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Science Standard
6.5.c.

Student Edition

California Education and the Environment Initiative

Energy: Pass It On!

California Education and the Environment Initiative

Approved by the California State Board of Education, 2010

The Education and the Environment Curriculum is a cooperative endeavor of the following entities:

California Environmental Protection Agency

California Natural Resources Agency

Office of the Secretary of Education

California State Board of Education

California Department of Education

California Integrated Waste Management Board

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Special thanks to **Heal the Bay,** sponsor of the EEI law, for their partnership and participation in reviewing portions of the EEI curriculum.

Valuable assistance with maps, photos, videos and design was provided by the **National Geographic Society** under a contract with the State of California.

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Where Are the Wolverines?

Researcher Katie Moriarty hiked through Tahoe National Forest. She stopped here and there to set up cameras in the trees. After she left, her cameras went to work. They took pictures whenever their motion and heat detectors sensed an animal nearby. In February of 2008, she was shocked when she looked at one of her photos. There stood a wolverine, a mammal that looks like a small black bear. Why was she so surprised? The last documented sighting of a wolverine in California was in the 1920s.

The Mighty "Skunk Bear"

Wolverines have thick bushy coats, broad heads, and short furry ears. Along with their sharp teeth and claws, they use foul-smelling musk oil to defend themselves. The musk oil makes them smell like a skunk. These features earned the wolverine the nickname, "skunk bear."

Wolverines are mainly scavengers. They clean up after another carnivore makes a kill. The dead animals they eat are called carrion. Carrion is a very important part of the wolverine's diet in winter. In California, this carrion is mainly deer and elk. In the summer, wolverines eat many other kinds of foods, including roots, berries, and small prey. Their prey includes fish, young birds, and small mammals like mice and gophers. Occasionally, wolverines may attack large mammals like deer, especially when they are stuck in deep snow.

Wolverines are about the size of a small collie. They are the largest members of the weasel family. They are also the most ferocious. Wolverines are remarkably strong for their size. Their powerful jaws and sharp claws make them powerful predators. Their teeth are sharp and strong enough to chew through bone and carrion that has frozen in the snow.

What wolverines lack in size, they make up for with aggressiveness. A large

Wolverine

Sierra Nevada, California

wolverine might weigh only 40 pounds. But it will challenge much larger predators and steal their prey. Hunters and trappers have seen 1,000-pound grizzly bears leave their meals behind when a wolverine approached.

Wolverines live in forests or tundra in the mountains. They prefer remote spaces with few people. They now live mainly on high mountaintops, where it is too cold and snowy for trees to grow, and because these areas are the least disturbed by humans. Wolverines share their habitat with other mammals, birds, insects, and fungi that they hunt and eat. Larger predators like mountain lions and bears also live in the same region. These predators compete with wolverines for food. On rare occasions, they may kill wolverines. Still, the wolverine depends on these predators to provide them with carrion.

Wolverines are well-adapted to live and hunt in the snow. Their fur is thick and keeps them warm. Their feet are large so they can walk easily on snow. If they are hungry, they can even use their long claws to dig 10 feet into the snow to find hibernating animals. In the tundra habitat, snow plays a very important role in wolverine survival. Female wolverines raise their babies in dens built in deep snow layers. These dens are long, complex snow tunnels that protect the young from predators and provide warmth in the cold climate. In forests, wolverines sometimes create dens from fallen or decayed trees.

Wolverines cover many miles in a day of hunting. Each animal needs lots of space to hunt and raise its young. Wolverines fight off other wolverines that try to enter their home territory.

This limits the total number of wolverines that can live in a region. It is one of the reasons that wolverines are one of the rarest mammals in North America.

Because wolverines are very secretive and travel across large ranges, they are hard for scientists to study. Many things about the species are not known. But one thing is certain, wolverines used to live throughout the Sierra Nevada Mountains. Now, they are exceedingly rare. In California, they are designated as a threatened species. Their decline is a mystery scientists want to explore.

Wolverine

What Happened to California's Wolverines?

The population of wolverines was never very large. Still, there were enough around in the 1800s to cause problems for people. Trappers would lose money when hungry wolverines stole animals from their traps. They began to use poisoned bait to kill wolverines. Wolverines also stole food from settlers' cabins. The "skunk bears" even ruined settlers' belongings with their musk and urine markings. People thought that wolverines were particularly fierce and dangerous animals. Settlers killed them whenever they got the chance. Today, in other parts of the world, hunters and trappers still kill wolverines for their fur.

What has changed over the last 150 years? For one thing, the ways people use the land have changed a lot. The discovery of gold at Sutter's Mill in 1848 began a major shift in the region. Is this what caused the wolverine to almost disappear?

After the Gold Rush started, miners and early settlers built many new towns in the Sierra Nevada Mountains. In 1860, about 150,000 people lived in the region. By 1960, that number grew to around 275,000. The population reached 650,000 in 1990 and will soon pass 1,000,000.

The Gold Rush paved the way for many new industries. Forests were cut to provide lumber for mines and houses. By 1880, over 1.5 million acres of pine forests had been cleared. Scientists

wonder how this logging affected the wolverines. Could they still find safe dens for their young without the trees? People also built mines, farms, and ranches throughout the region, some located in the wolverine's habitat.

In the late 1800s, ranchers grazed sheep in the high grasslands. This practice cleared large areas of native grasses. Ranchers worried that wolverines would hunt and kill their livestock. Like trappers, they also poisoned wolverines in order to protect their income.

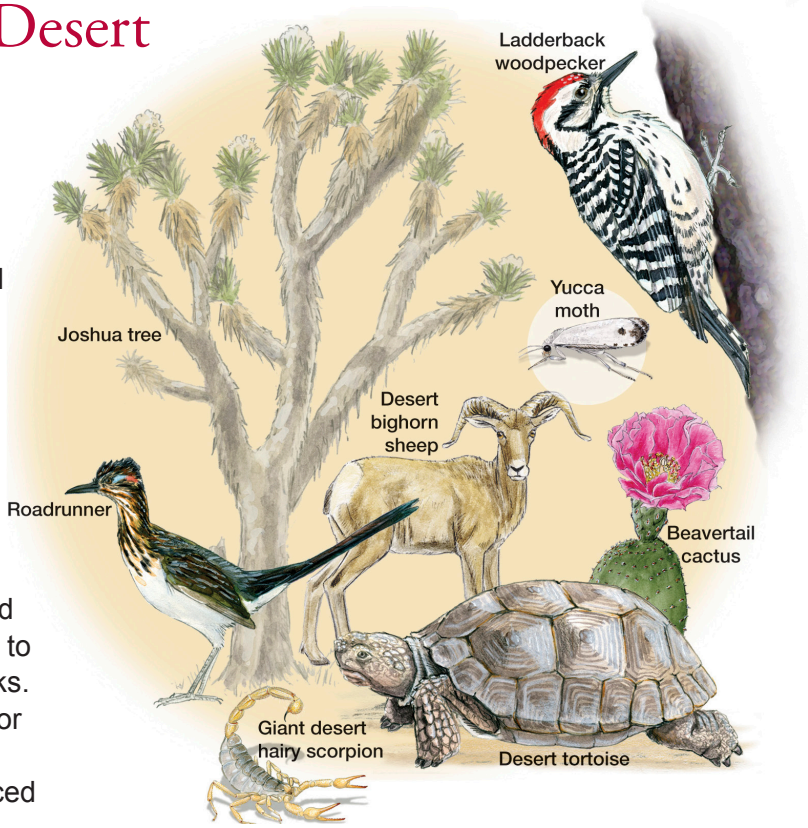
In the 1860s, people created parks at Yosemite Valley and Calaveras Big Trees. These were the first parks in the Sierra Nevada Mountains. More parks followed. Tourism brought more people to the area. More people meant more contact with wolverines. Some people were afraid of wolverines and sometimes killed them to protect themselves.

Mining, grazing, farming, logging, and recreation all affected the habitat of the wolverine. Wolverines had a harder time finding places to build dens and raise their young. They no longer had unbroken home ranges in which to hunt. In addition, the populations of some of their food sources may have changed. Hunters killed deer, an important part of the wolverine's winter diet. It grew harder and harder for the wolverine population to survive in the Sierra Nevada Mountains.

Will the wolverine continue to live in California? Or did Katie Moriarty find one of the last of a dying species? Scientists are studying how changes to the wolverine's habitat, populations of predators and prey, and other factors will affect the skunk bear's future.

Waterfall, Yosemite National Park

Explorer's Journal: High Desert



Location: Joshua Tree National Park, San Bernardino and Riverside Counties

Day 1:
When we arrived at our campsite, I was surprised at the variety of life that I saw all around us. I always thought that the desert was just dry sand, but Joshua Tree National Park is not like that at all. Sure, it is dry and hot during the day, but there is life all around. I first noticed the tall Joshua trees, the only trees as far as I could see. In between these, I found yucca plants with tall spiked leaves and the cholla cactus with its pointed spines. Shrubs of creosote were scattered everywhere. When I looked closer, I was amazed to find tiny wildflowers popping out between the rocks. The ranger says these will not show their colors for very long but will soon produce seeds across the desert floor. On one flower next to our tent, I noticed a small butterfly, drinking the sweet nectar.

As the Sun began to set, I watched a black-tailed jack rabbit hopping over the rocks, pausing to nibble on grasses and flowers. A small mouse popped from beneath a creosote bush, probably looking for some seeds to eat. As we went to sleep, I heard a coyote howl. I wonder if it will find that rabbit, or if another animal or plant will become its food. I hear that coyotes eat just about anything, dead or alive.

Day 2:
We went hiking today to find some more animals. We had not gone far before I noticed a lizard sunning itself on the rock. It sat very still and then leaped to catch a grasshopper, its lunch for the day. After another mile, a very loud rattling sound startled me. I knew it had to be a rattlesnake, frightened that I was approaching. I remembered that if I stayed far enough away, it would not want to eat someone as big as me, and I would be safe from its venomous bite. Thankfully, rattlesnakes prefer lizards and small rodents.

Back at our campsite, I studied the ground a little bit closer, wondering what I missed on my hike. Harvester ants crawled in a line, carrying seeds back to their colony to eat. Beneath a creosote bush, the soil looks dark. I wish I had a microscope to study the fungi that lives there, getting nutrients from decomposing creosote leaves. As the Sun went down, I was happy to see a bat flying overhead. I hoped it would eat any mosquitoes flying around, so that the mosquitoes would not bite me!

Day 3:
We packed up to leave the desert today. Overhead I saw a turkey vulture circling. It must have spotted something dead to eat on the ground. There are so many other animals and plants that I did not see on my visit. The ranger says that over 850 plant species live in Joshua Tree National Park. About 350 vertebrate species live there too, along with so many insect species that no one has counted them all. I cannot wait for a return visit to spot more life in the desert.

Explorer's Journal: North Coastal Forests

Location: Jedediah Smith Redwood State Park, Del Norte County

Day 1:
From the moment I entered Jedediah Smith Redwood State Park in the northwest corner of California, I could not believe how tall the trees were. Coast redwood trees towered over me, stretching over 300 feet into the sky. I wondered what kind of life lived under this lush canopy of needles.

After I set up my tent, I began to look around. Next to a fern on the forest floor, I spotted an intricate spider web. Entangled in it was a small insect, and I watched as the spider carefully wrapped its silk around its prey. Underneath, on the needled floor, slid a yellow banana slug, with its two eyestalks, or upper tentacles, waving through the air. These slimy organisms eat animal droppings and dead plant material, recycling their nutrients into soil.

By nightfall, the forest became quiet, and I could hear an owl hooting in the distance. Somewhere on the forest floor lived a mouse or vole that was in danger of becoming that owl's dinner. As I began to fall asleep in my tent, I heard a rustling outside. I grabbed my flashlight and peeked out. My light reflected in two beady eyes that stared back. A raccoon had come to see if I had left out any leftovers. Those animals will eat just about anything, plant or animal, but I keep a clean camp, and so they soon scurried away without a crumb.

Day 2:
I awoke to the loud cries of a bird. A blue Steller's Jay with its black crest hovered nearby, hoping for some of my breakfast. It is my campsite's daytime flying version of the raccoon, ready to eat seeds, insects, or whatever it can grab off my table.

I decided to take a hike, amazed at the beautiful flowers beneath the canopy of needles overhead.

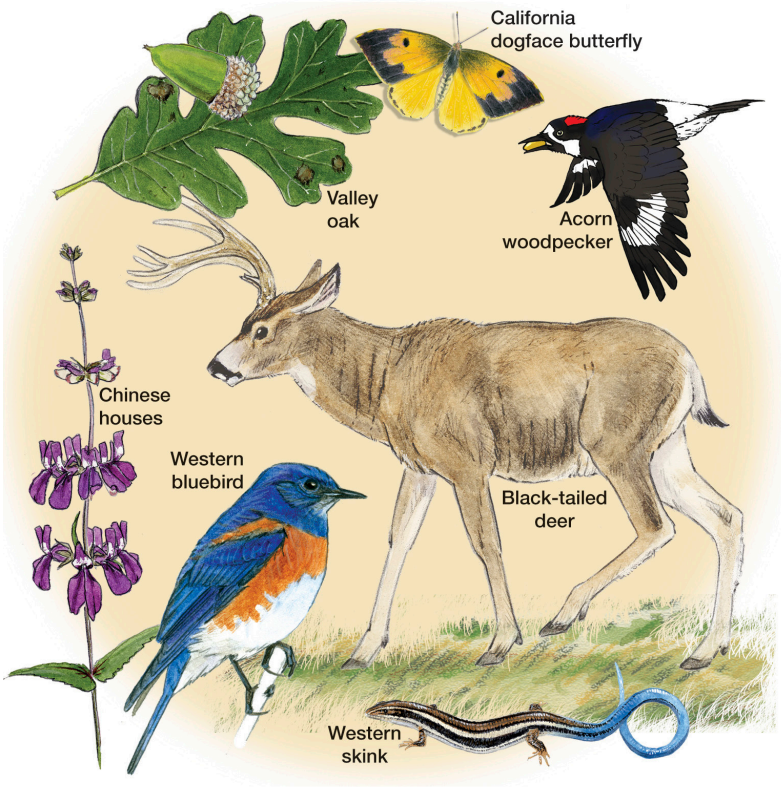
A golden tiger lily grew near a moss-covered rock, with a purple Douglas iris nearby. On my way, I heard a rustle in the distance. Was that just a ground squirrel, searching for pine seeds and acorns? I stared a little longer. From over the hill appeared a black-tailed deer, slowly strolling through the forest and nibbling at the vegetation. I tiptoed past, not wanting to scare it.

I ate my picnic lunch near a slow-moving stream. In a pool by my feet, a northern rough-skinned newt with its bright orange belly swam past, searching for an earthworm or mosquito larvae for its own picnic. Beneath a fern, I noticed the remains of some sort of dead rodent. A fly perched on top of it, sucking up its own "picnic" through its proboscis, the long mouth-like tube it uses for eating.

On the way back to my campsite, I spotted some tracks on the ground. I checked in my guidebook – these were the tracks of a black bear! I thought back to the deer I saw earlier. If it is not quick enough, it could easily become that bear's meal. When you think about it, every plant and animal in the forest is bound to become someone else's dinner, eventually.

Explorer's Journal: Oak Woodland

Location: Henry Coe State Park, Santa Clara County



Day 1:
I came camping at Henry Coe State Park to visit its oak woodlands. From my tent, I could see a giant valley oak surrounded by grasses blowing in the breeze. A blue oak shaded my picnic table. As I cooked my dinner for the evening, I noticed a large animal lurking in the grass on the hill. A coyote moved about, probably searching for any plants, animals, leftovers from careless campers, or even road kill that it could eat for dinner. I made a note to store my food securely.

Day 2:
I awoke to the hammering noise of an acorn woodpecker, preparing a place to store the acorns it collected from the many oaks around us. After breakfast, I decided to take a hike to explore the wildlife in the park. Wildflowers dotted the trail, along with less-appealing poison oak shrubs and vines. I noticed a butterfly flitting from flower to flower, sipping nectar as it went. As I passed, a Pacific gopher snake slithered into the grass. It was not interested in me. It prefers to eat small mammals and the occasional lizard or insect.

I decided to rest in the shade and sat beneath a California laurel tree. I noticed a large burrow beneath the tree. From the size of it, I guessed that it probably belonged to a badger. They dig through the dirt with amazing speed to capture ground-dwelling rodents to eat. I wondered what other life lived beneath the surface. Perhaps worms wiggled beneath me, eating the decaying leaves from the tree above? Under a nearby tree, a dusky-footed woodrat scurried past, searching for nuts, fruits, or green vegetation to take back to its nest.

As I began the return to my campsite, I noticed some scat, or animal feces, on the ground. I checked my guidebook, and discovered that it belonged to a mountain lion! These animals generally avoid people, so I have never spotted one before. The scat seemed to contain a fair amount of hair. I wondered which unfortunate mammal was the big cat's dinner.

Back at camp, I smelled the distinct odor of a striped skunk. Wherever it finds its meal of mice, eggs, insects, or berries, I hope it does not end up in my campsite. As the Sun began to set, a turkey vulture soared overhead, scanning the ground for dead animals to dine on. I sat still, mesmerized by the bird's slow circles in the air, the rustling of leaves in the oak trees, and the sound of the wind coming over the ridge.

Narrator (pointing to the "Sun"): Every day, lots of energy comes to Earth from the Sun. That energy can be used for many things, such as heating houses and water, and generating electricity. However, people and other animals cannot use the Sun's energy for life processes, such as breathing and growth. Only plants can do that.

Sun (pointing to 10,000 energy units represented by squares on graph paper): I am the Sun. I shine on Earth all day long, sending huge amounts of light energy to the planet's surface. Most of that energy is reflected back into the atmosphere, but pavement and oceans and plants and other things on which my rays fall absorb some of it. Plants are the only things that can use my energy to produce the chemical energy they need to live. The squares on this graph paper represent 10,000 units of light energy from the Sun.

Plant (pointing to 100 energy units): I am a grass plant, a producer, and I am able to absorb and store about 1% of the energy that reaches me from the Sun. The rest of the energy from the Sun is reflected away. Through photosynthesis, I turn light energy into sugars and starches, which I store in my stem and leaves. This stored energy is my source of food; I use it to live and grow. I am called a producer because I make food out of the Sun's energy. Plants are the start of almost every food chain on Earth. We are called the first trophic level. These squares represent 100 units of energy, which is only 1% of the light energy that reached me from the Sun.

Narrator: Plants store the chemical energy in sugars and starches for their own use. Sometimes, though, a plant is eaten by an herbivore, such as a rabbit, and that food energy is transferred.

Rabbit (pointing to 10 energy units): I am a rabbit. I eat plants, so I am an herbivore. Sometimes I am called the primary consumer or first level consumer. Herbivores form the second trophic level, or the second step in a food chain. I use most of the energy that I consume just to stay alive—to move, hunt for food, escape enemies, find shelter, build my body, and other life processes. Only about 10% of the energy that I take in is available to whatever might eat me.

Narrator: And there are many things that like to eat rabbits! As you know, meat eaters are called carnivores.

Coyote (pointing to 1 energy unit): I am a coyote and I am a carnivore. Since I eat first level consumers, such as rabbits, I am sometimes called the secondary consumer or the second level consumer. Like all consumers, I use most of my energy just to live. I need energy to hunt for and catch my food, or dig a burrow for my den. Why, I use energy just to breathe, digest my food, and to keep my heart beating! Only about 10% of the energy that I take in is available to whatever might eat me.

Narrator: Depending on the food chain, another carnivore, such as a mountain lion or wolverine, might eat the first level carnivore. Another example of this is one fish eating a smaller fish, or a snake eating a frog. Sometimes the first carnivore dies and is eaten by a scavenger, or its body is used by decomposers such as fungi and bacteria.

Mountain lion (pointing to the mountain lion energy unit 0.1 square): I am a mountain lion and I will eat almost any animal I can find. I will even eat a coyote if I find one! Like all of the other organisms in this food chain, I use most of the energy that I take in just to stay alive! Whether I am a mountain lion eating a coyote, an eagle eating a fox, a crab eating a dead fish, or a million bacteria decomposing a dead bear, I can only capture about 10% of the energy in my food!

Narrator: So we see that only a tiny fraction of the energy that comes from the Sun is stored in plants. Plants use that energy for photosynthesis to produce sugars and starches. In addition, when consumers feed on plants or other consumers, they only capture about one tenth of the energy in their food. And that is why it takes so much energy captured from the Sun to support one wolverine, eagle, salmon, or human being, because so much is lost along the food chain.

Eagle Creek Watershed Timber Sale

Background on Timber Harvesting

California harvests over fifteen billion dollars worth of wood and paper products each year. The forestry and paper industries provide jobs to over 74,000 people. People use timber to build houses and make paper products.

There are many different ways to cut down trees. Clearcutting involves cutting down all the trees in an area. Sometimes, individual trees may be removed out of a larger forest. How harvesting affects natural systems depends on which methods are used. All methods involve removing trees from the natural system. This can remove a food source or nesting site for different species.

Removing trees can have an effect on how fires burn in a forest. In California, people have tried to stop fires from burning for many years. This had led to some forests becoming thick and dense. When forest fires occur, they burn hotter than before. Some plants and animals cannot survive the extra heat. Hot fires also lead to more soil erosion. Removing some of the trees takes out some of the extra fuel. This may make fires less hazardous.

Most harvesting methods open up space to light. This allows plants that need light to grow well. Plants that require shade will not grow in these opened areas, at least not until time passes and new plants grow that can provide shade. What herbivores live in these sites varies depending on which plants grow there. For example, deer may find more food in open spaces.

When trees are cut, logging debris is sometimes left behind. This is material, such as limbs or stems, that cannot be used as timber. This debris returns nutrients to the soil, which allows new plants to grow. It also can provide sites for nesting and shelter for some animals.

Logging equipment and trucks use fossil fuels for energy. Burning these fuels produces greenhouse gases like carbon dioxide. These gases may cause a change in climate on Earth. Climate change may affect many species and ecosystems on Earth. New plants that grow in logged areas can absorb more carbon. This may help reduce the amount of greenhouse gases in the atmosphere.

Forest thinning

Logging trucks have other effects. They compact the soil of the area. Roots of many plants cannot grow well in compacted soil. Trucks also require roads. Road construction can break up habitats, preventing animals from using their full hunting or breeding range. Some get killed crossing the roads. Road construction can also produce erosion. This creates sediments that fall into nearby streams. Sediments can harm fish such as salmon and other aquatic life. Keeping logging away from streams can prevent this problem.

What Is There Now

The Eagle Creek watershed is part of the North Coast National Forest. The lower part of the watershed includes land that was logged about 75 years ago. There are now many large trees growing there. These trees are valuable for lumber. In the upper part of the watershed, the forest is an old growth forest. This means there was never logging in that area. The trees are very old and very large. People have not changed this ecosystem much. Deer, bobcats, black bears, and trout are common in Eagle Creek watershed. Some backpackers think there may even be wolverines living in the area.

The Proposed Change

The California Timber Company wants to cut down trees in the watershed. The company would sell the trees for lumber. It will pay the U.S. Forest Service for the rights to log the land. California Timber Company will cut select trees from the forest. Some will be old growth trees. They will not clear the land completely.

Some Points in Favor of the Proposed Change

Californians use a lot of lumber every year. They need lumber to build houses, offices, schools, and community centers. The California Timber Company will help meet that need. The company says it can cut the trees without harming the natural environment. They will plant trees to replace the ones they cut. The U.S. Forest Service manages the North Coast National Forest carefully. Even with past logging, the area is home to many kinds of animals. The local towns will benefit from new jobs. Logging can help prevent forest fires.

Some Points Against the Proposed Change

There is very little old growth forest left in California. Several kinds of plants and animals can only live in old growth forests. Wolverines are one of these animals. The wolverine is one of the rarest mammals in California. If wolverines do live in this forest, it is very important to protect the habitat from logging. People need lumber but they can cut trees from areas like the lower watershed. Logging has already affected the natural systems there.

Swift River Gravel Company Expansion

Background on Gravel Mining

About 100 million metric tons of gravel are mined in California each year. Much of this mining is in-stream, which means gravel is directly removed from a riverbed.

When gravel is removed from a riverbed, this changes the flow of the river. The streambed becomes wider and shallower, which causes the water to get warmer. Warmer temperatures can harm some organisms. The mined river often flows straighter, which can threaten plants that grow on the edges of the river. Animals that rely on these plants for shelter or food are also affected.

Salmon lift up small gravel with their tails and lay their eggs beneath the rocks. When gravel is removed from the riverbed, larger rocks still remain. Salmon cannot lift the larger rocks and may have no place to lay their eggs.

Normally, small gravel and sand flow downstream to the oceans. This sediment usually builds up on beaches, helping to prevent erosion. If the sediment does not flow out of the river, beaches on the coast erode. This can threaten species that live there. It can also threaten people's houses and other buildings on the coast.

Migrating salmon

Gravel mining involves dredges and heavy hauling trucks. These machines burn fossil fuels to get energy. The burning produces greenhouse gases. These gases may cause a change in climate on Earth. Climate change may affect many species and ecosystems on Earth.

Some mining companies are looking at ways to restore habitats after they remove gravel. They may build pools and side channels to help species that need protected habitat.

What Is There Now

The Swift River Gravel Company owns land near the Swift River. They have mined gravel there for over 40 years. Now, they are running out of gravel. The company owns another site that includes another part of the river. The river runs all year long. It is an important habitat for salmon and trout. These fish lay their eggs under small pieces of gravel in the river. The number of salmon has dropped dramatically in recent years.

The Proposed Change

The Swift River Gravel Company wants to start mining on their new site. They plan to mine in the river so they can continue to stay in business.

Some Points in Favor of the Proposed Change

Gravel is used to make concrete. Builders use concrete for buildings, roads, and many other projects. It is a necessary part of modern society. Gravel must be mined somewhere. Swift River Gravel Company has owned this land for a long time. They have always planned to mine gravel at this site. It is not fair to the company to stop them after they paid for the land. Current laws limit the amount and type of gravel mining. Swift River Gravel Company is within the laws controlling their new site. If Swift River goes out of business, 75 people will lose their jobs.

Some Points Against the Proposed Change

Some say mining laws do not go far enough. Even when companies follow the laws, mining creates noise and pollution. People living near the existing gravel pit are tired of the noise and danger caused by gravel trucks. They want to see the mine closed. They are worried about the effects of the new gravel mine on the river.

Roberts Mining Company Expansion

Background on Mineral Mining

Thirty-four different minerals are mined in the Southern California desert. The mining industry employs 20,000 people. It earns about two billion dollars per year.

Many minerals are mined from open pits in the ground. Miners dig up the land, killing or removing the plants and animals that live there. The mining process involves a lot of energy. Processing plants and hauling trucks burn fossil fuels to make energy. The burning produces greenhouse gases. These gases may cause a change in climate on Earth. Climate change may affect many species and ecosystems on Earth. Processing plants also need large amounts of water. Deserts do not have much water, so using precious water resources may cause some species to die.

Hauling trucks produce other gases. They make sulfur dioxide, which can cause acid rain. Acid rain is harmful to many species of plants. It also harms aquatic animals when it builds up in rivers and streams. Trucks also produce nitrogen oxide, which becomes smog. Smog is a kind of air pollution that is harmful to human health. Some mining companies are trying to use different kinds of trucks that use less energy and produce less air pollution.

Desert mining and manufacturing

All the digging involved in mining creates dust. This can cause breathing problems for people. To prevent dust, mining companies spray lots of water on their mining sites. This uses up more of the desert's water supply.

When mining companies have finished digging, they may try to restore some of the habitat they removed. Some companies grow native plants in greenhouses. They replant them after the mining is completed. Mining minerals, like borax, causes much fewer changes to the environment than mining other substances, such as coal or gold.

What Is There Now

The Roberts Mining Company owns land in the Southern California desert. They mine several types of minerals. Their property is next to federal land. Campers, horseback riders, and off-road vehicle drivers enjoy using these public lands. Coyotes, bobcats, and foxes live in the area. So do desert tortoises, skunks, and rattlesnakes. The rare desert orchid is one of many kinds of desert plants that live there, too.

The Proposed Change

The Roberts Mining Company wants to purchase mining rights on the federal land. They believe there are valuable minerals under the land. When they begin mining, they would fence off the area because it would not be safe for people to use the land for recreation.

Some Points in Favor of the Proposed Change

People use minerals every day. Many products depend on minerals. If people are going to have cars, computers, and DVD players, mining is necessary. The Roberts Mining Company has run the mines next to this land for a long time. They rarely have accidents. They do their best to limit environmental effects. The mines do not last forever. In about 50 years, the government can reopen the land for public use. Considering how important minerals are to society, this is a small price to pay.

Some Points Against the Proposed Change

The federal government owns this land. It is public property. The public should be able to use it. The Roberts Mining Company will keep people off the land. They will make money on land they do not own. In addition, mining will disrupt the land. The plants and animals living there probably will not survive the mining operation. People should conserve more rather than mine more.

Allied Grains Rice Farm Expansion

Background on Rice Farming

Rice farming in California produces 3.2 billion pounds of rice each year. To protect their rice from weeds and pests, farms flood their fields while the rice is growing. They also flood them in the winter. This creates a new kind of wetland for eight months of the year. This wetland is used by many different kinds of birds.

Flooding requires farmers to use large amounts of water from nearby rivers. These rivers need irrigation canals and dams built on them to control the flooding. Such structures can block salmon from swimming up the river to spawn. Sometimes the salmon even stray into irrigation drains.

Rice farmers use fertilizers to help their rice grow. Some fertilizer washes into the river. When fertilizers enter rivers, more algae grow, and there may be less dissolved oxygen for fish to breath. Farmers also use herbicides and pesticides that can harm fish and aquatic life. Farmers have worked hard to reduce the effects of these chemicals on natural systems.

When farmers harvest rice, straw is left behind. Many rice farmers burn the straw to get rid of it. This creates air pollution that can harm many species, including humans. Other farmers leave the straw to decompose. Not every grain of rice gets harvested. Some is left on the ground. This rice provides food for birds and other animals.

Rice field

What Is There Now

The Silver River runs through the fields of central California. In winter and spring, the river often floods. This turns the fields into wetlands. Ten to twelve million birds, such as ducks, geese, shorebirds, and wading birds, use wetlands like these each year.

Bob Williams owns the land. It has been in his family for generations. Long ago, they built levees to keep the river from flooding the land. They used the land for farming. It has not been a wetland for many years.

The Proposed Change

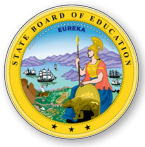
Allied Grains Corporation wants to purchase the land from Bob Williams. The large farming company plans to plant rice here.

Some Points in Favor of the Proposed Change

Some say, this land is not being used productively. Planting rice will make the land useful. California has some of the best rice-growing fields in the world. Rice farming provides jobs, as well as rice to eat. In the 1880s, California had 4 million acres of wetlands. Today, it has less than 300,000 acres. Rice farming helps create new wetland habitats to support migrating birds and other waterfowl that have lost their wetlands. Rice farming releases fewer chemicals into nearby rivers than many other kinds of farming.

Some Points Against the Proposed Change

Rice farming requires a lot of water. The farming company has to keep the rice fields wet all year round. To do this, the company must take water from the river. This affects the entire river ecosystem, especially during the summer dry season. Any pesticides or fertilizers used by Allied Grains easily could end up in the river and cause chemical pollution of the land and water.



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