual tool with the [Otter Adaptations](#) lesson plan. Use these photos and descriptions to compare the North American River Otter and Cape Clawless Otter feet. Why do you think these feet are so different?

Math & ELA Lesson Plans (Full lesson plans found in APPENDIX B)

- [Reading Pie Graphs: Zoo Otter Diets](#): Use the worksheet provided to analyze a pie graph displaying the daily diet of North American River Otters. Use the questions provided or make up your own!
- [Reading a Pictograph: Fish Eaten by Zoo Otters in a Week](#): Use the worksheet provided to practice your group’s math skills by reading a pictograph displaying the number of fish eaten by Zoo otters in week. Use the questions provided or make up your own!

- [A Day in the Life of an Otter Keeper: Math and English Language Arts](#): Read a passage about an otter Keeper's daily activities and use listening comprehension skills to answer questions. Some questions ask students to use the math skills to analyze the information within the passage.

Playful Otters

Otters are playful animals that seem to love having fun...and so do we! On this page you will find coloring pages, puzzles, and other *otterly*fun stuff!

Coloring sheets

- [River Otter Coloring Page](#): Color a river otter enjoying his wetland habitat! Provided by Sadie Stevens
- [Web of Life Coloring Sheets](#): Otters, Fish, Bugs, and Plants. These sheets work well as coloring sheets or for name tags in the [Web of Life game!](#)
- [is For Otter Coloring Sheet](#)

Games

- [Help the Otter Find the Fish Maze](#): It can be tough being an otter but you can help guide this otter to the fish! Provided by Sadie Stevens
- [Word Search for 1st -3rd grades](#) & [Word Search for 4th-6th grades](#): Look closely and discover words that are very important to otters! Provided by Sadie Stevens

Blog Posts Not included in any other section:

Otter Spotter Workshop

Posted on November 28, 2011 by [otterspotterny](#)

One of the main goals of Otter Spotter is to provide resources for teachers and zoo educators to use in their classrooms. Lesson plans for multiple ages covering math, science, and even a little ELA are available in the [Teacher Resources](#) section of the site. Many of these resources are based on New York State Learning Standards.

A few weeks ago we were lucky enough to be able to test out some of these lesson plans at the [Seneca Park Zoo](#). Former participants in [ZooCamp](#) were invited to a three hour workshop at the Zoo to learn all about otters! Participants (or as we liked to call each other...Otter Spotters) were also asked to take online pre and post tests to see if their otter knowledge increased after participation in the workshop. We packed a lot into three hours! Below are a few photos of some of our adventures throughout the day.

We predicted what a North American river otter's habitat would look like and what we might find there. We went to see the otter exhibit and compared the zoo's habitat for North American river otters to what we predicted in the classroom. Just for fun we met a few animals who had similar adaptations to otters. We talked about duck's webbed feet and water repellent feathers! Remind you of any other wetland animal???

The Otter Spotters also participated in some fun interactive activities to explore what it would be like to have webbed feet like a [North American river otter](#) or finger-like toes similar to a [cape clawless otter](#).

The whole workshop was full of fun and learning with a terrific group of Otter Spotters! All of the results are not yet in from post-tests but preliminary results show that the participants knew more about otters after the workshop than before. It was an otterly wonderful day!

Otterly Fun

Posted on October 11, 2011 by [otterspotterny](#)

Otters are playful animals that are fun to watch and incredibly cute! This makes them a favorite in Zoos across the country and in the classroom! At Otter Spotter we provide materials to be used at the Zoo, in the classroom, or even just at home having fun!

In our [Teacher Resources](#) page you will find lesson plans for [Science](#), [Math](#), and ELA. You will also find the all new [Playful Otters](#) page for some fun and games! Here you will find coloring sheets and printable games for your young otter lover! Because just like otters, we all deserve to have a little fun!

Otters in Training

Posted on September 11, 2011 by [otterspotterny](#)

This past week I was lucky enough to get a private photo shoot with two of the [Seneca Park Zoo](#) otters while they were having a training session with their ZooKeeper, Catina. These training sessions are very important to keep the animals physically and mentally active as well as reinforce a positive relationship between the ZooKeeper and the animals they care for.

Admiral is currently the oldest otter in conservation care at 21 years old! ([Check out our post a few months ago about his birthday celebration](#)). But as you can see by these photos it doesn't slow him down too much! He is ready for more training and more trout (his fish preference right now). All training is done by positive reinforcement; if the trainer gives the animals a cue and they do the right thing, they get a reward (for otters it is typically fish). Many trainers also use a clicker, a small tool that makes a clicking sound when you push the button, this is used as a bridge to let the animals know exactly when they have done the right thing and the reward is on the way! If they choose not to do a behavior that is okay too; it is completely their choice.

The behaviors the otters are trained to do are naturalistic behavior that help to mimic some of the actions they do in wild. It may be spinning in the water, standing on a stump, laying on their back, lifting a paw, or opening their mouth. These behaviors can also help for veterinary care. If an animal is asked to show their stomach, paw, or teeth on a regular basis as part of a fun training routine, when the vets need see these body parts it is not so scary!

As you can see, training is rewarding for the animals, the keepers, and Zoo visitors. At the Seneca Park Zoo there is an Otter Training Demo that takes place five days a week during the summer months and is a great way to visitors see the otters in action!

Otter Math Lesson Plans

Posted on August 6, 2011 by [otterspotterny](#)

Check out our [Math Lesson Plans](#), under the [Teacher Resources](#) section of the blog, and look over our new math lesson plans. Animals can be a great way to learn math skills; you can measure their weight, size, amount of food they eat, territory size, and more. You can also examine averages in a population or graph trends over time. The possibilities are infinite!

Right now we have two lesson plans posted. You can use the worksheets provided or just use the charts and create your own questions! Stop back soon for more!

Working Together to Help Otters

Posted on July 29, 2011 by [otterspotterny](#)

Last week I was fortunate enough to go to a workshop with fellow otter educators and researchers from all around the world at the [Columbus Zoo](#).

This was a strategic planning meeting to develop education goals and strategies for the [Association of Zoos and Aquariums \(AZA\)](#)'s [Otter Species Survival Program \(SSP\)](#).

Soon I will post a summary of this workshop and feature [research stories](#) about some of the researchers who attended the workshop. For now, here is a blog I posted on the [Seneca Park Zoo's Educator's Blog](#) about the event, [Working Together to Help Otters](#). More to come soon!

Web of Life

Posted on July 14, 2011 by [otterspotterny](#)

What happens when an otter's habitat is threatened by over-trapping, pollution, or habitat destruction? Check out the [Web of Life](#) curriculum under our [Teacher Resources](#) section to find out. This is one of my personal favorite lessons to use in the classroom. Students love taking on the persona of the animal or plant they are assigned to represent in the web. This activity allows

students to show off their artistic side by coloring their name tags and, of course, adding dramatic flair to the moment when they are cut from the web! This level of interactivity allows the students to relate to a relatively complex concept.

Students will also see the seriousness of the topic when they see the web of life falling apart. But never fear the wrap up section will also give you some ideas for things you and your students can do to take action and protect precious habitats in your area.

Teacher Resources!

Posted on July 13, 2011 by [otterspotterny](#)

Calling all teachers! We have now added a new [Teacher Resource](#) page!

This will include lesson plans to be used in the classroom or as a pre-visit activity before your Zoo visit.

We currently have two detailed lesson plans posted, filled with many interactive activities, and the Otter and Friends Matching Game. Check out the resources available and check back soon for more!

Scat Happens

Posted on July 10, 2011 by [otterspotterny](#)

If you read our last post, [“Where do River Otters Live?”](#), you will have learned a little about the history of North American River Otters in Western New York and about the New York State River Otter Project. But how do we know there are still otters in the area?

There was some early research using radio transmitters suggesting that the otters had established themselves after the release. 28 of the otters had been surgically implanted with radio transmitters before being released. Through this research it was concluded that 21 of the 28 were establishing home ranges in the area.

However, after that there was little or no research happening to determine the success of the reintroduction project. So a research group at [Rochester Institute of Technology](#) began the process of tracking down the released otters. However, otters can be elusive animals and many members of the group did not ever see an otter through the course of their research!

How did they know otters were there? Scat! Or feces, poop, dung, droppings, etc. Get the picture? We prefer the term scat or spraints. Spraint is another term for otter scat; otters often leave spraints in the same location (latrines) and can be used as a form of communication between otters. No matter what you call it, scat is a very useful tool when researching animals. From scat you can determine the location, diet, health, population density, DNA, etc. For the [RIT](#) Group latrine sites were crucial to researching otters. Latrine sites were marked and mapped using GIS allowing research students to use them for a wide range of projects.

Scat is important in Zoos too! Changes in feces can be one of the first indicators that an animal is ill; ZooKeepers check scat on a daily basis and send samples to the vets very often to further monitor the animals health. Also, Zoo scat can be used as a control for researchers to compare to their samples from wild otters. So as you can see, scat happens. And that is actually a very good thing!

Where do River Otters Live?

Posted on July 2, 2011 by [otterspotterny](#)

“Where do river otters live?” is a very popular question when visitors see playful river otters in Zoos across the country. Luckily here in Rochester, NY the answer is...right in our own backyard! It is even more interesting to learn that it wasn't always the case!

Unfortunately, there was a time when North American river otters (NARO) no longer swam in our waterways even though they are native to the Western New York region.

Historically, North American River Otters populated the waterways of Western New York but were extirpated (became extinct in the region), as they were in many other regions of North America. The loss of otters was due to over-trapping for their thick pelts, water pollution, and also urbanization in the 19th and 20th centuries. In order to reestablish river otter populations in the area the New York State Department of Environmental Conservation (NYSDEC), in conjunction with other organizations, reintroduced 279 otters between 1995 and 2000 to the waterways of Western New York.

So where are the otters now? Well, research at the [Rochester Institute of Technology \(RIT\)](#) has shown there are still otters living in the Greater Rochester Area. Over the next few posts I will be sharing short summaries of the work several students at RIT done to monitor our local otter populations. In weeks to come, I will also be posting news about otters in other parts of the country and even updates about the NARO's cousins in other parts of the world. So stay tuned for more information about what is happening with otters in the wild today!

Why we love otters!

Posted on January 19, 2011 by [otterspotterny](#)

Working in a Zoo I get asked almost on a daily basis, “where are the otters?”. It seems like everyone wants to sneak a peek of these fun animals! But why does everyone love otters?

Well, these amazing animals are extremely charismatic, playful, and fun to watch, which is part of the reason why they are often seen in Zoos! (Though there are 13 species found world-wide, there are five species of otter most commonly found in Zoos, more information about these animals can be found at www.otterspotter.com) Zoo visitors love to get a glimpse of the otters swimming, wrestling, or working with their trainer.

However, in addition to being adorable, otters are also an important part of the wetland habitats

they live in. As carnivores, North American river otters play an important role in the food web, are very sensitive to pollution, and effected by changes in the fish populations. Due to these factors, otters are often considered “indicator” species to the overall health of the environment (meaning the health of the otter populations can give us an “indication” of the overall health of the habitat).

As you can see we love otters not only because they are cute but because otters are very important to our wetlands and waterways. Keep an eye on future blog posts to learn more about what Zoos and wildlife researchers are doing to learn more about otters!

And of course, stay tuned for cute otter stuff too because we know you really love otters because of photos like this!

APPENDIX B: Lesson Plans

Exploring River Otter Habitats:



New York State Core Curriculum Standards

- Living Environment, Key Idea 1
 - LE 1.1a, Animal need air, water, and food in order to live and thrive
- Living Environment, Key Idea 3
 - LE 3.1a, In order to survive in their environment, plants and animals must be adapted to that environment
- Living Environment, Key Idea 5
 - LE 5.1b, An organism's external features enable it to carry out life functions in its particular environment

Introduction for Teachers:

The main focus of this activity is to understand what a habitat is and the basic needs of all living things. For this lesson, we will use the North American River Otter to learn how otters fulfill their basic needs in their habitat. The process of this activity will help to strengthen the students' observational skills, start to plant the seeds of forming hypotheses and serving as an introduction to the scientific method. This is also an opportunity for children to explore their local habitat and appreciate the wildlife in their own back yard. This lesson works best if used as a pre-visit activity to your local Zoo.

Part 1: Introduction to Topic for students-

Supplies Needed: Photos of otters, photos of otter habitats, and photos of other habitats (provided on www.otterspotter.com).

- I. ***"Today we are going to learn about otters!"*** Show photos of otters and using the resources at Otterspotter.com give the class some basic information about North American River Otters from the Otter fast fact section.
- II. ***"Where do otters live?"*** Ask the students where they think an otter would live (River, streams, bogs, lakes, etc.). Could every animal live where an otter lives? What about an elephant? Or a whale? No way! Animals have special places they need to live where they can find everything they need to survive. What do we call the

special places where animals live? *Habitat!* Talk about a few different kind of habitats and show the students photos of habitats (i.e. Forest, wetland, rainforest, desert, etc.), to demonstrate how different habitats can be. But no matter how different an animal's habitat, they all need the same basic things.

- III. ***“What are the basic needs of animals?”*** What do we need to survive everyday? There are five things that animals need to survive in the wild and we need those same things. These five things together make up an animals habitat and they are:
- food
 - water
 - shelter
 - oxygen
 - space
- IV. **Make Predictions:** Discuss what kind of habitat North American River Otters live in (wetlands, lakes, and rivers often bordered by forests). Make a list of the types of animals that might be living in these habitats.
- Think about otters and about how otters might act in their habitat.
i.e.:
 - How do they get their food? What do they eat?
 - How do they move around their habitat?
 - Where do they sleep? Or hide?
 - Activity- Draw an otter's habitat:* Have the children draw (or if you are feeling really ambitious, create a diorama!) where they think an otter would like to live! Make sure all five basic needs are there!
 - Activity- Matching Game:* Use the Otters and Friends Matching Game on the Teacher Resource section of OtterSpotter.com to match some northeast animals with their habitat, food, shelter, tails, and feet to further explore the ideas of habitats and adaptations.

Part 2: Check out the habitat in your own back yard!

Supplies needed: Clipboards or notebooks for each child or small group.

- I. ***Activity- Look at North American River Otter Habitat:*** Now you are going to look for the five things that will help the otters survive. Give each child or small group a clipboard with the attached worksheet (if they are old enough). If they are too young to record their own, you can do it as a large group. Drawing can also be a great way to record!

- a. *Outside the Classroom*- If you live in a part of the country that has otters, discuss what the habitat is like where you live. If you can, take a hike! It would be really helpful if you can get to a river or stream where an otter could live or just take a walk outside and see what kinds of plants and animals there are in your area.
- b. *Inside the Classroom*- If you do not live where there are otters or you can't get outside, you can look at pictures, webcams, and video footage of an area that does (check out some of the resources on www.otterspotter.com). Keep in mind North American river otters might have once lived in your area but were driven out by pollution or trapping. This would be a great teaching opportunity later on for discussing why the otters can't live there any more.

II. ***What do you see in the habitat?***

- Plants-What kind and how many?
- Water-How much and in what forms? (looking up average rainfall is a good idea)
- Food-What could animals eat here?
- Shelter-Where could animals hide or raise their young?
- Space- Is there lots of room for animals to live? Do you think it is easy for animals to live near people or not?
- Air- What's in the air that we breath? Where does oxygen come from?
- Temperature- What does it feel like today, does it ever get really cold or really hot? What do animals do during these times?

Part 3: What did you find?

Supplies needed: 5 large pieces of paper to place on the chalkboard.

- I. ***Compile the data:*** After collecting your "data" and make a list of what you saw. Ask the students what they saw and how these things might help otters and other animals. Place five large sheets of paper on the wall and label each sheet of paper with one of the five basic needs of all animals (Food, water, shelter, oxygen, and space). Have the students go around the room and read off their lists, collect the class's data together on the papers you placed on the board. During this activity you can also start to talk about that adaptations an otter would have to survive in this habitat.

II. ***Discuss each section:***

- a. Food: What did they see that an animal could eat (leaves, fruit, bark, bugs, mushrooms)? What might an otter eat that they couldn't see (fish, crawfish)? Feel free to add the vocabulary for carnivores, herbivores, and omnivores.
- b. Water: Discuss how much and what kind of water you saw in the habitat (Pond, river, lake, puddles, none, etc.). You will need to do a little research to find out the average rainfall (i.e. Rochester NY gets ~33in/year). Annual average rainfall is a hard concept to explain, but using a measuring tape to measure it can make it clearer. Also, comparing it to other habitats can put it in perspective.
 - i. A desert might get around 10 inches/year

- ii. A rainforest might get around 200 inches/year
- c. Shelter: What looks like it might make a good shelter in your habitat? Think of a few places different animals could live where you explored and make a list of these places. Look for holes in the trees, holes in the ground, nests, beaver lodges, holes alongside the waterway, and any places where the plants are matted down where it looked like an animal might rest.
- d. Air: Discuss that we breath oxygen and where it comes from. This reinforces the idea that we are very dependent on our environment and everything is interconnected.

Part 5: Look at otters in Action!

- I. ***We're going to the Zoo!***: Now that you have thought about how an otter would survive in your habitat...it is time to see some otters! If you live near a zoo that exhibits North American river otters you can take a field trip to the zoo to observe the otters behavior and exhibit. Use these to examine how the otters interact with their environment. *And/or* you can go back to www.otterspotter.com and click on the links to the otter web cams.
- II. ***Set up an Education program at the Zoo!***: Most Zoo's will have options to add a tour or animal presentation to enhance your visit. If you have a special interest in Otters, give them a call! At the Seneca Park Zoo we have programs specifically designed to help you learn more about otters and habitats, be sure to look at our list of options on the Teacher Resource Section of www.otterspotter.com.

Part 6: What did we learn about otters?

- I. ***Wrap up!***: Now that the students have observed an otter's habitat and observed an otter in a Zoo or on a webcam, go back and see if their predictions were right. Is this how they thought otters would behave and use their habitat? What were you right about? What were you wrong about? What was surprising?

Worksheet for Exploring River Otter Habitat Lesson Plan:

Name: _____

Date: _____

Habitat Exploration!

Take a hike! What do you think animals need to survive? Get outside into your habitat to look for the basic needs to help animals to use to make it on the wild side! Look closely because there are clues all around you!

1.) Food: What did you see that an animal could eat?

Draw food here:

2.) Water: Did you find any water on your adventure?

Draw water here:

3.) Shelter: When you were exploring did you see any place an animal could hide and use as shelter?

Draw shelter here:

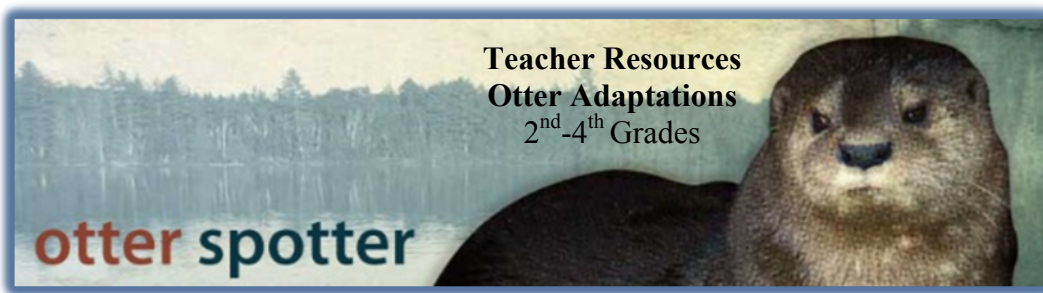
4.) Air: Take a deep breath! Where is that air coming from? Is there air for animals to breath?

Draw what makes air/oxygen here:

5.) Did you see any animals on your adventure? YES NO

Draw any animals you saw here:

Otter Adaptations Lesson Plan:



New York State Science Core Curriculum

- Living Environment, Key Idea 3- Individual organisms and species change over time
 - LE 3.1a, 3.1c
- Living Environment, Key Idea 5-Organisms maintain a dynamic equilibrium that sustains life
 - LE 5.1b, 5.2e, 5.2g

Introduction for Teachers

For this lesson plan we will be exploring some of the adaptations of river otters, focusing primarily on feet, tails, and teeth. We will also be talking about how these adaptations help them to survive in their habitat. This lesson plan compares otters both to other species of animals and to other species of otters. Use the plans provided as well as the matching games and other resources found at www.otterspotter.com.

Part 1: Introduction to the topic

- I. ***Review the Term Habitat:*** For this activity your class will need to be familiar with the topic of habitats. If your class is comfortable with the idea of a habitat, just remind them that a habitat is where an animal makes its home and finds everything it needs to survive (food, water, shelter, air). If your class is not familiar with what a habitat is, I suggest going through “Exploring River Otter Habitats” lesson plan first.
- II. ***Introduce the Term Adaptation:*** Once you are comfortable with the habitat topic, introduce the word adaptation. We define adaptations as: features on or in an animal’s body that help them do the jobs they need to do in the wild to survive in their habitat. You might want to explain that an adaptation can also be a behavior (i.e. parrots mating dance, bower bird collecting items to decorate nest, etc). Ask the students what they think animals jobs are in the wild; they will most likely say the two big jobs are:
 - a. Finding food
 - b. Keeping themselves and babies safe.

Part 2: Comparing Adaptations to Other North American animals? See how each is adapted to live in their selected habitat and do the jobs they need to do to survive.

- I. ***Look for Otter Adaptations:*** Looking at pictures of North American River otters at www.otterspotter.com and look for features that will help them to survive. The two main ones are:
- a. Tail: Their webbed feet and broad tail help them swim in order to catch their food and escape from predators.
 - b. Feet: Webbed feet for swimming, with claws for living near muddy riverbanks and manipulating food.

II. ***Interactive Activities***

- a. *Activity- Otter and Friends Matching Game:* (Supplies: Matching game found under the Teacher Resources section of www.Otterspotter.com)
 - i. Give the cards to each student mixed up and see what animal matches with the appropriate tail, foot, food, habitat etc.
 - ii. OR Read the “Who Am I Cards” aloud and ask the students who they think each animal is and then as a group, go through the rest of the cards to determine which adaptations fit with each animal. Use the information below to explain more about each adaptation.
- b. *Activity-Webbed Foot Tug-a-War!:* Try having webbed feet! (Supplies: rope dog toy, mittens, swimming flippers)
 - i. Have a rope with knots on each end (Dog rope toys work great!) over a cushioned mat. (The mat is for safety and make sure they are protected if someone falls!)
 - ii. One student can put on a pair of mittens and one can have just their bare hands. Imagine the child with mittens is the otter with webbed feet and the child with bare hands is the opossum with bare toes for climbing!
 - iii. Have them sit cross-legged the ropes distance away and start to tug! Who wins? (Most likely the student with no mittens!)
 - iv. Wrap-Up-Webbed feet are not made for gripping branches but an opossums bare, clawed toes are perfect for grabbing on and climbing in the trees.
 - v. You can also show them a pair of swimming flippers and have them try to walk in them. Do they think it would be easy to climb in them?
- c. *Activity- Teeth and Tools Matching Game.* (Found under the Teacher Resources section of www.otterspotter.com)
 - i. Collect everyday tools that represent animal teeth (of use attached photos)
 - 1. Fillet knife (to be safe just use the photo of the knife!)
 - 2. Chisel
 - 3. Scissors
 - 4. Mortar and pestle

- ii. Use provided photos of our teeth and various animals' teeth to match with the right tool. Look at the other photos of teeth, what does each animal eat? How are their teeth going to help them eat their food?
 - 1. Otter
 - 2. Beaver
 - 3. Rabbit
 - 4. Elephant
- ii. Match-It!: Have the students match up which tool is most like each tooth.
 - a. Otter- Fillet knife
 - b. Beaver- Chisel
 - c. Rabbit- Scissors
 - d. Elephant- Mortar and pestle
- iii. Wrap up: Think about how we use these tools? Is it similar to how the animal uses them?

Part 3: Comparing North American River otters to other species of otters.

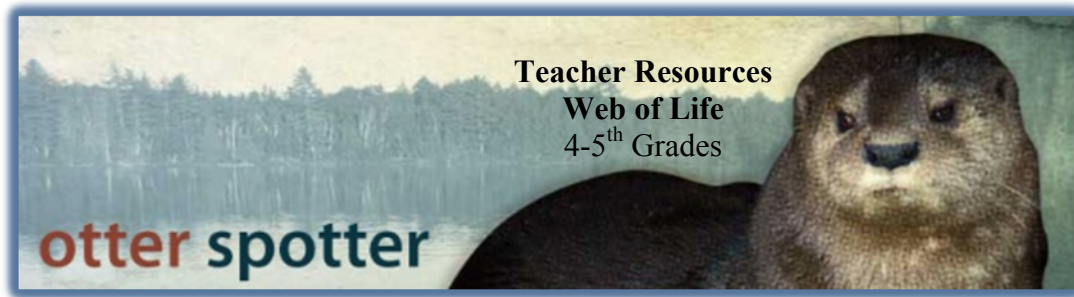
- I. ***North American River otter – Cape Clawless otter comparison:*** Now let's compare these adaptations between otter species. Look at our North American River Otter and Cape Clawless otter (more pictures and info will be on their individual info pages on the www.otterspotter.com).
 - a. Compare pictures and descriptions of their feet. (*Supplies: Photos found on www.otterspotter.com*)
 - b. Compare their diet.
 - i. North American River otters eat mostly fish and a few crustaceans (crabs, crayfish, etc.) They have fully webbed feet and claws.
 - ii. Cape Clawless otters eat crabs, bottom feeding fish, and mollusks (like clams and mussels). They have no webbing on their feet and no claws and instead they have long fingers.
 - c. Have the students think about why are these two species feet so different?
 - i. The cape clawless must dig through the silt in the riverbeds to look for the mollusks they like to eat. They are bottom feeders and they don't need the webbed feet for speed for hunting fish but rather for more dexterity to dig up their food.
- II. ***Interactive Activity:***
 - a. *Webbed Feet Vs. Toes* (*supplies: Small bin, fish tank gravel, mittens, small toy animals/bugs, stopwatch*)

- i. Fill a small tub/bin with small rocks and hidden small toys to represent food. Cover bin with a towel or sheet.
- ii. Have the students try it two different ways. Once with mittens to represent the North American River otter with webbed, clawed feet and once with bare hands to represent the cape clawless otter. Slip their hands under the sheet and try to find all the hidden toys in the rocks.
- iii. To measure effectiveness, you can count the objects to see if they can find them all both times and time them with a stopwatch to determine which method takes longer!
- iv. Wrap up:
 - a. Which way was more effective for digging items out of the rocks?
 - b. Why do these otters have such different feet?

Part 4: Conclusion

Go over again that adaptations are features on an animal or behaviors that help animals do the jobs they need to do in the wild and that animals are specialized to do certain jobs and live in specific habitats. Encourage the students to do further comparisons on their own and to check out the otters at the zoo to see them using their adaptations in action!

Web of Life Lesson Plan:



New York State Core Curriculum Standards

- Living Environment, Key Idea 6- Plants and Animals Depend on each other and their physical environment
 - LE 6.1a, LE 6.1b, and LE 6.1c
- Living Environment, Key Idea 7- Human decisions and activities have had a profound impact on physical and living environments
 - LE 7.1b & LE 7.1c

Introduction for Teachers:

The main focus of this activity is to understand how all living things are interconnected and how some manmade changes to habitats can negatively affect animals. It might be a good idea to do this after a lesson about the basic needs of living things and defining a habitat (Exploring Otter Habitats found on otterspotter.com would be a good start).

Part 1: Create your web

Supplies Needed: Ball of yarn to make web, “name tags” (attached to lesson plans), and props to represent man made problems: Hunting cap, fishing pole, empty container of bleach, toy bulldozer.

I. Introduction:

- a. In this lesson/game we will learn how almost everything is interconnected within a habitat. For this activity we are going to focus on a stream/river habitat. The “players” in our habitat game are as follows:
 - i. Otters-Eat fish
 - ii. Fish-Feed otters, eat bugs, eat plants
 - iii. Bugs-Eat plants, feed fish, eat other bugs
 - iv. Algae/plants-Provides fish with oxygen to breathe and feeds bugs.

II. Create the web

- a. Have your group sit in a circle and toss a ball of yarn around from child to child. Once each child has had the yarn, they should see a web formed in the center of the circle. This is our food web.

- b. Attached to these lesson plans you will find animal “name tags” for each type of animal we are using. Go around the circle, mixing it up, give each child a nametag while they are still holding onto their string. Keep in mind there are generally more prey than predators and a lot more producers than consumers. So you might want to hand out a few more plants than otters. (Please note: Depending on the age of your group you might want to hand out the name tags before you toss the yarn and let the group color the tags)

III. Discuss their jobs

- a. You might have touched on this during the introduction but have the kids think about what their job is in the stream. If they are an otter what are they going to do? If they are a fish who eats them and what do they like to eat? Etc. Go over the terms *producers* and *consumers*.
- b. Look at who you are connected too. We did these connections by chance but most likely you are connected to something that you would eat or would eat you. Even if you are not (i.e. an otter is connect to a plant) you can talk about how that connection would work. A fish might eat that plant or breathe the air for the plant and the otter would eat the fish. Everything is connected.

IV. Change the habitat: Now we are going to start introducing manmade problems to the habitat and see what happens. We will cut the strings to demonstrate an animal not being about to get what they need from the environment and thus dying or leaving.

- a. *Fishing:* Put a fishing pole in the middle of the circle and ask the kids what it is used for? Fishing! Ask them what they know about fishing and you could even look up what the fishing laws are in your area. For most areas there are fishing seasons and laws; you have to have fishing permits, size, and quantity limits. So this time, our fisherman will take too many fish and take 1/2 of the fish in our stream. **CUT THE STRINGS OF HALF OF YOUR FISH.**
 - i. Once you have cut the strings, have the kids that were cut, scoot just outside the circle. All the remaining kids tug on their string. Did they lose any connection? How would it affect them in the wild?
- b. *Overhunting/trapping:* Throw a hunting cap into the circle. What is going to happen? The hunter is probably going to kill an otter for its fur. You can look up to see what the specific trapping regulations are for your area but there are some places where otter trapping is allowed. (Explain that hunting is not bad if you follow the laws). However, you can ask the kids do you think it is a good idea to hunt all the otters in our wetland? No way! Sometimes people don’t follow the laws and this can hurt the ecosystem. For this activity, the hunter will only take one otter to keep the game going, but have them think about what would happen if the hunter took all the otters? This might be half of your otter population depending on the size of your group. You can talk about how laws can vary from place to place. **CUT ONE OF THE OTTER’S STRINGS.**
 - i. Have the kids give the strings a tug again. What happened when we lost that otter? If anyone tugs and is not connected anymore, have them scoot

outside the circle too. This will show how many animals are affected by the cuts.

- c. *Pollution:* Throw an empty jug of bleach (or empty motor oil) into the circle. Talk about what pollution is and where it comes from. Talk about how these pollutants get into the river (dumping into the water, dumping down the storm drain, run off, etc). Ask them what they think this will do to the stream? A large amount of bleach would most likely kill some of the fish, bugs, and the plants. CUT THE STRINGS OF HALF OF THE PLANTS, BUGS, AND FISH LEFT.
 - i. Have the kids give the strings a tug again. What happened when we cut these strings? If anyone tugs and is not connected anymore, have them scoot outside the circle too. This will show how many animals are affected by the cuts. Are there still some people connected to each other, or has everyone been cut?
- d. *Habitat Loss:* Take a toy bulldozer and put it in the center of the circle. What would a bulldozer do habitats? Knock down trees? Push dirt around? Why might someone want to do that? (build houses, shopping malls, or other buildings for people etc.) Imagine otters living in a wetland habitats and a bulldozer covers half the wetland. Where will they go and what will happen? For this experiment we will just say that half of the wetland has been destroyed. CUT THE STRINGS OF HALF OF EVERYTHING LEFT.
 - i. Have the kids give the strings a tug again. What happened when we cut these strings? If anyone tugs and is not connected anymore, have them scoot outside the circle too. This will show how many animals are affected by the cuts. Are there still some people connected to each other, or has everyone been cut?

V. Wrap up: What happened and what can we do to help?:

Take one final look at what happened to your web. What is still connected? If there are still some connections, take a look at them and ask the class if you think an otter would be able to survive with that is left. What do they think is going to happen to our habitat?

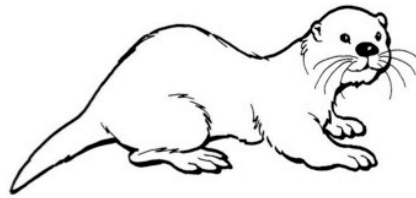
Also, take this time to go back over everything you put in the circle and ask the class if they remember why they are bad. For each object, offer the class something they can do to help! This can be done as individuals or as a class project.

- a. *Conclusions and Solutions:* Go over what you have talked about with each addition to your circle. Refine the terms such as pollution and habitat destruction. But most importantly, brainstorm solutions to these problems. They can be large-scale solutions (i.e. donating money or writing to congress) or everyday solutions like recycling.
 - i. *Overhunting/poaching:* Pull out the hunting cap. Discuss again why overhunting is bad. (Remember, not all hunting is “bad” be sure to differentiate between the two) So what should kids do to make sure this

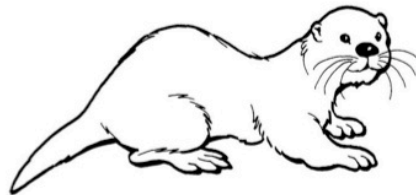
doesn't happen? If they or their relative hunt or trap, make sure they follow the laws.

- ii. Fishing: Pull out the fishing pole. Why are the fish important? What job did they have in our habitat we created? Just like hunting, fishing isn't always bad, but we have to make sure we follow the laws and don't take too many fish! You can even connect this to the oceans and discuss declining fish populations in the oceans due to human consumption. www.seafoodwatch.org is a great resource for fish that is acceptable to eat vs. fish we should avoid. You can send them home with a seafoodwatch card from the above website.
 - iii. Pollution: What can we do to stop pollution: don't litter, recycling so we have less waste, and picking up litter. Any chemicals their family might have around the house should be disposed of in the proper way: motor oil, anti-freeze, paint, and paint thinner. Look up the information from your local government agencies to see where your hazardous materials should go and hand the number out to the class to give to their parents.
 - iv. Habitat loss: What can we do to help? Encourage students to create backyard habitats for animals that might have been displaced from their habitats. We might not be able to create a home for otters but we could put up birdhouses, bat houses, bird feeders, toad abodes, or maybe even backyard ponds for turtles and frogs. Encourage them to go to their local parks or wildlife refuges to look for wildlife.
- b. *Group projects:* Now that we have talked about what they can do in their everyday life to help save otters and other animals in the wild, here are some ideas for class projects.
- i. Class clean up: Go to a local park or maybe even right outside your school and clean up litter and garbage. Litter can get into waterways and hurt animals. Plus cleaning it up makes our world look a little brighter!
 - ii. Raise money: Have a bake sale, craft sale, or a walk-a-thon to raise money for a habitat in trouble. You could donate it to a local conservation organization such as a Zoo or Aquarium. The kids could make a large check to hand over to an "official" from the organization.
 - iii. Create Backyard Habitats at your School: Have the kids make birds houses, birdfeeders, frog ponds, and other resources for animals and put them right outside your school. You could make it into a lesson of watching to see who comes to use your backyard habitat.

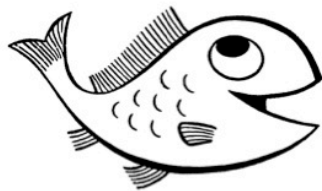
Name Tags for Web of Life Lesson Plan:



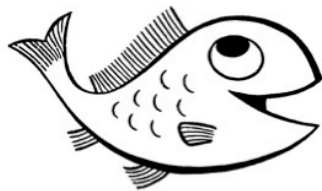
Otter



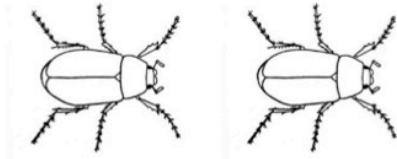
Otter



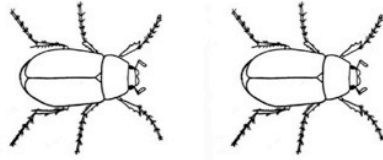
Fish



Fish



Bugs



Bugs



Plants



Plants

Otters and Friends Matching Game (Small version):

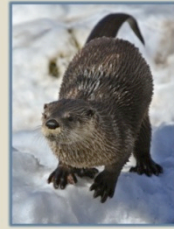


- Print and cut cards.
- Match up the animal with the correct habitat, shelter, food, foot, and tail.
- Use cards to talk about how animals survive in their habitats using their adaptations.
- Use the "Who am I card" as a group activity to use the clues to guess the animals.

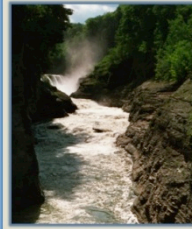
Otter and Friends Matching Game

Print and Cut cards. Have students match up the animals with the right items!

North American River Otter



Who lives here? In the River



Who am I?

- I live in the River
- I have webbed feet
- I have a long, thick tail to help me steer.
- I eat fish.

Whose feet are these?



Who would eat this?



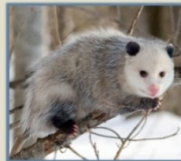
Whose Tail is this?



Whose Shelter is this?



Virginia Opossum



Who lives here? In the trees



Whose shelter is this?



Otters and Friends Matching Game Cont':

Who Am I?

- I live in the trees
- I eat fruit, bugs, and dead animals
- I have toes with claws from climbing
- I have a hairless tail to wrap around branches

Whose foot is this?



Whose tail is this?



Who would eat this?



Eastern Cottontail Rabbit



Who lives here? In fields and forests



Who am I?

- I live in burrows in fields and at the edge the forest.
- I eat grasses and other plants.
- I have feet for hopping and digging.
- I have a white tail to warn my friends of danger

Whose foot is this?



Whose tail is this?



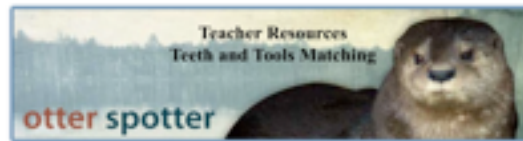
Who eats this?



Whose Shelter is this?



Teeth and Tools Matching Game (Small version):



- Print and Cut Cards
- Have students match up the correct set of teeth with the correct tool
- What does each animal eat?
- What do people use that tool for? Is it similar to what the animal uses its teeth for?
- Think about human teeth and look at the photo. Why do we have a variety of teeth?

Otter Teeth



Rabbit Teeth



Beaver Teeth



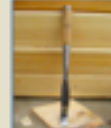
Elephant Teeth



Mortar and Pestle



Chisel



Scissors

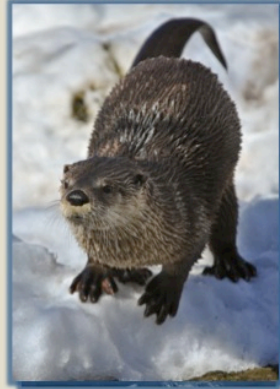


Fish Fillet Knife



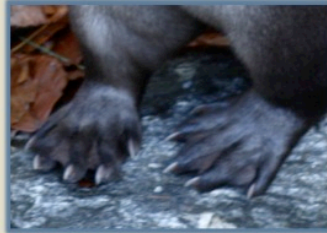
Lend a Paw Cards (Small Version):

**North American
River Otter**

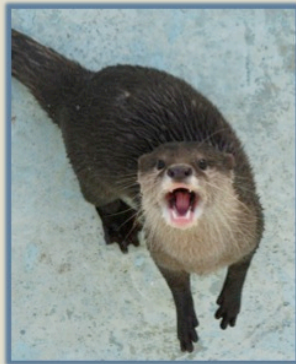


**North American
River Otter**

This otter eats mostly fish and needs to be able to swim fast to catch its food. Their webbed feet help them to chase after fish quickly!

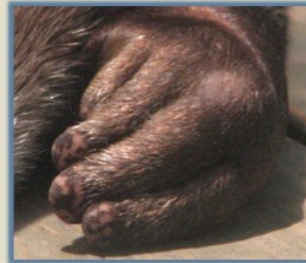


**Cape Clawless
Otter**

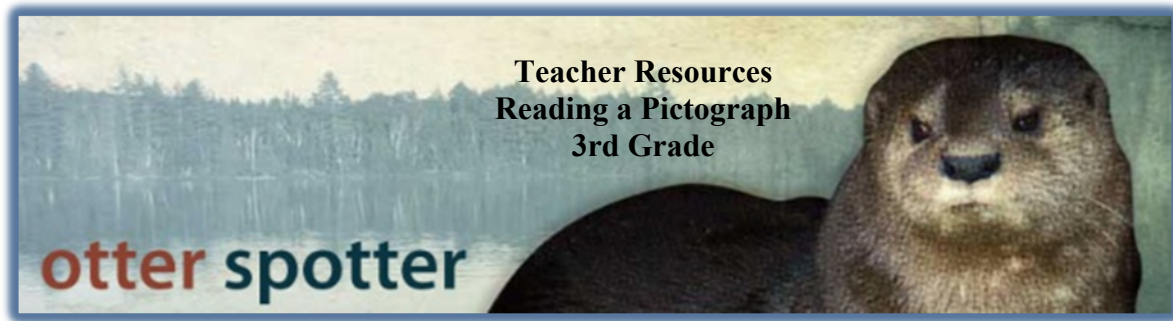


Cape Clawless Otter

This otter eats crabs, clams, and other animals in the rocks and dirt. They use their clawless fingers with no webbing to dig them out!



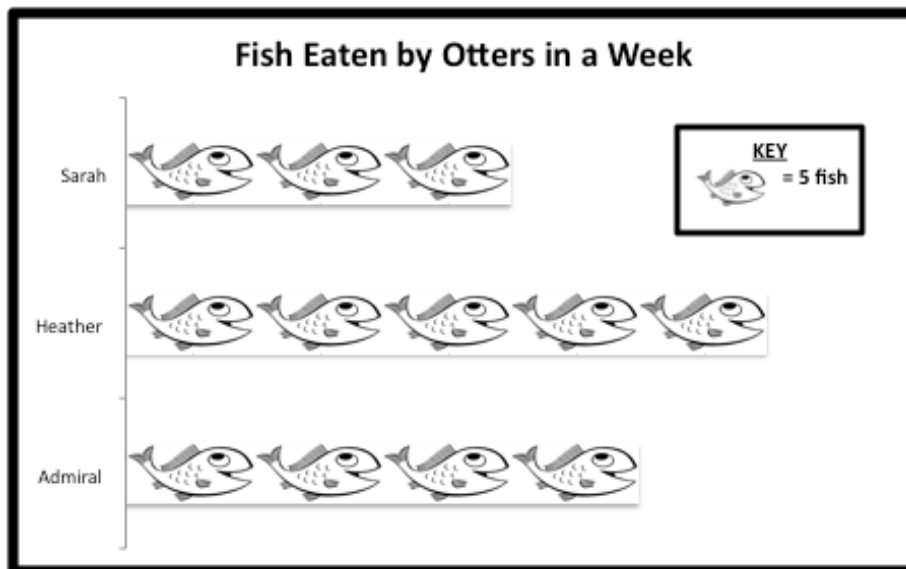
Reading a Pictograph Math Lesson Plan:



Name: _____

Date: _____

Directions: ZooKeepers keep track of how many fish each otter eats in a week. Use the pictograph below to answer the questions:



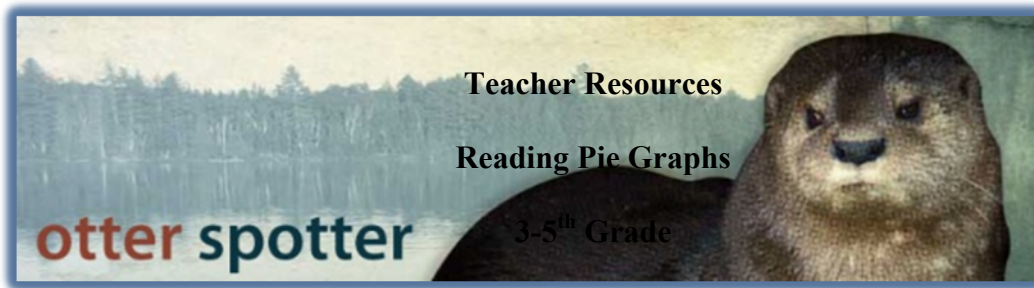
- 1.) How many fish did each otter eat?
 - a. Heather: _____
 - b. Sarah: _____
 - c. Admiral: _____
- 2.) How many fish were eaten all together? _____
- 3.) Which otter ate the most? (Circle one)
 - a. Heather

- b. Sarah
- c. Admiral

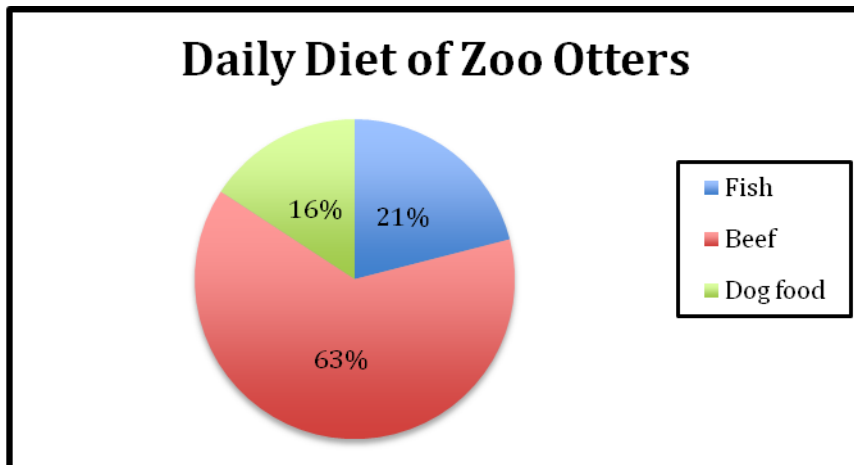
4.) What was the **least** amount of fish eaten by an otter in a week? (Circle one)

- a. 5
- b. 25
- c. 15
- d. 3

Reading a Pie Graph Math Lesson Plan:



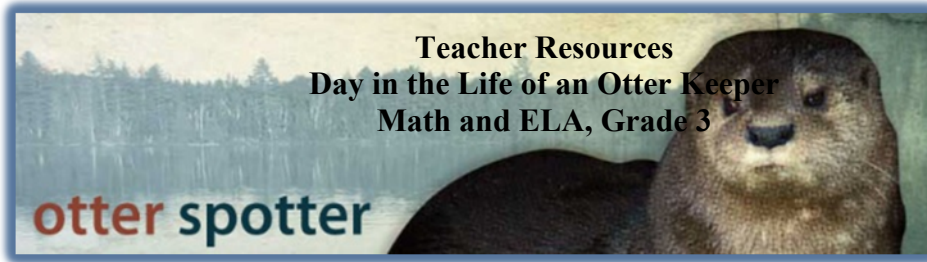
Name: _____
Date: _____



According to the graph:

- 1.) What is this graph about?: _____
- 2.) How many different foods do otters eat at the Zoo? _____
- 3.) What foods do otters eat the most? _____
- 4.) What do otters eat the least? _____
- 5.) What is the percentage of fish eaten by the otter? _____
- 6.) If this were a wild otter, which food do you think they would eat the most? _____
Why? _____

Day in the Life of an Otter Keeper, Math and ELA Lesson Plan:



Standards Met:

- Math: Reading clocks, multiplication, addition,
- English Language Arts: Listening or reading comprehension

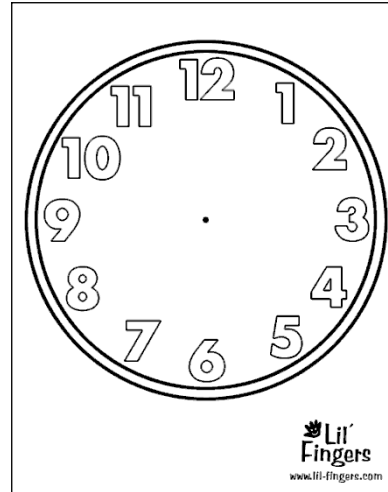
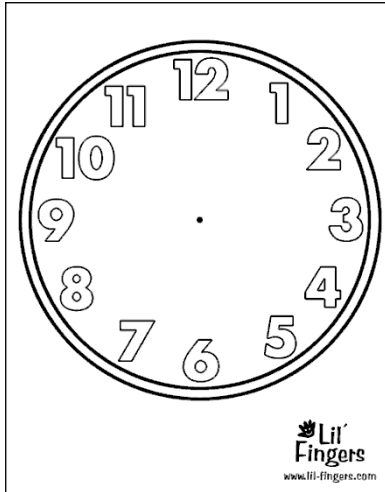
Introduction for Teachers

Math is used in Zoos everyday. Have your students read through the following passage (or read it to them). Then have them answer the questions below. This includes both math questions, as well as reading or listening comprehension (depending on the level of your group).

A Day in the Life of an Otter Keeper

A ZooKeeper, Tina, arrives at her job at 8:30am. She puts her coat, backpack, and lunchbox in her locker. She says good morning to her boss, John, and then goes to check on the otters. There are 3 otters living at the Zoo: two girls and one boy. The ZooKeeper gives them their morning meal; each otter gets 7 fish. She cleans the otters' area and then goes to take care of the other animals. At the end of the day Tina comes back to give the otters some beef for their afternoon feeding. She gives them each two pounds of beef. Tina gives them each 1 crayfish as a treat before she leaves. She goes back to her locker to get her coat and her lunchbox. Tina leaves at 5:00pm.

- 1.) What was the name of the main ZooKeeper in the passage?
- 2.) What was her boss's name?
- 3.) What time did she get to work and what time did she leave? (Draw it on the clocks below)



- 4.) How many otters are there at the Zoo?
- 5.) How many boy otters and how many girl otters?
- 6.) How many fish did each otter get in the morning?
- 7.) How many fish did she need all together in the morning?
- 8.) In the afternoon she fed the otters beef. How many pounds of beef did each otter get?
- 9.) How many pounds of beef did she feed to the otters all together?
- 10.) The otters ate three kinds of food during the day. Can you list all three?

Bonus: The ZooKeeper brought three things with her to work. Can you list all three things?

Double Bonus: She forgot to take one thing home. What did she forget?

APPENDIX C: New York State Core Curriculum Standards Referenced in Table 1

Reference Number	Learning Standard
Living Environment 1.1a	Animals need air, water, and food in order to live and thrive.
Living Environment 3.1a	Each animal has different structures that serve different functions in growth, survival, and reproduction.
Living Environment 5.1b	An organism's external physical features can enable it to carry out life functions in its particular environment.
Living Environment 5.2e	Particular animal characteristics are influenced by changing environmental conditions including: fat storage in winter, coat thickness in winter, camouflage, shedding of fur.
Living Environment 5.2g	The health, growth, and development of organisms are affected by environmental conditions such as the availability of food, air, water, space, shelter, heat, and sunlight.
Living Environment 6.1a	Green plants are producers because they provide the basic food supply for them- selves and animals.
Living Environment 6.1b	All animals depend on plants. Some animals (predators) eat other animals (prey).
Living Environment 6.1.c	Animals that eat plants for food may in turn become food for other animals. This sequence is called a food chain.
Living Environment 7.1 b	Over time humans have changed their environment by cultivating crops and raising animals, creating shelter, using energy, manufacturing goods, developing means of transportation, changing populations, and carrying out other activities.
Living Environment 7.1 c	Humans, as individuals or communities, change environments in ways that can be either helpful or harmful for themselves and other organisms.
3. Problem Solving Strand 6	Translate from a picture/diagram to a numeric expression
3. Problem Solving Strand 7	Represent problem situations in oral, written, concrete, pictorial, and graphical forms
3. Problem Solving Strand 8	Select an appropriate representation of a problem
3. Statistics and Probability Strand 8	Formulate conclusions and make predictions from graphs
3. Connections Strand 6	Recognize the presence of mathematics in their daily lives
3. Measurement Strand 9	Tell time to the minute, using digital and analog clocks

APPENDIX D: Write in comments from surveys

Educators Survey Write in Comments for each Question

How useful is the overall content of www.otterspotter.com for Zoos and Aquariums?
We have river otters AND sea otters in our collection. IT would be nice to have sea otter info on the website
Otters, training, diets and exhibit designs vary greatly. It would be nice to see otters from many facilities and how they adapt to that facility. South versus North versus inside versus outside.
I like the math lesson plans.
Great Overview
We have our own in-house fact sheets, so I'm technically supposed to get all info in house if possible. Perhaps this would be useful if i needed more than we had? Not sure; how would I know (if i hadnt gotten your email) that this site was legitimate/well researched/accurate?
How useful are the the lesson plans and other resources in the "Teacher Resource" section to Zoo Educators?
They look like fun, but I am not a teacher at a school
Referencing the science standards for New York is limiting. Is there someone way that "key concepts" could be described so it would be more easily correlated to other states?
Good - just need more!
Lots for those working with young children, but not so for those of us working with middle and high school aged
N/A Not a teacher.
Otter adaptations link is broken in 2 places
How likely are you to use www.otterspotter.com as an otter information resource for your facility?
We will check this all the time IF the information is constantly being updated.
Don't have otters in collection.
How likely are you to use the lesson plans provided on www.otterspotter.com?
We are getting otters in 2012 so this is great!!
Ideas can be used for various animals.
Not a teacher.
We do not have otters :-)
Its not in my job's purview. Perhaps a coworker would?
we currently do not have otters
How likely are you to follow the Otter Spotter Blog?
Not a lot of time for that sort of thing, but I'll try!!