THE IPA NEWSLETTER

Mystic Lake, Middle Pond, and Hamblin Pond in Marstons Mills, MA

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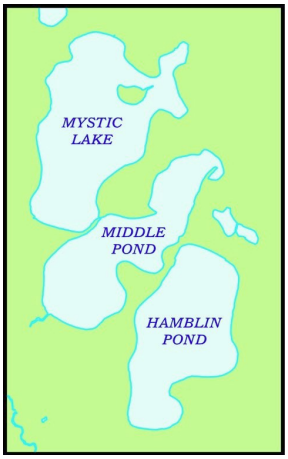
INDIAN PONDS ASSOCIATION ANNUAL MEETING REPORT



The Indian Ponds Association (IPA) held its 65th annual meeting on July 30, 2023 at Fuller Farm in Marstons Mills. The event, hosted by the Barnstable Land Trust (BLT), was a resounding success with over 70 people attending. IPA President Butch Roberts welcomed all attendees to the gathering, but before delving into the agenda, he reflected on the IPA's achievements over the past year. Some noteworthy accomplishments included securing alum treatment funding from the Town of Barnstable, advocating for stricter regulations on docks in Middle Pond, establishing the Anderson Intern Partnership to engage young individuals in freshwater conservation, and initiating the development of a strategic plan to guide the IPA's future endeavors.

President Butch Roberts welcomes participants to the annual meeting.

The minutes of last year's meeting were approved, and Greg Cronin, the IPA treasurer, presented the financial report, demonstrating prudent management of funds. The IPA's financials indicated an income of $8,627.90, expenses of $7,928.44, and an ending balance of $36,894.32.

Meeting attendees inside the Michael R. Kramer Center at Fuller Farm.

Sandra Leo-Clark, on behalf of the Nominating Committee, stressed the importance of diversity among the IPA Board of Directors to better represent the IPA area. The Committee recommended Rachel Jones and Tom Hamilton for two-year terms as Directors and Scott Borden for an Associate Director position. All candidates were unanimously approved.

During the meeting, the IPA honored individuals and organizations for their significant contributions to water conservation. Sandra Leo-Clark presented Ryan Christensen with the Schwarm Memorial Scholarship and a check for $1,500. Grateful for the recognition, Ryan pledged to utilize his environmental engineering education to give back to the area that had shaped his passion. Additionally, the Barnstable Clean Water Coalition (BCWC) received the Anderson Intern Partnership Award of $1,500. The BCWC plans to use the award to support an intern who will perform additional water sampling and invasive species surveys in IPA ponds, a tribute to the enduring commitment of Dr. Emory Anderson and his wife Geri.

The two keynote speakers were Bruce Walton from the New England Water Environment Association and Brian Baumgaertel, Director of the Wastewater Division at the Department of Health and Environment. Their talks focused on the importance of watershed regulations in relation to the performance of septic systems, managing innovative/alternative (I/A) infrastructure, and the availability of funding for upgrading systems.

Walton shed light on the Clean Water Act and its implications for the IPA area. The EPA has identified our area as a nitrogen-sensitive zone, necessitating certain actions to reduce nitrogen levels. Within five years, nitrogen reduction technology upgrades must be implemented if the Town lacks a watershed permit. The permit must aim for a 75% reduction in nitrogen load. Potential solutions include sewer systems, I/A septic systems, and photobioreactors (PRBs), among others.

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MESSAGE FROM YOUR PRESIDENT

We started this year with five new Board members, a nearly new slate of officers, a pending need for an alum treatment on Mystic Lake, and a threat of permanent helical piles being installed in Middle Pond. Our new Directors offered fresh new ideas with great energy and enthusiasm. We established a monthly meeting schedule for the third Monday of every month at 6:30 pm. All are welcome to attend.

To address the needed alum treatment for Mystic Lake, we set up a committee to submit a letter of intent to apply for funding under Barnstable County's ARPA $5 million small- and medium-sized project funding round. This proved to be a very challenging and eye-opening process. After successfully completing the letter of intent application process, we failed to make it to the next round.

We followed up with a meeting in October with Town Manager Mark Ells, Town Council President Matt Levesque, Councilor Paula Schnepp, Public Works Director Dan Santos, and Lake/Pond Project Manager Amber Unruh. Rather than making our case for the alum treatment, we asked what we needed to do as an organization to make it happen. This set the stage for our later success at the April 27 Town Council meeting.

We mounted a successful campaign to pack the April 27 hearing with residents showing their support for the alum treatment appropriation and arranged for five speakers to each discuss separate reasons why this appropriation was needed. With a quarter of the hearing room filled with residents wearing IPA badges, several of the Council members even spoke about their enduring relationships with the three Indian Ponds. The Council voted unanimously to fund the much-needed alum treatment for Mystic Lake.

To address the helical pile issue in Middle Pond, we launched a petition drive. Our goal was to have the Conservation Commission make their Guidelines for Private Freshwater Docks, Piers, and Floats into a regulation applicable to the Indian Ponds and any other ponds in Barnstable for which such a regulation made sense. The second goal was to show widespread objection to the application that was before the Mass. Department of Environmental Protection Water Protection Program for approval. We obtained 119 signatures and support from another 74 who did not wish to sign due to privacy considerations. This petition drive highlighted the value of working directly with the several homeowner associations within the IPA area. While the Conservation Commission rejected our request to codify their guidelines, the show of support did not fall on deaf ears. We need to continue to be a presence at the Commission's meetings. The petition had its desired effect with the MassDEP Water Protection Program. Though they have not yet issued a ruling on the application, they did instruct the applicant to address our concerns by July 8 otherwise they would act without the benefit of a rebuttal to our concerns. The July 8 deadline passed with no word from the applicant. We now await the response from MassDEP.

For the new Anderson Scholarship announced at last year's annual meeting, the Board decided to embark on an internship program with another like-minded organization. This will assist a young person to get physically involved in caring for the pond and, at the same time, benefit the ponds with the intern's efforts. Barnstable Clean Water Coalition had such a program and, with our additional support, they were able to extend their program to include monthly water testing for nutirients in the water column and to survey the ponds for invasive species.

We have started a process to develop a strategic plan. This is a work in progress, but it has been very helpful in looking forward to the new year and will help to shape the next 5–10 years. Watch for more to come on this topic.

In conclusion, we have had a very successful year, but we have a lot more to accomplish if we are to ensure that the three Indian Ponds remain as a valuable resource for future generations. Mystic Lake and Hamblin Pond both have a high nutrient load sitting in the sediments which will need ongoing monitoring and treatment. There is a *Hydrilla* population in both Mystic Lake and Middle Pond that needs to be monitored, and the ongoing treatment process needs to be continued. We have many Title 5 septic systems upstream of the groundwater flowing into all three ponds. If left as they currently exist, we will eventually see the effects of the resulting nutrients in our three ponds.

With the warming of the Cape because of climate change, nutrient loading quickly converts to algae and to the expedited eutrophication of the ponds.

To counter these forces, the Indian Ponds Association needs to be a strong, grass-roots organization with an enduring infrastructure to insure its longevity. Our successes this year demonstrate how powerful and effective we can be with high membership involvement. For that we thank you and look forward to your continued involvement in the coming year.

Butch Roberts

NEW BOARD MEMBERS

Two new Directors were elected to two-year terms on the IPA Board of Directors at the July 30 annual meeting: Tom Hamilton and Rachel Jones.

Tom and his wife Sue bought their home on Hollidge Hill Lane on Hamblin Pond in 2019 and moved from Connecticut full-time in 2022. Prior to retiring in 2021, Tom held a variety of leadership roles in research, technology, and analytics, and most recently led the data science function at Voya Financial. He holds an MBA from Carnegie Mellon University, as well as master's degrees in psychology and computer science from the University of Illinois.

Tom and Sue enjoyed many summer vacations on the Cape with their three daughters while they were growing up. They now enjoy hosting frequent visits from family and friends, especially by their five grandchildren. When not on the Cape, Tom and Sue enjoy traveling to Europe and visiting US National Parks throughout the year, and spending time in Florida during the winter.

Tom is pleased to be joining the Indian Ponds Association Board of Directors, and looks forward to learning about and working to preserve these precious resources. As a member of the IPA Board, Tom will serve as the liaison to the residents of the Barley Hill (Hollidge Hill Lane) Association, where he also serves as president.

Rachel Jones has had a diverse career founded on the need to address health disparities. She was an emergency room nurse in New York City and Newark, NJ during the dawn of the HIV/AIDS pandemic. She went on to attain an MS in Family Primary Care, becoming a family nurse practitioner. She completed a PhD at New York University focusing on HIV prevention in young adult urban women. It was in this field of inquiry that she received independent research grants from the National Library of Medicine and the National Institute of Nursing Research at the National Institutes of Health. She also served for two years as a member of the Advisory Committee of the Office of Research on Women's Health at the National Institutes of Health, and as an *ad hoc* reviewer for the NIH Special Emphasis Panel (HIV Prevention) Scientific Review Group.

Rachel was a tenured member of the faculty at Rutgers University and most recently retired as Assistant Dean of Research at the School of Nursing at Northeastern University in Boston. Her methods of promoting health in target populations have been to find creative ways to communicate public health messages. Communicating complex health information into relevant and familiar messages to target populations is a key skill she brings to the IPA Board.

She is a full-time resident of Marstons Mills and enjoys hiking daily with her dogs and kayaking on Mystic Lake. She is deeply concerned about the fragile ecosystems on Cape Cod, particularly the ponds. She is designated a juried fine art photographer at the Cape Cod Art Center with a focus on Cape Cod landscape photography.

Sandy Leo-Clark

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INDIAN PONDS ASSOCIATION ANNUAL MEETING REPORT *(Continued from page 1)*

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Bruce Walton

Walton shed light on the Clean Water Act and its implications for the IPA area. The EPA has identified our area as a nitrogen-sensitive zone, necessitating certain actions to reduce nitrogen levels. Within five years, nitrogen reduction technology upgrades must be implemented if the Town lacks a watershed permit. The permit must aim for a 75% reduction in nitrogen load. Potential solutions include sewer systems, I/A septic systems, and photobioreactors (PRBs), among others.

One of the critical topics covered was the current performance of septic systems. It was noted that standard Title 5 systems only remove about 35% of the nitrogen. However, preliminary results from alternative septic systems at Shubael Pond demonstrated a remarkable nitrogen removal rate of over 90%. That said, the data related to phosphorus is lacking. This is important because phosphorus is more of an enemy to our freshwater lakes than nitrogen.

Both Walton and Baumgaertel stressed the complexity involved in managing I/A infrastructure. It requires meticulous planning, design, permitting, financing, installation, operation, monitoring, and reporting. Such a comprehensive approach is essential to ensure the effectiveness and sustainability of the systems.

The cost of upgrading septic systems was another key aspect discussed. Retrofitting existing Title 5 systems can be upwards of $30,000 per household, and additional expenses may be incurred if the tank and/or leaching field require upgrading. To aid homeowners in funding these upgrades, various options were presented, including grants, loans from Town sources like Aquifund and subsidies such as tax credits and loan forgiveness.

Baumgaertel highlighted the different technologies available for reducing nitrogen and phosphorus leaching from septic systems into the groundwater. He compared the performance of standard Title 5 systems, Black Box (IA) systems, and layered systems. While the standard systems remove only about 35% of nitrogen and 25% of phosphorus, I/A systems significantly improve nitrogen removal to about 90% while 75% phosphorus leaching is still a major concern for freshwater lakes and ponds. Additionally, he mentioned ongoing testing of other technologies, such as soil-based phosphorus removal systems with pump chambers and biological uptake/recycling, as well as electrochemical systems for in-tank phosphorus removal employing metered chemical additions like aluminum compounds.

Brian Baumgaertel making a point.

The speakers provided invaluable insights into the challenges and opportunities in upgrading water treatment systems to protect our precious ponds.

Dan Santos, Director of Public Works for the Town of Barnstable, outlined the Town's proactive approach to reducing nutrient flow into the watershed. This includes implementing sewer systems, addressing road runoff, partnering with non-profit water organizations, and seeking financial assistance for vital conservation efforts. Santos commended the technology and implementation of innovative and alternative septic systems as an interim measure. He emphasized that these systems are crucial since, as per the current DPW plan, it will take approximately 20 years for the Town to complete the expanded sewer system.

The IPA annual meeting was an opportunity to reaffirm our dedication to preserving and restoring the health of our ponds. While celebrating past successes, President Roberts acknowledged the challenges ahead, including addressing high nutrient loads in Mystic Lake and Hamblin Pond, the ongoing *Hydrilla* eradication, and mitigating the impact of Title 5 septic system discharges on pond eutrophication.

Following adjournment of the meeting, IPA members were invited to a social hour, fostering connections and camaraderie among like-minded individuals striving to protect our valuable water resources.

Sandy Leo-Clark
Photos by Rachel Jones

PHOSPHORUS: THE DEVIL'S ELEMENT

The word "phosphorus" has frequently been mentioned in IPA newsletters in reference to the water quality of the Indian Ponds and/or as the cause of undesirable algae blooms, such as cyanobacteria. But many readers may not know much about the element. A recently (2023) published book by best-selling author Dan Egan, "The Devil's Element: Phosphorus and a World out of Balance", tells a compelling story about (i) the discovery, use, and misuse of this important component of every living thing on earth, (ii) that man is fast exhausting the finite supply of phosphorus which is vital for global food production, but which has, in the process, been responsible for toxic blooms of harmful algae and the pollution of our nation's waterways, and (iii), to quote Egan, "*there are steps we can take to pull some of that nuisance phosphorus back into the agricultural cycle, which could check burgeoning algae outbreaks and extend the life-expectancy of the Earth's phosphorus reserves.*"

Phosphorus, first discovered by German alchemist Henning Brandt in 1669, is a chemical element with the symbol P and atomic number 15 in the periodic table of elements. Because elemental phosphorus is unstable and highly volatile, it is rarely found on its own in nature. Instead, each P atom is bound together with four oxygen atoms to form a molecule of phosphate. Phosphates are essential to plant growth and to the life and growth of all living things. Every living cell on earth contains phosphorus. It is used in the production of fertilizer, detergents, incendiary items (safety matches, fireworks, munitions), and rat poison, to name just a few. Relative to its use as a fertilizer, which has two other key components (nitrogen and potassium, both of which are in ample supply), phosphorus is in short supply worldwide, with reserves estimated to last from only decades to perhaps several hundred years.

Without replenishment of essential fertilizing properties normally obtained via the decomposition of dead organic matter, soil will, over time, become progressively unable to sustain plant growth. Over the history of mankind, this fact became slowly evident. However, with the advent of agriculture and the establishment of towns and cities as humans began to grow their food in one place and eat it somewhere else, croplands became nutrient-deficient and food production declined. Humans eventually learned that spreading human and animal waste on croplands stimulated plant growth. However, as the population in Europe began to rapidly increase in the late 1700s in conjunction with the Industrial Revolution, the supply of animal manure became insufficient to keep overworked soils productive. In England, this forced the search for other types of fertilizer and led to the unsavory practice (from 1819 to the late 1860s) of harvesting human bones from the battlefields of Europe to be crushed in mills and spread as powder on farmlands to improve crop yields.

In 1802, German naturalist Baron von Humboldt, while visiting coastal Peru, discovered guano, the excrement from millions of fish-eating birds, which was rich in phosphorus, that had accumulated over millennia in depths of 100 feet or more on islands. This led to a global industry of harvesting and shipping guano from the Peruvian islands, as well as from other islands in both the Pacific and the Atlantic, to be used as fertilizer. Part of this industry occurred on Cape Cod with the Pacific Guano Company on Penzance Point in Woods Hole during 1859–1889. Guano deposits worldwide finally were exhausted near the end of the 19th century, and the agriculture industry was forced to find new sources of phosphorus.

Also during the 1800s, phosphorus-containing rocks (coprolites or fossilized dinosaur feces) were being used in England for fertilizer, which led to the search for greater deposits of rock-based phosphorus found mainly in sedimentary rock formations. Discoveries were made in various places such as west-central Florida in the 1880s in a place called Bone Valley, islands in the Pacific and Indian oceans, and eventually in a host of countries around the world. According to Egan, "*By 2019, phosphorus mines around the world …. were collectively scraping from the Earth some 250 million tons of phosphorus rock annually.*" In 2020, the world's largest producers were China (90 million tons), Morocco/Western Sahara (37 million tons), and United States (24 million tons). This use of phosphorus resulted in massive increases in food crop production during the Green Revolution, following the end of World War II, allowing the world's population to increase from 2 billion to over 8 billion. As of 2022, there were estimated reserves of approximately 50 billion tons of phosphate rock in Morocco, compared to total global reserves of about 72 billion tons. According to some researchers, Earth's phosphorus reserves are expected to be depleted in 50–100 years and peak phosphorus mining to be reached in about 2030. In light of this forecast, something will have to change or the world will no longer be able to feed 8 billion or more inhabitants.

We have all seen photos of or even personally observed badly polluted bodies of water choked with masses of algae, other aquatic plants, or frothy masses of soap suds. These are all brought about by excessive amounts of phosphorus. For thousands of years, soap or detergent was made from animal fats mixed with lye to create molecules able to pull grease and grime from our bodies and clothing. With the advent of motorized washing machines in the 1930s, Procter & Gamble, one of the country's largest detergent manufacturers, began to add phosphorus (sodium tripolyphosphate) to its synthetic detergent to "soften" the water in order to improve its cleaning ability. Unfortunately, this new detergent produced bubbles which soon were flowing into rivers and lakes. By the late 1960s, the US was producing some 4 billion pounds of detergent

annually and it was calculated that 70% of the phosphorus found in wastewater could be traced back to those detergents. Lakes began to show signs of distress from the effects of too much phosphorus through the formation of algae blooms which inevitably died and decayed thus removing oxygen from the water. Lake Erie became the classic example of this and by the late 1960s was labeled "dead". Public and political outcry, assisted by some vintage scientific research in Canadian lakes by eminent limnologist Dr. David Schindler who proved that phosphorus, *not* nitrogen, was the *limiting factor* in algae growth in freshwater and coupled with various municipal bans on the use of phosphorus in detergents finally won the day leading to reductions by the detergent industry in the amount of phosphorus that could be used in detergents. However, it wasn't until the mid-1990s that all phosphorus was removed from household detergents. As Schindler and other scientists had predicted, America's lakes and rivers began recovering in the 1980s.

The problems with Lake Erie finally convinced Congress to pass the Clean Water Act in 1972. This was intended to prevent, reduce, and eliminate pollution in the nation's waters, but while it regulated industrial and municipal pollution, it exempted agriculture. It was thought that reducing the phosphorus-rich discharges from industries and cities would be sufficient to heal US waters, and that regulating millions of farmers would be an impossibility. This turned out to be erroneous thinking.

Shortly after the recuperation of most previously polluted lakes in the 1980s and 1990s, lakes such as Lake Erie again began to be plagued by massive amounts of algae. Instead of industrial and domestic discharges of phosphorus-laden wastewater, this time the culprit was excessive phosphorus fertilizer washing off croplands into rivers and streams and then into lakes. Even though the farming industry, guided by government regulations and financial incentives, implemented some measures to reduce fertilizer runoff, problems persisted. Factors included "legacy" phosphorus leaching from fields that were overdosed for decades when chemical fertilizer was quite cheap, climate change affecting traditional weather patterns, and agricultural operations becoming industrial-scale for which sewage treatment facilities were not available. In contrast to the algal blooms of the 1950s and 1960s comprised of a variety of non-toxic species, the blooms of the 21st century are now often caused by cyanobacteria (blue-green algae), some species of which produce toxins that can be harmful and sometimes fatal to animals.

Egan cites numerous cases around the country of rivers and lakes adversely impacted by phosphorus-driven, toxic algae infestations. Warmer temperatures brought by climate change and increased phosphorus runoff have exacerbated these outbreaks while incurring billions of dollars in damage to fisheries, recreation, drinking water supplies and risking health to humans.

To quote Egan, "*An exquisitely balanced phosphorus exchange existed for billions of years before humans corrupted the element's flow through the environment*. *In the last two hundred years, humans cracked the circle of life held together by phosphorus and replaced it with a line running straight from mines to farms to waters that are, as a consequence, increasingly fouled by toxic algae.*" Although it was once thought that the country's algae problem was solved by the Clean Water Act, today's algae problem is more serious and will be harder to solve. According to Egan, the phosphorus problem today is driven by about 2 million farms on about 40% of the landmass of the lower 48 states. In addition, as stated by Dr. Schindler, all the "legacy" phosphorus tied up in farm soil due to decades of over-fertilizing will take generations to leach out.

Solving the problem will require greater efficiency in how phosphorus is mined, processed, and applied as fertilizer, but it will also require changing the attitude that human and animal excreta is waste. Ways need to be found to use that excreta and the phosphorus it contains to fertilize our croplands. This has been done in Asia for thousands of years. Egan states that there are "*ripe opportunities to restore the phosphorus cycle by reclaiming the nutrients in the human waste stream. Globally, there is, very roughly, three million tons of phosphorus flowing out the undersides of humans every year in the form of urine and feces, yet relatively little of it is exploited for the fertilizer strove that it is.*"

On an optimistic note, technologies exist to convert the nutrients in human waste to their elemental form. Let's hope that clever entrepreneurial minds will seize on such opportunities. Equally vital is the need for significantly tighter regulations on the application of fertilizer anywhere, particularly on croplands, in order to diminish and eventually stop fertilizer runoff into rivers and lakes, and to begin what will be a very slow process of eventually purging croplands of the excess phosphorus already applied.

Emory D. Anderson, PhD

NEWS BRIEFS

There has been no word from the Town as to when the **alum treatment for Mystic Lake**, authorized by the Town Council in April, will be implemented. It will likely not be done until fall 2024.

The annual treatment of Mystic Lake and part of Middle Pond with the chemical Sonar for the **control of the invasive plant *Hydrilla*** was done on July 26 and again on August 18.

The pair of adult bald eagles residing in the vicinity of Mystic Lake has again successfully produced another offspring. The chick recently fledged and can now be seen flying. It can be distinguished from its adult parents by its all black plumage, compared to the white tails and heads of the adults.

FOXES VS. COYOTES

I was asked to do a report comparing foxes and coyotes. I have to admit that my first thought was: one is red and the other is gray. I quickly became disabused of this simplistic view after discovering that there actually are gray foxes, and Cape Cod is within their range. Suddenly, my job became a lot more interesting, so I created this chart that I hope you will find interesting.

	Red fox	Gray fox	Coyote
Order	Carnivora	Carnivora	Carnivora
Family	Canidae	Canidae	Canidae
Genus	*Vulpes*	*Urocyon*	*Canis*

All three of the animals have identical order and family, but differ as far as genus. So much for the science; now we can start to look at the various animals.

To me, the **gray fox** is the most interesting. It is an omnivorous animal widespread throughout North and Central America. It was once the most common fox in the eastern United States, but has been edged out by the red fox as human advancement and deforestation made the area more suitable for the red fox and less suitable for the gray. It has a black stripe ending in a **black-tipped tail**, has white on its ears, throat, belly, and hind legs, and weighs 8–15 lb, although occasionally as much as 20 lb. They also have black around their eyes and on their lips and noses. While they are similar in size to the red fox, they appear smaller because of their short, stubby legs. The gray fox is specifically adapted to climbing trees and is capable of climbing 50 feet up and jumping from branch to branch. Its hooked claws allow it to scurry up trees to reach food sources or to escape predators. It may walk down trees by jumping branch to branch or by descending backwards slowly like a cat.

The other night, around 10:30, we were driving home from the Cape Playhouse in Dennis when a young **red fox** ran across the road in front of us. I say it was young because it was small, very skinny, and very curious; it stopped and stared at us until we were almost on top of it. The red fox is the largest true fox and one of the most widely distributed, being found across most of North America, Europe, Asia, and parts of North Africa. It has also been introduced to Australia. Red foxes are usually found in pairs or small groups consisting of families, such as a mated pair and their young. The young of the mated pair usually remain with the parents to assist in caring for new kits. Red foxes primarily feed on small rodents, rabbits, squirrels, game birds, and invertebrates. Fruit and vegetables may also be eaten on occasion. They tend to kill smaller predators, but are vulnerable to attacks from larger predators such as wolves, coyotes, and birds such as the golden or bald eagle. Red foxes are the largest species of the genus *Volpes.* However, they are much lighter than similar sized dogs. Their limb bones may weigh 30% less than those of a dog of similar size. On average, adults measure 14–20 inches high at the shoulder and 18–35 inches in body length, with tails measuring 12–22 inches (**with white tip**) which may hang to the ground when they are standing. They trot at a speed of 4–8 mph and can reach a maximum of 30 mph. Their color may vary from red to silver, platinum, and amber.

The **coyote** is a species of canine native to North America. It is smaller than its relative the wolf and has occasionally been referred to as the American jackal, prairie wolf, and brush wolf, although it is neither a jackal nor a wolf. It is listed as *least concern* by the International Union for Conservation of Nature due to its wide distribution and abundance throughout North America. The species is versatile and able to adapt and expand into environments modified by humans. Urban coyotes are common in many cities. There are 19 recognized subspecies of coyote. The average male weighs 20–40 lb and the average female 15–40 lb. Their fur color is predominantly light gray and red mixed with black and white. Their tail is bushy with **a black tip.** They live in a family unit or in loosely knit packs of unrelated individuals. Coyotes sometimes mate with gray, eastern, or red wolves producing a hybrid known as a “coywolf”. Genetic studies show that most North American wolves contain some level of coyote DNA. At the time of the colonization of the Americas, coyotes were largely confined to the open plains of the western half of the continent. Reading early descriptions of new animals seen for the first time, it is often difficult to determine whether the writer is referring to a wolf or coyote. This is especially true since the coyote was unfamiliar to Europeans since it was native to North America. Even at the time of the Lewis and Clark Expedition, though it was already well known to European traders, it was described in reports of the Expedition as “the small wolf or burrowing dog of the prairie”. The coyote’s diet consists mainly of rabbits, rodents, birds, reptiles, fish, and invertebrates. Just as its cousins described above, it may occasionally consume fruits and vegetables and like them, it may form groups to bring down larger game such as deer.

As I said at the start, this project became very interesting because it concerned animals that I found very interesting and introduced me to an animal, the gray fox, that I didn’t know existed.

Dave Reid

"To preserve and protect the natural environment and ecological systems of the Indian Ponds and surrounding parcels of land and watershed and to participate in studies and work with other agencies, individuals, and groups to educate the public, serve the community, and promote and preserve the Indian Ponds and surrounding areas." IPA Mission Statement

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FORWARDING SERVICE REQUESTED