

Adaptations of Invasive Species Curriculum Handouts (September 2015)

Day 1 Handout: Print out 1 of this handout for each group of 3 students

Student Handout (one per group)

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Day 2 Handouts (This page thru Asian Carp)

Small Indian Mongoose



Native to Asia

Introduced to control rats in Hawaii, St. Croix and several other islands

These mongooses mostly eat insects but are opportunistic feeders and will eat crabs, frogs, spiders, scorpions, snakes, and birds and bird eggs.

The mongoose introduction did not have the desired effect of rat control, either in Hawaii or St. Croix. The mongoose hunted birds and bird eggs, threatening many local island species. The mongooses bred prolifically with males becoming sexually mature at 4 months and females producing litters of 2–5 pups a year. On Okinawa, the mongoose is known to carry antimicrobial-resistant strains of *E. coli*. Mongooses can carry leptospirosis, an infection caused by bacteria affecting humans.

Your Assignment:

On your blank piece of paper draw a picture of a biological control for this species (an organism or disease).

On the back of your paper answer the following questions:

1. Adaptation(s) the biological control species has to control this invasive species
2. How the biological control works to the target invasive species
3. Describe how the biological control will be kept from becoming invasive

European Starlings



Native to Europe

In 1890 New York resident released some 60 European starlings in Central Park. His dream was to introduce every bird mentioned by Shakespeare into North America.

Now the purple-green iridescent birds roost in hordes of up to 1 million; they can devour up to 20 tons of potatoes in one day and their droppings are believed to be vectors of several infectious diseases.

Numerous inventive attempts have been made to eradicate the birds — including strategies involving itching powder, live wires, poisoned pellets, cobalt 60 and Roman candles. Even a jetliner couldn't stop them. In 1960, a flock of some 10,000 starlings flew straight into a Lockheed Electra, crippling its engine and causing the plane to crash. Sixty-two people were killed.

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Zebra Mussels



Native to the Caspian and Black Seas near Russia

Zebra mussels are thought to have hitched a ride to the Great Lakes in the late 1980s by clinging to the hulls of U.S.-bound European vessels. The unwelcome visitors, that have since spread east to New England, are known to feed on the phytoplankton that nourishes the filter feeders which support the diets of larger fish—effectively starving other species unfortunate enough to live alongside them. The creatures' tendency to cluster and cling to hard surfaces has also proved nightmarish for many power plants and water-consuming facilities that have incurred over \$500 million in costs per year fighting off the buildup of mussels that clogs their pipelines.

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Constrictors



Native to Central and South America

The U.S. Geological Survey says nine species of pythons, a type of snake that can range from 12 to 28 feet in length pose a medium to high-risk threat to ecosystem health. Over the past 30 years these reptiles have been traded domestically and internationally and pet owners often take these snakes into homes that cannot accommodate them as they grow. When snakes get too large offending owners release them into the typically Floridian wild, where they ingest endangered species like the Key Largo wood rat and invade wildlife refuges. The government is working to stop constrictor serpent imports into the county and even ban transport between states.

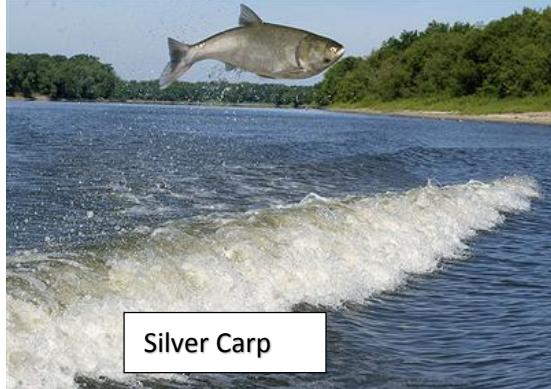
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Asian Carp



Silver Carp



Bighead Carp

Native to Asia

Invasive Asian carp including: silver, bighead and black carp came to the U.S. in the 1970s as live vacuum cleaners meant to remove algae and suspended matter from ponds and fish hatcheries. These fish can grow to 100 pounds and will eat just about anything, adapting shockingly well in new environments. They have taken over and now represent 90% of the biomass in the Illinois River.

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Day 4 Handout (1 Per Student)

Tiny but Hungry, Moth May Peril California Crops

By: Jesse McKinley

San Francisco, June 15, 2007 — Full grown, the light brown apple moth is roughly the size of a nickel: a little dirt-colored insect with an adult life span shorter than the average summer vacation.

But oh, what an eater. As a caterpillar, the moth feeds on flowers, fruits and firs, a diet that can include corn and tomatoes for dinner and cherries, peaches and plums for dessert. So omnivorous is the moth that some entomologists call it the "light brown everything moth."

It is exactly that appetite that has state and federal officials in California worried. A native of Australia, the moth had never been seen in the continental United States before February, when a retired entomologist discovered one in a trap behind his house in Berkeley, just across the bay from here and within fluttering distance of one of the nation's most important agricultural regions.

The moth has since been found in nine California counties, including Napa, where the discovery of a single specimen set off alarm bells for winemakers and farmers up and down the grape-happy region.

"It is a significant pest of wine grapes and because that's what we grow, that's what caught our attention," said Greg Clark, the assistant agricultural commissioner in Napa County. "And if we have an infestation here, it's likely it could move into other agricultural regions."

Over the years, California has faced a number of threats to its agriculture. Perhaps the most famous invasive pest was the Mediterranean fruit fly, or medfly, which prompted a statewide panic — and aerial spraying — in the early 1980s, when it appeared to be threatening the state's billion-dollar citrus industry. The National Guard was called out to bury tons of infested fruit, and highway checkpoints were installed.

No one is predicting that kind of response this time. But, then again, no one is taking the chance. "People want to see this pest dealt with quickly and decisively," Mr. Clark said. "Because there's always another pest over the horizon."

Spraying began this week in Oakley, a Bay Area suburb where masked workers went bush-to-bush with organic pesticides, with additional treatments planned for Monday in Napa, thought to be the northernmost border of the moth invasion.

The problem seems even more serious to the south in Santa Cruz County, where nearly 3,500 moths have been discovered and where farmers and agricultural officials have set thousands of traps in wholesale nurseries to try to safeguard the county's \$73 million industry in shrubs, trees and other ornamental flora. Statewide, agricultural officials say California could lose more than \$100 million because of increased production control and pest control.

Officials also fret that California may be just the port of entry for the moth.

Chief among growers' concerns is the possibility that foreign markets will begin to reject California crops. To that end, the federal Department of Agriculture and the California Department of Food and Agriculture have declared quarantines for the affected counties, barring the transportation of crops or plants around the state without inspections. That comes even as Mexican and Canadian officials have traveled to California to inspect their progress fighting the moth.

Like many states, California is already dealing with a variety of other invasive pests and diseases, each with a more evocative name than the last, like the glassy-winged sharpshooter (which can be devastating to citrus groves and vineyards) and the red imported fire ant, a nasty little insect whose bites can result in pain and welts.

Officials say they do not know how the moth got here, but that it may have come via a host plant brought by a homesick immigrant. "California is a popular place, and people come and bring their favorite plant along," said A. G. Kawamura, California's secretary of food and agriculture.

The moth infestation has also renewed cries from officials like Mr. Kawamura who believe that agricultural border inspections should be returned to the province of federal agricultural officials. The job is currently performed by the Department of Homeland Security, which some critics say does not have the expertise to spot incoming pests like the moth. Senator Dianne Feinstein, Democrat of California, has recently introduced a bill in Congress to move inspections back to the Department of Agriculture.

Russ Knocke, a Homeland Security Department spokesman, disputed the notion that the federal agriculture agency would do a better job. "If someone in this department said everything is working properly and everything is perfect, that person should be removed," Mr. Knocke said. "But for someone to express that rearranging the deck chairs — again — is going to be the solution, I'm going to flatly reject it."

Regardless of its method of entry or which agency ultimately takes the lead, getting rid of the moth is going to be a challenge. James R. Carey, a professor of entomology at the University of California, Davis, said eradication efforts can be fruitless, particularly when large numbers of insects have been found.

"These pests can be there at subdetection levels for years if not decades," said Mr. Carey, who worked on the medfly infestation. "They operate — cancer is a good analogy — they operate in little pockets and then boom, the conditions come together, both climatic and in microevolution, and then they appear."

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