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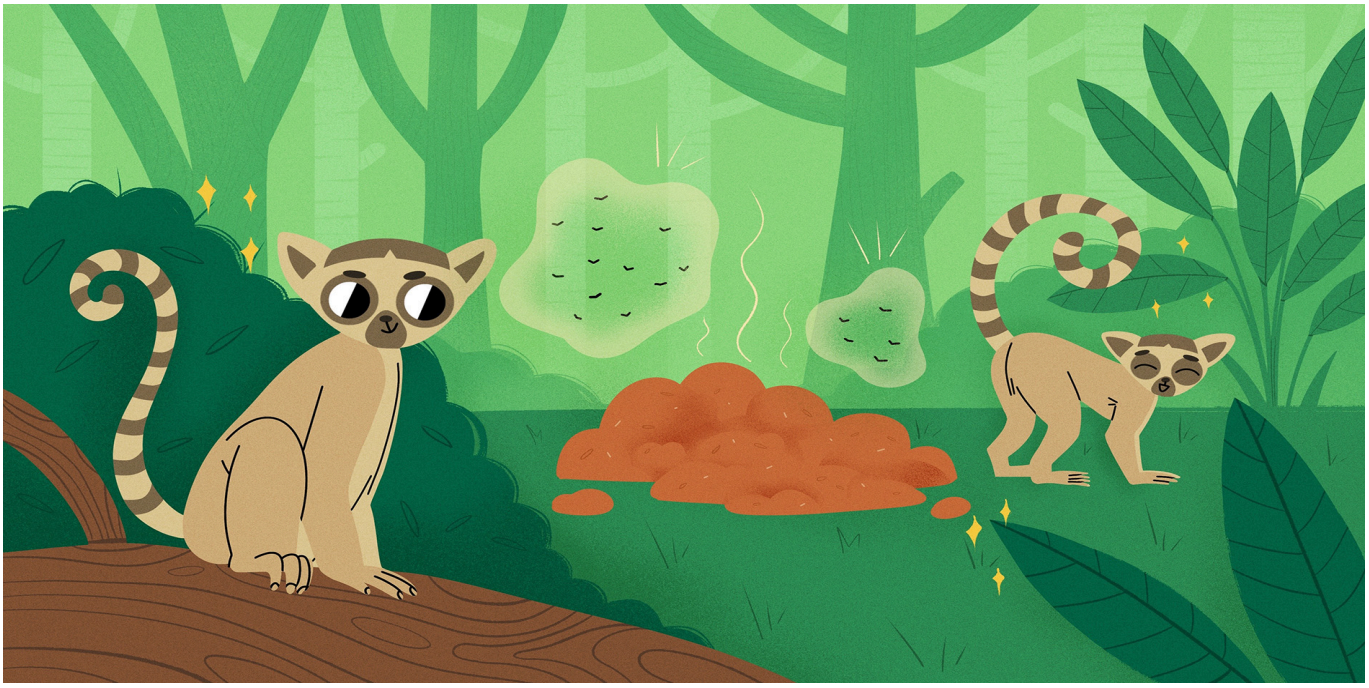

POOP IS COOL! ANIMAL "BATHROOMS" HELP ANIMALS AND PLANTS

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YOUNG REVIEWERS:

ANJU
AGE: 10

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Many animals eat fruits and then get rid of any seeds that they swallow through defecation (pooping). This can be good for plants because it moves seeds around, and the seeds can grow into new plants using the dung (poop) as compost. In some cases, many animals will poop in the same spot, creating "bathroom" areas called latrines that help them to bond with other individuals of their species, communicate, and mark their home regions. These latrines can also attract many other animals that eat seeds, insects, and even poop. Unfortunately, humans are causing many animals to become less common or even extinct as we destroy their habitats or hunt them for food and fur. If we lose these animals, we also lose all the good things they do for nature. We must protect natural habitats so these important animals can keep living—and pooping!

YOU ARE WHAT YOU EAT!

While many large animals are predators and like to eat meat, others prefer to eat just plants. Animals that only eat plants are called

HERBIVORES

Animal species that eat just plants (leaves, branches, roots, grasses, and fruits).

FRUGIVORES

Animal species that eat mostly fruits.

SEED DISPERSAL

When plant seeds are transported to new places away from their "mother" plant. Seeds that get dispersed usually have a better chance of growing into new plants.

LATRINES

Sites where more than one individual from the same animal species regularly defecates.

herbivores if they eat mostly leaves and stems or **frugivores** if they eat mostly fruits. When frugivores eat fruits, they sometimes swallow the seeds. Seeds can be hard to digest, so eventually, frugivores get rid of them through defecation (pooping) or regurgitation (vomiting), and then the seeds can grow into new plants. It may seem gross, but the seeds that get eaten and then pooped out may be the lucky ones. When a frugivore eats seeds, the animal carries the seeds away from the mother plant and helps to spread them around the landscape, helping the seeds find good places to grow. This is called **seed dispersal**. Also, when seeds get pooped out, they start their lives with some extra fertilizer, which can help the new plants grow faster and stronger. Some examples of great seed dispersers are monkeys (such as spider monkeys, capuchins, howler monkeys, gibbons, and langurs), bats, birds (such as robins, thrushes, and tanagers), and even some land mammals (such as deer, peccaries, and agoutis).

Some animals return to the same places each time they poop, sometimes with their families or social groups. These special bathroom places are called **latrines**, and over time, they can accumulate big piles of poop. A good example of an animal that makes latrines is the lowland tapir (Figure 1). Lowland tapirs live in tropical rainforests and are the largest land mammals in South America—adults weigh more than 500 pounds! Tapirs use their short grasping trunks to reach for leaves and fruits, which they grind up and eat using their large teeth. Tapirs can eat and disperse at least 140 seeds per month (or 1,680 seeds per year) [1].

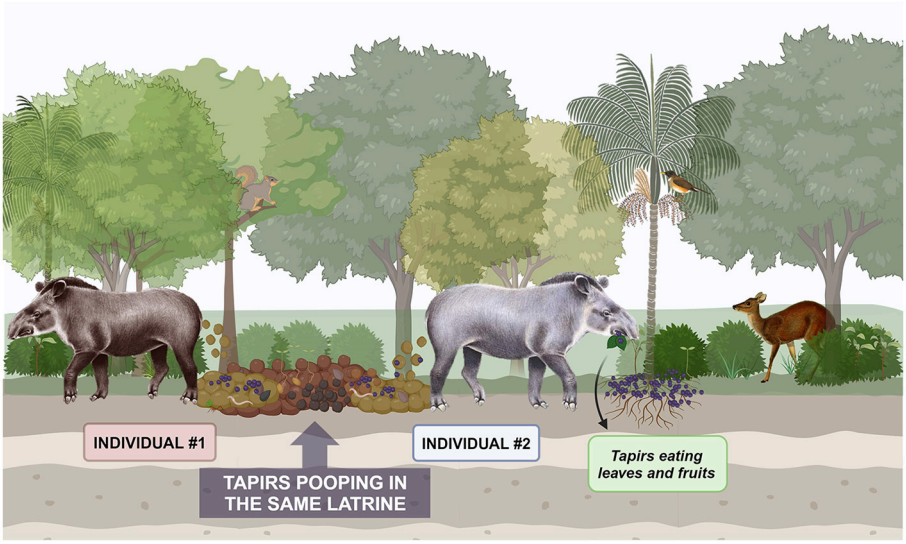

Figure 1

Figure 1

Large animals called lowland tapirs are herbivores that live in Neotropical forests and eat leaves and fruit. Tapirs defecate in the same "bathrooms", which are called latrines, dispersing many seeds. Created with BioRender.com.

After eating fruits, tapirs will poop out the seeds in their favorite latrines. Some people even call tapirs "forest gardeners" because they disperse so many different types of seeds. These seeds will germinate faster and grow better inside the dung pile. In fact, scientists think that some tree

species in the rainforest would go extinct if they did not have tapirs helping move and fertilize their seeds (Figure 2).

Figure 2

Lowland tapir latrines in tropical forests. **(A)** Researchers install automatic camera traps to record tapirs pooping in latrines; **(B)** tapir latrines can have different colors according to their freshness (older poop is darker); **(C)** latrines can contain many seeds that can be important food sources for birds, rodents, and other animals; and **(D)** defecated seeds that do not get eaten can germinate and grow inside tapir poop.

LATRINES ARE GOOD FOR EVERYBODY

Latrines can be very important for the animals that use them and also for the many other plants and animals that benefit from these poop piles in various ways. Some animals, like European badgers, lemurs, and certain raccoon species (like ringtails), communicate through smells. Sometimes, these animals use their stinky latrines to mark their territories and protect important resources, such as food and sleeping sites, from other groups [2].

While some animals use latrines to communicate and warn everybody about where their territories are, other animals use these spots to hide. Lots of predators use smells to hunt for their food. One way that animals can hide from predators and avoid being eaten is to cover up their scent using fresh piles of poop! For example, the ocelot is a medium-sized jungle cat that makes latrines to mark its territory. Some

of the ocelot's prey (such as opossums and rodents called agoutis) rub their faces and bodies in ocelot poop to disguise their smell and hide from ocelots [3]. It is better to be dirty and smell bad than to get eaten!

Latrines can also be good places for animals to find food. Remember that many large herbivores and frugivores eat lots of fruits and then poop out the seeds in their latrines? Some animals, like rodents and birds, like to eat seeds. For these seed-eating species, latrines are like restaurants with regular food deliveries (Figure 3). In fact, researchers in Brazil have recorded videos of Brazilian squirrels spying on tapirs to see where they poop (no privacy!) and then searching the latrines for seeds.

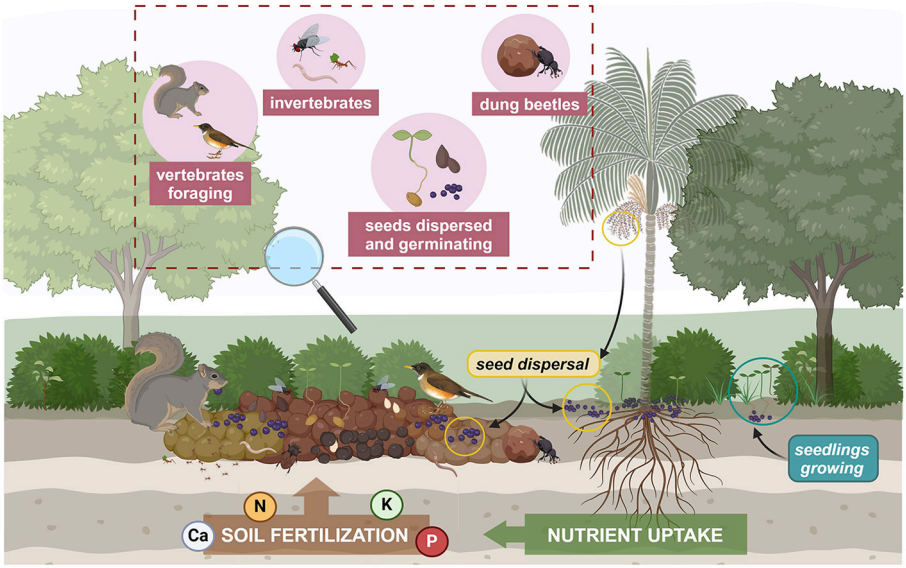

Figure 3

Figure 3

Latrines help other plant and animal species. Birds and squirrels use latrines to find their food. Invertebrates (e.g., ants, beetles, worms, and flies) are also attracted to the dung piles and might become food for insect-eating animals. Dung beetles roll balls of poop to lay their eggs in. Seeds deposited in latrines usually find a lot of nutrients, like nitrogen (N), potassium (K), calcium (Ca), and phosphorus (P), thus helping them sprout into plants. Plants near latrines also use plentiful nutrients to help them grow faster and stronger. Created with BioRender.com.

INVERTEBRATES

Invertebrates are animals that do not have a backbone or a skeleton inside their bodies. Some examples include insects (e.g., spiders, ants, and bees), mollusks, lobsters, and crabs.

Not only seed-eaters find food in latrines. Stinky latrines attract many worms and insects, like flies, worms, and dung beetles. Animals that feed on insects and other **invertebrates** will visit latrines to look for their next meal. Dung beetles also come to latrines to eat. They are a special group of insects that use the poop of mammals for feeding and nesting. Dung beetles are important for breaking down and recycling dung into the soil, allowing the nutrients to cycle through the ecosystem and fertilize other plants. Dung beetles select pieces of poop, make them into balls, and then roll these poop balls away to bury them. Then, female dung beetles lay their eggs inside the balls so that their babies have lots of food waiting for them when they hatch. Sometimes, extra-lucky seeds accidentally get trapped in the dung beetle's poop balls, so they get spread around even further in the environment.

Even plants can enjoy a good latrine. Plants need nutrients like nitrogen, phosphorus, and potassium to grow and stay alive. Poop is

a good natural fertilizer because it can contain lots of these important nutrients. Latrines have lots of poop, so they also have lots of natural fertilizer. This is good for the plants that grow from the seeds pooped in the latrines, and it can also be good for the plants that live nearby. Some plants grow their roots into latrines to use the nutrients. For example, red howler monkeys are important herbivores and frugivores in the rainforest. Howler monkeys like to poop as families and make latrines. Scientists found that the soil under howler monkey latrines has more nitrogen and phosphorus than the soil outside of the latrines, and there are more roots under the latrines than in other parts of the forest [4].

SAVING ANIMALS TO KEEP FOREST ENVIRONMENTS HEALTHY

Unfortunately, many of the animals that make latrines are threatened. Humans are destroying lots of natural habitats, including rainforests. Animals living in these areas may become less common or may even be driven extinct. Also, humans like to hunt and eat many large animals that make latrines. In some places, large animals like tapirs are missing or endangered because of habitat loss and hunting. If we lose these animals, we also lose all the important, helpful things they do for nature. For example, many other animals will have a harder time finding food without tapirs and howler monkeys' latrines. Moreover, many plants will not get dispersed, will have a harder time growing, and may eventually go extinct. We must protect natural habitats so these important animals can keep living—and pooping!

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I live in Japan. I love reading animal-related books, ballet, and violin. I also enjoy walking and playing with my dog and participating in activities such as volunteering. I would like to learn more about animals, and I love to learn new subjects, especially biology. My dream is to become a veterinarian and have an international vet clinic to help animals and owners around the world.

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Harsith enjoys playing Cricket, Soccer, and Cycling. He loves to make chain reactions with gears and dominoes. He loves to play with his sister. He is good speaker trying to improve his public speaking skills. He enjoys writing and starting to review science.

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