The Case of the Disappearing Tui Chub
4th Grade

INTRODUCTION 5 -10 minutes	Introduce yourself and welcome students to the Desert Discovery Center. Give some background on the partnership and the Jr. Naturalist program.
STATUS 15-20 minutes Species Pictures	Students will be introduced to the concept of Extinct, Endangered, Threatened, and Viable species. They will then play a matching game where they will be given pictures of animals and will have to put them into the proper category.
POPULATION SIMULATION 45-60 minutes Card game (1 set per every 4 kids) Scorecard (1 set per every 4 kids) Pencils 40 "fish" per group	Students will play a card game to represent the natural life cycle of the Tui Chub. Through this game they see the species would not be Endangered if they were left to their natural life cycle. Then human impact cards will be added to the deck and the students will play the game again. This time they will see how these added factors have led to the Tui Chub becoming Endangered.
TUI CHUB: RECOVERING A SPECIES 15-20 minutes Plain Paper Crayons Makers Lined Paper	Students will choose an activity to help educate others about the endangered Tui Chub and suggest ways the species could recover. They can make an informational poster or write a letter to their state representative.
CONCULSION 5 minutes	Once students have completed their project, encourage them to hang their poster in a prominent spot or send their letters to their state representative. Thank them for their participation in the class and encourage them to keep working to help the Tui Chub recover.

The Case of the Disappearing Tui Chub
4th Grade

STATUS

The teacher will start by writing the words "Extinct", "Endangered", "Threatened" and "Viable" on the board.   Ask the students for their definitions of these words. Extinct-no longer exist. Endangered-At risk of becoming extinct, few left. Threatened-species is vulnerable to becoming extinct in the near future, minimal amount left. Viable-species is thriving. Then hand out pictures of various animals.   Have the students place their picture next to the status they believe that animal to be.   Then as a group go through the classifications and correct as need be.   This should give the students an understanding of the status classifications and some of the animals that are in each category.

Key for Pictures:

Extinct	Endangered	Threatened	Viable
Baiji, Chinese River Dolphin	Florida Panther	American Crocodile	White-tailed Deer
Cave Lion	Siberian Tiger	Roseate Tern	Moose
Blue Pike	San Joaquin Kit Fox	Desert Tortoise	Bald Eagle
Dodo Bird	Atlantic Salmon	Northern Sea Otter	Polar Bear
Dusky Seaside Sparrow	Wood Bison	Florida Scrub Jay	Red Eyed Tree Frog
Passenger Pigeon	California Condor	Mexican Spotted Owl	Northern Raccoon
Miss Waldron's Red Monkey	Puerto Rican Parrot	New Mexican Ridge-nosed Rattlesnake	Louie's Western Pocket Gopher
Longjaw Cisco Whitefish	California Clapper Rail	Black Howler Monkey	Eastern Gray Squirrel
Great Auk	Desert Pupfish	Koala	Wild Turkey
Western Black Rhino	Hawksbill Sea Turtle	Mona Ground Iguana	Large Mouth Bass
Wholly Mammoth	Puerto Rican Boa	Grizzly Bear	American Robin
Bachman Warbler	Mojave Tui Chub	Steelhead Salmon	Strawberry Dart Frog

The Case of the Disappearing Tui Chub
4th Grade

POPULATION SIMULATION
Cards for Round 1

Reproduction 10 tui chubs were hatched. Increase the population by 10.	Competitor Native fish species are competing with the tui chub for resources. Decrease the tui chub population by 8
Predator Cutthroat trout have eaten some of the tui chubs. Decrease the tui chub population by 11.	Reproduction 8 tui chub eggs hatched. Increase the population by 8.
Weather There was a flood in part of the tui chubs' habitat. Decrease the tui chub population by 10.	Reproduction 9 tui chub eggs just hatched. Increase the population by 9.
Reproduction 11 tui chub eggs just hatched. Increase the population by 11.	Reproduction 12 tui chub eggs hatched. Increase the population by 12.

The Case of the Disappearing Tui Chub
4th Grade

Weather	Disease
Part of the tui chubs' habitat evaporated. Decrease the tui chub population by 12.	Some of the tui chubs got sick and died. Decrease the population by 9.
Reproduction	Mortality
2 tui chub eggs just hatched. Increase the population by 2.	Some tui chubs died of old age. Decrease the population by 2.

POPULATION SIMULATION

Cards to add for Round 2

Habitat alteration	Habitat alteration
Due to land development in the area, the waterways have been altered so that there is not enough water for all the tui chub to live. Decrease the population by 7. <div align=right>x</div>	Due to land development in the area, some of the ponds in which the tui chub lived have dried up. Decrease the population by 6. <div align=right>x</div>
Non native competitor	Habitat alteration
A non native species of tui chub, the arroyo chub, has been introduced into the waterways. This non native species is competing with the tui chub for resources. Decrease the tui chub population by 5. <div align=right>x</div>	Due to fertilizer washing into the waterways from people's lawns, cattails have reproduced so much that they have reduced the amount of water the Tui Chubs have in which to live. Decrease the Tui Chub population by 7. <div align=right>x</div>

The Case of the Disappearing Tui Chub
4th Grade

Habitat alteration The tui chub originally lived in a series of interconnected ponds. Land development has removed the connections to those ponds and some of the ponds themselves. Decrease the tui chub population by 10. x	Non native predator Mosquito fish, introduced by people to try to control the mosquito population, are now eating tui chub eggs. Decrease the population by 5. x
Non native hybridization Tui chubs have been breeding with non native arroyo chubs. The new fish are not pure tui chubs and do not reproduce. Decrease the tui chub population by 5. x	Non native induced disease Tui chubs have contracted the Asian tapeworm, which was introduced when people used a non native fish species as bait for fishing. Decrease the Tui Chub population by 10. x

Tui Chubs: How a Species Became Endangered

This activity is a simulation. Students will state that a successful species maintains its population through a balance of reproduction and natural loss.

Round 1: A Species in Balance

Materials: A deck of 12 cards consisting of 6 reproduction cards, 1 competitor card, 1 predator card, 2 weather cards, 1 mortality card, and 1 disease card. These cards simulate a balanced population.

One "Scorecard" per group.

One pencil per group.

One "pond" per group of students

40 plastic fish or cutout fish to represent tui chubs

<u>To set up for play</u>:

2 – 4 students play with one deck

The Case of the Disappearing Tui Chub
4th Grade

Begin by putting 25 tui chubs (fish cut out of paper or use plastic dime store toy fish) in the pond. The remaining 15 tui chubs are extra so that actions indicated by the cards can be carried out. They should remain on the side, out of the pond.

Shuffle the 12 cards. Put them face down on the table.

Discuss: Ask the groups to state how many Tui Chubs are in the pond.

(Students will state there are 25 tui chubs in each pond).

<u>To play</u>:

Students take turns pulling a card off the top of the deck and then either adding to or subtracting from the population of Tui Chubs in the pond, per each card's directions.

As students act out the situations on each card, one of the students should be keeping track of what happens to the population by recording each move on the "Scorecard".

Students keep taking turns until all 12 cards are gone.

Discuss: Ask groups to state how many tui chubs are in their pond now.

(Students will state there are still 25 tui chubs in each pond).
Ask the class if there were always 25 tui chubs in each pond at all times.

(No, sometimes there were more, sometimes less, depending on whether they had just reproduced or whether some had just died due to a natural loss of some type.)

Tell students since the Tui Chubs reproduced numerous times, you would expect the groups to end up with way more than the 25 tui chubs at the end of the game. Ask if there is some reason they did not.

(Although the Tui Chubs always reproduced, some Tui Chubs also died.)

Ask students what kinds of things happened that reduced the Tui Chub population, despite their reproduction.

(Predators, disease, natural death by old age, competition by other species, unfavorable weather.)

<The teacher should write this list of circumstances on the board as students name off the things that help keep the population in balance.>

Tell students we consider a population of animals like this to be stable and healthy. When the numbers of a population remain the same over time, the population is viable. Ask someone to summarize why the number of Tui Chubs was still 25 at the end of the first round of the simulation.

The Case of the Disappearing Tui Chub
4th Grade

(Checks and balances in the population of the tui chubs ensured that although new Tui Chubs were always being hatched, the same number of Tui Chubs were also dying.)

Round 2: A Species Becomes Endangered

This simulation will show how habitat changes caused by human activity result in a species becoming unbalanced to the point of endangerment.

Materials: A deck of 20 cards, consisting of the original 12 cards augmented by 8 more cards, 4 habitat alteration cards, 1 non native predator card, 1 non native hybridization, 1 non native induced disease, 1 non native competitor cards. All of the 8 extra cards are marked with an x in the lower right hand corner so the teacher can easily pull them out of the deck to be ready for their next use.

To set up for play:

2 – 4 students play with one deck of cards.

Put 25 tui chubs in the pond. The extra tui chubs are for acting out an increase in population. Set them aside.

Shuffle the 20 cards and put them face down in the center of the table.

Players take turns turning over the top card in the deck and acting out what happens to the tui chub population according to the card's directions.

One student in the group should also keep track of the running total of tui chubs in the pond on the "Scorecard".

Play is over when the tui chubs in the pond are depleted, or when the teacher calls time.

Discuss:

We began with 25 tui chubs in each pond. How many tui chubs remain in your pond now?

(Allow each group to share the number of tui chubs left in their pond.)

Last time every group still had 25 tui chubs, even though some of the tui chubs died. New tui chubs were reproduced to take the place of the ones who had died. Why did everyone's tui chub population shrink to under 25 this time?

(This time factors besides the original factors negatively influenced the tui chub population.)

What are some of the new factors that influenced the tui chub population?

(Habitat alterations such as the introduction of non native fish that prey on tui chubs, the introduction of non native fish that compete with tui chubs for resources, the introduction of non

The Case of the Disappearing Tui Chub
4th Grade

native fish that breed with tui chubs and result in hybrids that can't reproduce, changes in habitat due to land development that change the environment so that tui chubs can't live there. . .)

<The teacher should record on the board the new circumstances as students relay them.>

What do all these new circumstances have in common?

(All of the circumstances made the tui chub population decline. All of the changes in habitat were caused by humans.)

What are some of the things that people did which resulted in a decline in the tui chub population?

(Land development: changes in the waterways, drying up of some waterways, fertilizer making cattails grow more than usual.
Introduction of non native species of fish, resulting in competition for resources, hybridization, and direct preying on the tui chub population.)

What would it mean if the tui chubs all die?

(If the tui chubs all die, then they would be extinct. There would never, ever be any tui chubs on the earth again.)

Do you think it matters whether the tui chubs become extinct or not?

(Allow responses. Some students may say it doesn't matter, others may believe it is a shame for a species to become extinct.)

Are people part of the habitat?

(Yes, a habitat consists of all living things and all non living things. People are living things and we must share the habitat with all other living things.)

In the case of the tui chub, things people did changed the fish's habitat so that it became harder for the population to continue in a balanced way. When changes in the environment cause the population to decrease more quickly than the animals can reproduce, the species becomes "endangered".

Some of your ponds have no tui chubs left at all. These ponds indicate that the tui chub became "extinct".

Some of your ponds have only a few tui chubs left. These ponds indicate that the tui chub became "endangered". If there are some tui chubs still, then there is hope that the species can still continue. What will happen if the tui chubs' altered habitat continues as it is now?

(The remaining tui chubs will also become extinct.)

The Case of the Disappearing Tui Chub
4th Grade

I wonder, is there anything people could do to reverse or fix the changes in the tui chubs' habitat that have made it difficult for the tui chubs to live?

(Yes, if people altered the habitat before, they can purposely alter the habitat again.)

What kinds of things might help fix the tui chubs' habitat so they can reproduce and live successfully?

(Allow responses.)

The Case of the Disappearing Tui Chub
4th Grade

Names:

Tui Chub Population Simulation: Scorecard

Tui Chub Population	Increase(+)	Decrease(-)	Result

The Case of the Disappearing Tui Chub
4th Grade

TUI CHUBS: RECOVERING A SPECIES

Goal: Students will suggest changes that could be made to the Tui Chubs' environment that would counteract prior harmful alterations.

<u>Make an informational poster</u>:

Materials:

Plain paper or poster board
Pencils, crayons, and markers

Use pictures and words to show at least 2 harmful alterations to the Tui Chubs' environment and 2 ways people could fix them.

<u>Write a letter to your state representative</u>:

Find out the name and address of your state representative.
Write a letter to him or her explaining how alterations in the Tui Chub's habitat have resulted in endangering the species.
Suggest ways citizens could fix the environment for Tui Chubs.
Ask your representative to help.