A Berry Good Project

BY RICK HENNINGFELD

ILLUSTRATIONS BY DONALD WU

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To Mom & Dad for instilling a love of gardening
especially fresh strawberries in the spring.

Thanks for letting me tinker with
all sorts of agricultural projects growing up!

Love you,

R.D.H.

Book Vocabulary:

Threshold [noun]:
An amount that must be exceeded to create a reaction

Pesticide [noun]:
A substance used for destroying targeted insects

Biodegrade [verb]:
To decompose or breakdown

Integrated Pest Management [noun]:
A method of managing pests on agricultural crops that is a combination of approaches including chemical, physical, and biological solutions

Highlighted Careers:

Strawberry Farmer:
A person who cares for the daily needs of strawberries

County Extension Agent:
A person that provides formal and non-formal educational learning activities to people in the county with an emphasis on taking knowledge gained through research and sharing it with residents

Chapter 1:
TODAY IS THE DAY

I've been waiting for this day all year! I just need to get through math and then a spelling test. After that, our science teacher, Mr. Brian (who we call Mr. B), is going to kick off our fourth grade class project! Oh, by the way, I'm Rowan! You see, every year, the fourth grade class at my school is in charge of the school strawberry patch. It is almost as big as the soccer field right next to it. Yeah, that's a lot of strawberries! Mr. B says if we were to measure the field, it would be equal to one acre, and that farmers generally measure land in acres.

The reason I'm so excited for this class project is because my two brothers, Jack and Kane, guaranteed me that I would get to eat all the strawberries I could ever want at the end of the project, and I L.O.V.E. strawberries.

Each year, the project is a little different. Jack's class got to sell strawberry shortcakes at a high school basketball game and raised enough money to put a wheelchair elevator in our auditorium. My friend Seth is in a wheelchair, and he uses the elevator to get on stage every year for

our concerts and plays. With the elevator, he doesn't have to go all the way around to the back of the theater to use the ramp. That's pretty cool!

Kane's class turned the field into a "U-Pick Patch" one weekend. They called it "U-Pick," I guess, because people got to pick their own strawberries for a fee. I liked it because I got my own basket and picked until it was piled high with strawberries. Then, I took them home, washed them, and ate fresh strawberries until I thought I would bust. The next week, his class went back out to the field and picked everything left to donate the food pantry along with the money they raised.

This year it's our turn with the field! I have no idea what Mr. B is thinking, but as long as I get to eat fresh strawberries at the end, I am all in!

Chapter 2:
SPECIAL GUESTS

Math and spelling are taking forever. Finally, Mr. B asks, "Who is ready to learn about the fourth grade class project?" The class shouts, "We are!"

Mr. B pulls out a basket full of strawberries and a gallon of vanilla ice cream from a cooler behind his desk. I'm not sure if people are more excited about the project or the food, but half the class jumps out of their seats for the strawberries and ice cream.

"Alright folks, grab a seat, grab a seat," Mr. B says.

Once everyone settles down, Mr. B continues, "To help introduce our project, we have two guests this morning." Two people come up front from the back of the room. I did not even notice them with all the excitement! Mr. B says, "Please welcome Mr. Bower and Ms. Renee to our class. Mr. Bower is a strawberry farmer, and Ms. Renee is a county extension agent."

Before I really think about it, I blurt out, "What's an extension agent?"

Ms. Renee chimes right in, “I’m an extension agent! Specifically, a horticulture extension agent. My job is to help farmers like Mr. Bower and people who live in this county when they have questions about raising strawberries or other field crops.”

Mr. Bower adds, “I usually don’t have too many questions, but when something goes wrong in my fields, I can ask Ms. Renee to help me figure out the problem and then help me find the best plan to fix it.”

“So, Ms. Renee is a teacher?” my friend Seth asks.

“Kind of,” said Mr. B. He continues. “Ms. Renee actually works for our state university and is what’s called a County Extension Agent for horticulture. Horticulture is a new word for us, and it means the practice of growing and managing plants. Anyone, from farmers to backyard gardeners and even curious elementary school students, can ask Ms. Renee questions about the best way to grow plants. She’s really smart and knows a lot about plants and any problems they may have.”

I had never thought people would have questions about growing plants. It seems like plants are everywhere, and they seem to grow just fine. My friend Seth raises his hand and, without waiting to be called on, says in a funny voice, “So, you could tell me why the tomato plant my mom and I plant every year in our garden NEEEVEERR actually produces any tomatoes?” Everyone chuckles a little bit at Seth’s question because of how he said, “NEEEVEERR.”

Ms. Renee answers, “Yup, that is exactly the kind of question I would help answer, Seth. But for now, I am here to help with your project.”

Sophia quickly asks, “What is our project this year?” Sophia always asks questions really fast when she gets excited.

Mr. B says, “Ms. Renee and Mr. Bower, would you mind telling the students what the project is this year?”

Chapter 3:
THE PROJECT

Mr. Bower says, "As you might imagine, your class is going to become the farmers for the strawberry field this year! This means you get to make decisions about growing the plants. The goal is to grow a LOT of berries, and the decisions you make will affect how many you get. But don't worry, Ms. Renee and I are here to help."

Ms. Renee continues, "When it is time to harvest, your class will be hosting a strawberry sundae fundraiser!" The class started cheering at the thought of strawberry sundaes.

Mr. B, who no one noticed working in the back of the class, says, "Well, knowing you all like strawberry sundaes, why don't you come grab one, and then head back to your seat." Everyone jumped out of their desk and ran to the table in the back of the room.

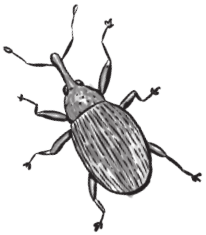
I tell Seth, "This is awesome!" as we wait for our sundae. Seth agrees that strawberries on ice cream is the best! When everyone makes it back to their seats, Mr. Bower says, "The success of your fundraiser will be affected

by how well your class can raise the strawberries." Ms. Renee continues, "Your class will have to make a lot of decisions about how to manage the strawberry patch. Let's get right to it. This afternoon, your class will take a field trip to your strawberry field!"

Seth and I look at each other and laugh because we are taking a field trip to a field. I think to myself, "This is the best day of school ever, a field trip and strawberry sundaes!"

Mr. B jumps back in and says, "Alright class, it is time to head to music, then lunch. After lunch, we will get ready for our field trip. We will see Mr. Bower and Ms. Renee this afternoon, but let's thank them for coming in to introduce our project."

"Thank you!" the class says enthusiastically, and we head out the door.



Chapter 4:

A FIELD TRIP...THAT IS LITERALLY A TRIP TO A FIELD

At lunch, all we talk about is the field trip that afternoon. Right after lunch, we have recess. As I walk out of the door for recess with Seth, he says, "Check it out!" and points towards the strawberry field. "Those tents must be for our field trip!"

I run off the blacktop and through the grass out to the crowd of kids by the strawberry field. "Whoa!" I say aloud, as I see a big drone sitting on one of the tables. I yell, "Seth, check that out!"

I turn to look for Seth, but he is not with me. I look back and see Seth still on the blacktop, so I run back to tell him, "Seth, there is a huge drone on one of the tables!"

Seth responds, "I wonder what that has to do with strawberries?" Then, the bell rings, and we all head into the school. Mr. B is at the door telling our class to stay outside because we were going to head right to our field trip!

When the other classes are inside, Mr. B says, "Okay, let's start our trip to the field."

“You mean field trip?” I say.

“Either way is correct!” says Mr. B.

We walk out to the edge of the blacktop, and then the class starts through the grass. Seth hesitates and says, “Oh boy, this is going to be a bumpy ride!” as he pushes his wheelchair to the tents.

Mr. Bower and Ms. Renee are at the edge of the strawberry field. Ms. Renee says, “Welcome to your field day! In agriculture, we have field days where people are invited into a field to learn about technology and practices being used in producing a specific crop, like strawberries.”

Mr. Bower continues, “One of the coolest parts of a field day is the demonstrations.” Then Mr. B says, “In a moment, I’ll assign you to one of two groups. What you learn with your group will be applied throughout this project so pay close attention.” When Mr. B starts counting us off, Seth and are sneaky and quickly make sure Zack is standing between us so we will be in the same group. Once Mr. B counts us off, he sends our group to a tent to start.

Chapter 5:
SCOUTING...BUT NOT FOR ATHLETES

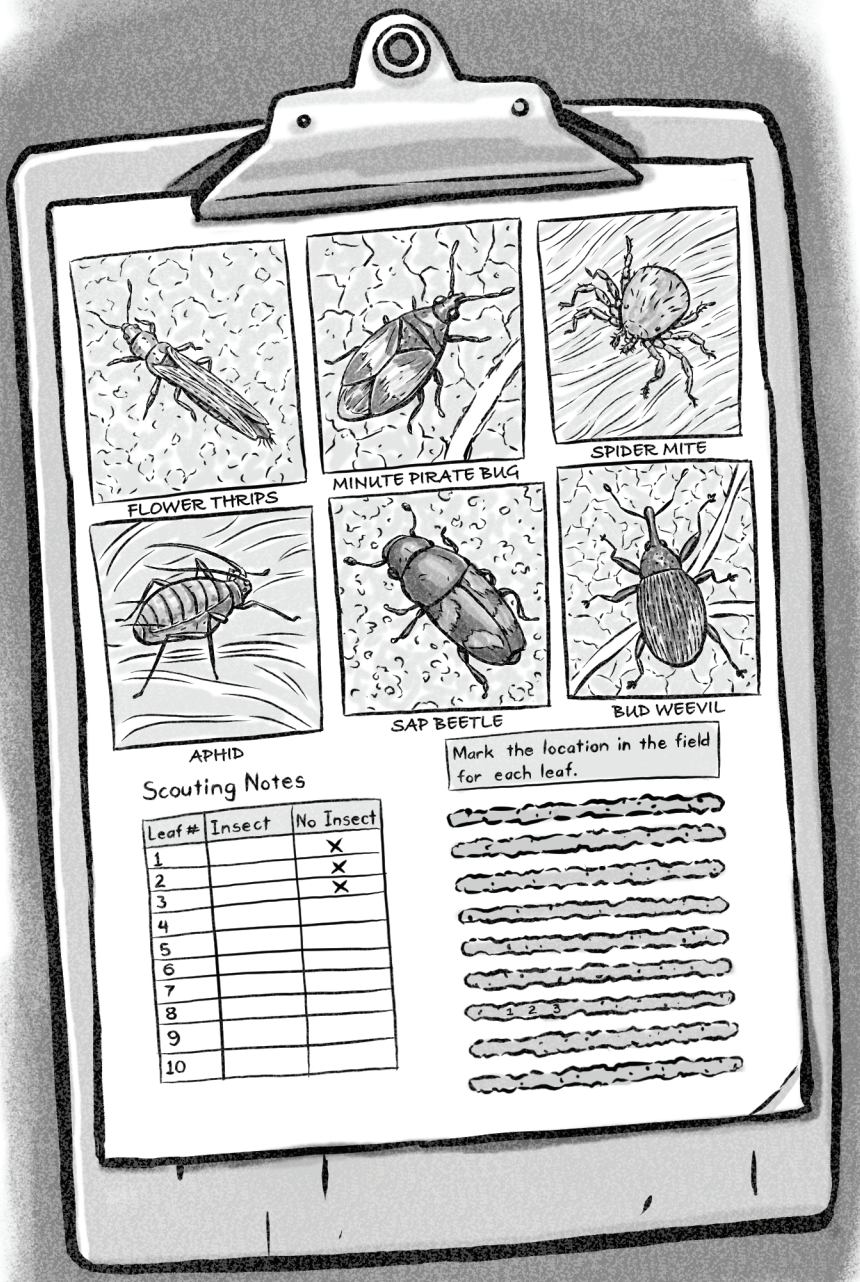
"Has anyone ever heard of scouting?" Ms. Renee asks when our group arrives at the tent.

Sophia says, "I have! It's when someone in high school is super good at a sport and a college sends important people to watch them."

Ms. Renee chuckles and says, "I suppose you're right! But, for this project, you won't be scouting athletes, you'll be scouting strawberries!"

Ms. Renee seems really excited about this, but I guess from the confused looks on our faces, she knows we don't get it. Ms. Renee continues, "Just like a scout watching an athlete, we are going to be watching our strawberry plants, making observations, and recording them. I have a chart with pictures of many insects you may find that will help us, so let's give it a try! Write down anything you see that looks different."

We each grab a clipboard off the table and walk over to the edge of the field.


FLOWER THRIPS
MINUTE PIRATE BUG
SPIDER MITE
APHID
SAP BEETLE
BUD WEEVIL
Scouting Notes
Leaf # | Insect | No Insect
1 | | X
2 | | X
3 | | X
4
5
6
7
8
9
10
Mark the location in the field for each leaf.
1 2 3

Ms. Renee bends down and points to a group of small green plants. "These are your strawberry transplants," she says. "They're just starting to grow after being planted, what do you notice about them?"

I say, "They're really green!"

Aiden says, "It looks like some of the plants are attached to each other by a vine looking thing above the ground."

"Great observation!" says Ms. Renee. "Those are called stolons, or runners. That's one of the ways strawberries produce more plants. What else do you notice?"

Seth says, "When you look across the field, the plants look like they're in rows."

"Another good observation! This is what we would expect to see in a field that is planted correctly. Straight rows let the farmer drive tractors through the field without running over plants," says Ms. Renee. "Now, you should each have a magnifying lens, let's use it to look really closely at the plants. We are investigating the leaves now. Look for clues or signs of any insects that might be on the plants, like an actual insect, an eaten leaf, or insect eggs on a leaf. Insect eggs are the size of a grain of sand, but they are round with no sharp edges. Be sure to look at both the top and bottom of the leaves and remember to look at the pictures on your chart. Each person needs to look at 10 different plants and fill in the chart."

Ms. Renee says, "If you find an insect or anything that seems strange, call me and we will identify what it is. Now, as someone mentioned before, the strawberries are planted in rows, so be careful not to hurt our little plants and walk between the rows! Spread out and start scouting!"

Chapter 6:
FRIENDLY INSECTS

My classmates spread throughout the field and began making observations.

Scott calls out, “I found an eaten leaf.” Ms. Renee goes over, takes a look, and says it was probably just torn or broken when planted and will heal in time.

Then, Isabella shouts, “I think I found some eggs, but they are very small and might be sand.” Ms. Renee looks and says, “You’re right! These are eggs. We should keep looking at our plants to see if we find more eggs or other signs of insects.”

I am looking at my tenth plant without finding anything. Then, I spot an insect on the underside of a leaf. I holler, “Ms. Renee, I found an insect. Do you know what it is?”

Ms. Renee comes over to look at the insect with me. She calls the class over and says, “Look at this insect.” She asks, “Is this a problem?”

A bunch of us start nodding our heads and agreeing that insects on plants are bad news. Ms. Renee speaks up, "Actually, we are in luck because these are good insects! They don't hurt the strawberry plants at all, and they are a natural enemy to bad insects."

"That's right, Ms. Renee," says Mr. Bower who comes over to take a look at our insect. "Think of it this way, in science class you learned about predators and prey in an ecosystem, right? In the ecosystem of our strawberry field, this beneficial insect called the Minute Pirate Bug, is the predator that prey on insects that damage a strawberry plant, like thrips."

"What's a thrips?" I ask. Ms. Renee answers, "It's a small insect that loves to eat the flower of a strawberry plant. They can do major damage. Lucky for us, we didn't see any thrips today, which is good."

We all go back to one of the tents. This time it is the tent with the big drone on a table! I'm really curious why there is a drone and if I can fly it!

Chapter 7:
A FLIGHT

Mr. Bower says, “Your class is going to be responsible for scouting the field and making sure everything is growing correctly. If you observe something unusual, Ms. Renee and I can come back into the field to help solve the problem.”

Mr. Bower continues, “There are a lot of observations we need to make, and sometimes we have help. See those field sensors?” He points at what looked like a pipe sticking out of the field with a box hooked to the top of it. “These smart sensors send information to my phone telling when the strawberries might need water, or fertilizer,” he continues. “The sensors are so smart they can even automatically turn on the irrigation system, that’s what waters the plants, when moisture gets too low in the soil. We are really lucky that is taken care of for us and guarantees we do not waste water.”

Seth asks, “Can I get that for my garden? My mom always makes me do the watering with a hose. It would be way more fun if I could just use a phone to do it!”

Mr. Bower says, "Probably, however, this was a big purchase. For me, it was worth it, because I can't water all of my fields with a hose, and if my strawberries don't grow, my family won't make any money. I think the hose might still be a good option for a small garden, but Ms. Renee can teach you when and how much to water so that you know when you can skip it!"

Mr. Bower pauses, and I just can't wait anymore.

"What is the drone for?" I blurt out.

"Great question, Rowan!" Ms. Renee says. "This is one of the new technologies my office is using, and we'll get to use it too!"

"Cool, what are we going to use it for?" I ask just as Seth blurts out, "Can I fly it?"

"Well, not yet Seth…" says Ms. Renee. "We are going to use this over the next three months to help with our scouting."

"Like what we just did in the field? How can it do that?" I thought.

Ms. Renee continues, "The camera on this drone is really powerful and can take excellent pictures of plants. It's so good that we would even be able to see damage caused by insects on the plants!"

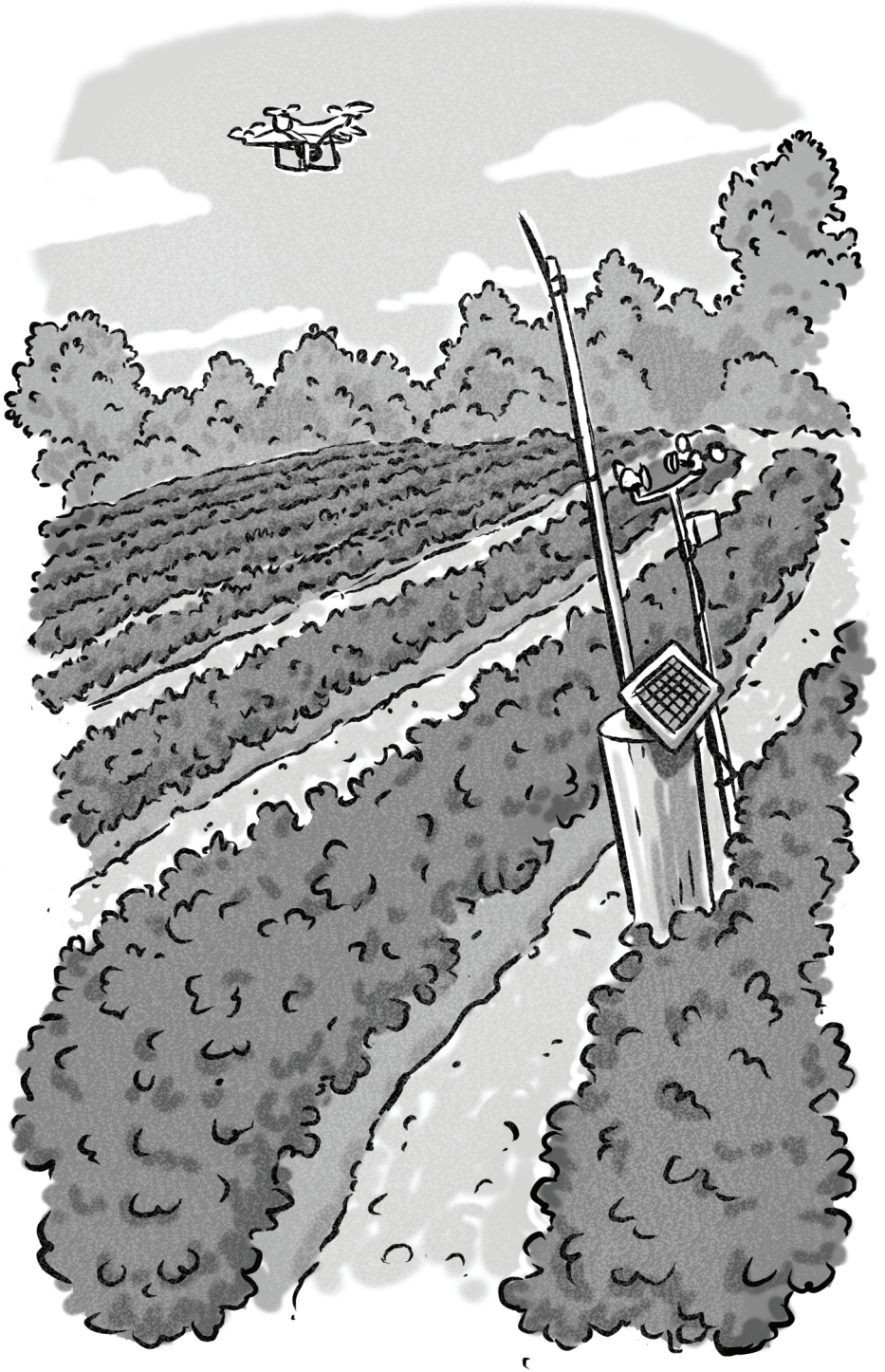
"That's cool!" says Mr. B.

"And even cooler," says Ms. Renee, "is the drone can add a GPS marker to locate where the picture was taken in a field…kind of like dropping a pin on a map online. So, we know exactly where the plant is! If the drone finds anything, we can use a hand-held GPS and go straight to that spot to look at it."

"Would you like to see a demonstration?" asks Ms. Renee.

We all shout, "Yes!"

Ms. Renee starts up the drone and sends it flying over the field. The drone goes up and down at different points in the field.



Mr. B says, “Class, take a look at Ms. Renee’s laptop, it is showing pictures from the camera on the drone!”

Mr. Bower says, “See the map of the field on the screen? Every place a picture is taken a GPS coordinate is also recorded. Then, it drops a pin with the picture attached to it.”

The hum of the drone gets louder as it flies back to the tent. Ms. Renee says, as the drone lands, “Now I have all the data I need to scout the field from my computer. With this technology, I can scout huge fields to help farmers identify problems without having to drive or walk all over.”

Just then the school bell rings, and Mr. B jumps says quickly, “Whoa, I lost track of time! Class we need to thank Mr. Bower and Ms. Renee and head back to wrap up the day.”

“Thank you!” says the class.

Mr. Bower responds, “We will see you next week to check in on the project!”

Chapter 8:
BERRY WATCH

The next week, Mr. Bower and Ms. Renee are back in our classroom. Mr. Bower shows us a graph on his phone that has a green line showing the moisture level in the field.

Seth asks, "With all the rain, has the irrigation system needed to turn on much?"

Mr. Bower responds, "No, Seth, as long as this line is green the irrigation system will not turn on. I'd imagine you have not had to water your garden too much either! If the line turns red at any point, that would mean our sensors are recording the moisture is too low, and the irrigations system would turn on."

Ms. Renee pulls out her laptop and says, "Today is an important day for scouting. The strawberries are flowering, and this when insects can become a problem in the flower. I brought my drone again to help us, and this time I have programmed it to take pictures throughout the field in an organized way. In fact, it is going to take pictures in 190

locations! All the pictures will be sent to my computer and if we see anything strange, we will go out and have a look."

Seth raises his hand and asks excitedly, "Can I fly the drone this time?"

Ms. Renee responds, "Well, no one will really be flying the drone, because it's programmed for where it's going to go. But, how about this, you can push the button to start it and hold the remote while it takes pictures."

"Awesome!" Seth says.

"Okay, let's head outside and start our scouting!" Ms. Renee says as she heads out the door.

When we got to the edge of the blacktop, Seth hesitates. He doesn't want to take another bumpy ride and some of the areas are muddy from all the rain. Ms. Renee says "Seth, you don't have to go any closer if you do not want to."

Seth smiles at Ms. Renee and says, "Okay, I'll stay here."

Ms. Renee sets the drone on the blacktop, hands Seth the remote and says, "Okay, push the power button, here; then the program button, here."

Seth hits the buttons, and the drone flies out to the strawberry field. A bunch of my classmates run out to the edge of the field to get a closer look at the drone. The drone works over the field like a humming bird dipping up and down as it flies in straight lines from one end of the field to the other. It looks like the drone is drawing graph paper over the field as it flies.

Chapter 9:
USING CLUES, CALLED DATA, TO IDENTIFY THE PROBLEM

The drone comes back to the blacktop and all the students come back from the field to join Seth and the drone. Then, everyone heads back to the classroom.

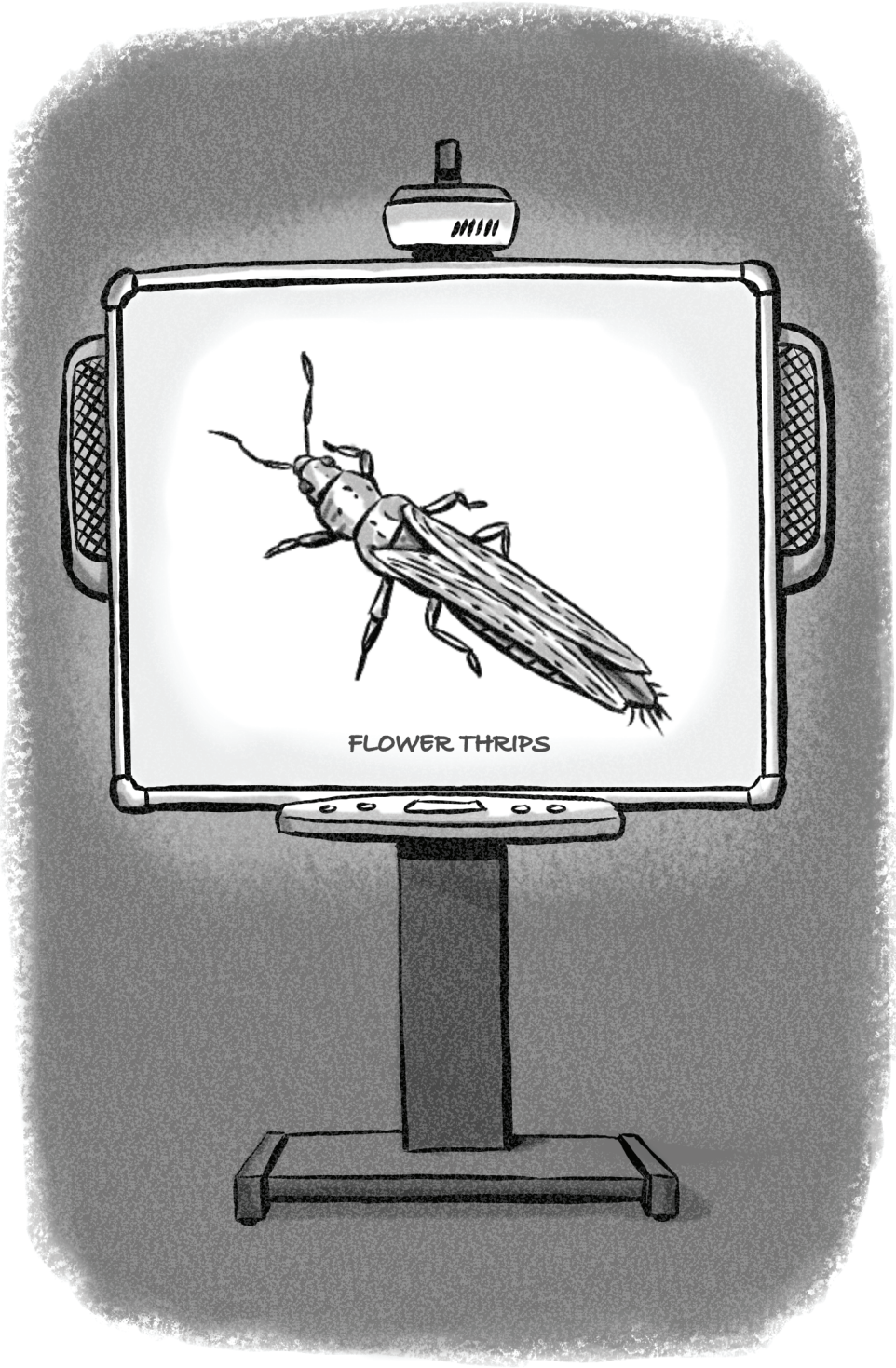
Ms. Renee says, “Let’s go do some virtual scouting!”

Mr. B tells us to grab a laptop on the way to our desk and log into the website written on the board.

After everyone has the site up, Ms. Renee says, “The pictures are now all loaded. Go ahead and open the “Fourth Grade Field” link, and you should see a map of our field with 19 pins on it.”

When I open the link, I see a satellite map of the actual field! I see part of the school and the playground. The strawberry field has 19 red dots across it, each labeled with a number.

Ms. Renee continues, “Each person will get a number of the location you will scout. When you click on the red dot, a folder will open with 10 pictures. These are the pictures the drone took in your location


FLOWER THRIPS

earlier today. You need to look closely at each picture. Zoom in to see if you notice any insects or strange looking things in the picture. When you find something, let Mr. Bower or me know, and we will help identify what it is."

Looking around the room, I notice that most people are already looking at their pictures, so I started to look too!

When I open the first picture and zoom in, I am amazed at how detailed the images are. I don't see anything unusual in any of my pictures.

Isabella says loudly, "Ms. Renee, I think I found something."

Everyone swarms around her computer screen.

Ms. Renee walks over and says, "Oh, my. Yeah, you did, click on the flag for that picture and type 'Minute Pirate Bug' in the box underneath it."

Seth says in a pirate kind-of voice, "Arr a Minute Pirate Bug! Didn't we see one last week?"

Ms. Renee goes to the front of the room and projects an image on the white board. "Remember seeing this, the Minute Pirate Bug," Ms. Renee says.

Then, Sophia shouts out, "But those are good insects!"

Ms. Renee continues, "You're right, Sophia, but remember how we talked about these being a predatory insect to thrips? A number of farmers have been reporting high populations of thrips recently, and that's why I wanted to visit with you all today. I thought maybe thrips would be in your patch too."

Ethan asks, "Are these insects a problem now? The ones we saw when we scouted last time were good insects."

Mr. Bower answers, "Yes, the Minute Pirate Bug is a good insect, but why they are in your field might indicate another problem. Minute

Pirate Bugs eat thrips, and when we see them, we also need to look for thrips. Thrips are what we call a pest in a strawberry field." Ms. Renee changes the picture on the white board, so we can see what thrips looks like.

Seth says loudly, "My little brother can be a pest sometimes!" Everyone laughs.

Mr. Bower continues, "I would imagine when your brother is being a pest, you don't want him around. Thrips, like the one Ms. Renee is showing, are not always a pest to strawberries, but right now when the strawberries are in blossom, or have flowers open, they can be a major pest. The pest you are seeing is specifically called a Flower Thrips, and it will eat the inside parts of the flower. That flower will die off and not produce a strawberry. Every flower that gets infested with thrips means one less strawberry the field will produce."

"Lucky for us we have Minute Pirate Bugs to eat them right?" Sophia says and Ms. Renee agrees. Ms. Renee continues, "As long as we have a high population of Minute Pirate Bugs, they will eat the thrips, and we won't have a problem, keep an eye out for more Minute Pirate Bugs!"

We continue looking at our photos. A lot of us find Minute Pirate Bugs which seems to make Ms. Renee and Mr. Bower really happy.

Then James says, "Why aren't these leaves green, they look brownish yellow?"

Mr. Bower looks at the picture and says, "Oh, no, that looks like Spider Mite damage. Spider Mites feed on the leaves which hurts the plants and can reduce the number of strawberries we can grow."

That doesn't sound good at all. The whole class wants a big harvest! Bigger than last year. We don't want the thrips or Spider Mite to hurt our plants.

Mr. B. says, "So, it seems like the thrips are under control because the Minute Pirate Bug is eating them. How much damage could the Spider Mite do?"

Ms. Renee answers, “We’ll have a better idea when we are done scouting.” She continues, “Everyone, analyze the rest of your pictures closely. Click the flag and make a note on any that seem to have bronze colored leaves.” Ms. Renee changes the picture on the board to show bronze leaves caused by Spider Mite damage. She seems to have pictures of everything we will find!

Seth asks, “Why don’t I see any Spider Mites on the bronze leaves in this picture?” Mr. Bower responds, “Spider Mites hide under the leaves and are too small to see with cameras. That is why we still go to the field after we look at the pictures.”

We all go back to work determined to find a picture of a Spider Mite damage. I think to myself, “Wow, plants need a lot of attention. There are a lot of things out there trying to hurt them!”

Chapter 10:
DECISION TIME

When everyone is done analyzing their pictures, Ms. Renee refreshes the map on her computer and projects it for the class to see. Five of the red dots had turned black with red exclamation points in them.

Ms. Renee says, "Who wants to go on a field trip?" Everyone raises their hands. "We need to go into the strawberry field and do some in-person scouting. It looks like only a small portion of the field is showing signs of Spider Mite damage, but there may be more out there the camera didn't see."

We all head out of the school with our notebooks and a magnifying glass. Ms. Renee walks us out to the field. This time, Mr. Bower stays in the classroom with Seth. They're going to look up information on how to manage Spider Mite damage in a strawberry field.

Ms. Renee tells us to scout the area we scouted last week. She says she will scout the areas where the drone saw Spider Mite damage. Ms. Renee reminds us, "Be sure to look closely under the leaves,

that's where these mites like to hang out!"

I think Seth would say, "I like to hang out in the gym," if he were here. I wish it was easier for him to come into the field with us.

After the scouting, we go back into the classroom. Only Ms. Renee found Spider Mites. She says, "This is a good sign, I think we found the Spider Mites before their populations grew, and they damaged the entire strawberry field! Now we have to decide what to do to manage the Spider Mites."

Mr. Bower projects a graph on the whiteboard and asks us to copy it down.

Mr. Bower says, "This is a critical point in any farming operation." And he points to the place where all three lines cross. "This is where a farmer will lose the crop and, ultimately, not make any money from that field. The good news is, we are not here…yet. We are getting close based on all of your scouting data. The Spider Mite population is in this area which is called a threshold." He pointed to a spot just left of where the three lines crossed. "Meaning we need to make a decision quickly about how we manage the Spider Mite, or there won't be any strawberries to harvest!"

Sophia says quietly, "No strawberries would mean no strawberry sundae fundraiser!" Mr. B sees that we are upset with this news.

Mr. B asks, "What can we do?"

Then Seth chimes in, "While you all were out in the field, Mr. Bower and I looked up some pest management options for Spider Mite on the website of Ms. Renee's office, the county extension office."

Ms. Renee smiles and says, "That is another huge part of my job, to provide information to farmers on what to do once they identify a pest!"

Seth continues, "Mr. Bower figured we would need to do something to save our crop. Because we are approaching a major threshold of the

Spider Mite population…" Seth pauses to see if anyone notices that he used the word 'threshold' correctly in his sentence.

Mr. B says, "Nice use of the new vocabulary, Seth. For the rest of us, a threshold is an amount of something that will cause a reaction. In this case, we are talking about the number of Spider Mites in the field approaching a level, or threshold, that will begin to kill all the strawberry plants. Did I get that right Seth?" Seth smiles and nods.

Seth continues, "We have two options to save our strawberries. A biological control and a chemical control." Seth changes the screen on the whiteboard to show the control options, and continues, "For the biological control, we would release beneficial insects…actually another kind of mite into the field…and they would eat the Spider Mites. Like what the Minute Pirate Bug is doing to the thrips naturally. For a chemical control, we would apply a spray that targets the Spider Mites."

A few of the kids' hands go up after Seth stops talking. Mr. B calls on Emma, "Mr. B, I don't want any chemicals on my food!"

A bunch more hands go up. Ms. Renee steps in and says, "These are not easy decisions. Let's look at everything we know so we can make the best choice. First, the problem is that we need to do something fast to reduce the Spider Mite population in our field. A sprayed pesticide application, or chemical spray that targets and kills the unwanted pests, is really fast and effective in reducing the Spider Mite population. The chemical we would use is tested and approved by the government to use on strawberries to reduce Spider Mite populations. When applied correctly, following the directions given on the label, all of the spray would biodegrade or go away before any strawberries are picked. So, none of the spray would be on the strawberries you would eat. To avoid the Spider Mite coming back and the need to spray again, I think we can actually use a biological control too. The biological control is another type of mite that prey on, and eat the Spider Mites. Now, we could just release other mites but it takes them a while to eat the Spider Mites and by the time they reduce the Spider Mite

population we may lose our entire strawberry crop. We have to think about what would work the best to save the strawberries."

Mr. Bower adds, "My family will eat these strawberries too, and we are going to feed them to the entire community. That is a lot of responsibility on the people who grow food and have to make decisions like this. I look at Ms. Renee's recommendations similar to a doctor giving a prescription. They are both experts and, as long as we follow the instructions they give, like when I give my kids medicine, we can ensure everything will be safe and healthy."

Emma says, "So, we can do both?" and everyone slowly put their hands down.

"Yes," said Ms. Renee. "I think it's our best option." She continues, "It's what we call Integrated Pest Management, or IPM, and is really common in the strawberry industry. IPM is using multiple methods to control pests. I'd recommend we ask Mr. Bower, who is trained and certified to apply sprays to crops, to spray an insect control for Spider Mites one time. Then, we add the biological control of beneficial mites to the field to keep populations down."

We must all look a bit confused, so Ms. Renee continues, "I will create a one-page explanation of the problem we are having in the strawberry field for each of you to take home tonight. It will explain the options of the chemical control, the biological control, and blending the two controls into an Integrated Pest Management plan. I will also include what each option will cost. Please talk it over with your family and friends and come ready to vote tomorrow morning on what to do."

Chapter 11:
AN IPM EXPERIMENT – RELEASE THE BUGS

This morning, the class is buzzing with all the thoughts and stories of the conversations people had at home. Mr. B says, "We need to vote on our plan with the strawberry field. The three options are: biological only, chemical spray only, and IPM plan using both the spray and the mites."

Mr. B calls out each choice, and we raise our hands. It is obvious. The IPM plan of both a chemical spray followed by beneficial mites wins! Mr. B says, "I will call Ms. Renee and Mr. Bower and let them know, so they can get to work!"

Mr. Bower applies the insect control spray early Saturday morning. It is really calm in the morning with no wind; the ideal weather for applying the spray. Two weeks later small strawberries are starting to appear all over the field.

Ms. Renee returns to class with a bottle that has pictures of mites on the outside of it. Ms. Renee tells us, "Here are the mites! But, before

we release these, we need to scout the field one more time looking for signs of Spider Mites."

"Yes! That means a trip to the field!" I say, then look over at Seth. He wasn't as excited. I wish the ride to the strawberry field wasn't so bumpy for him and muddy for his wheelchair.

As we walk outside with our magnifying glasses, Ms. Renee says, "Seth, you get to run the drone today!" Seth's eyes light up. Ms. Renee continues, "I've programmed the drone to take pictures of about half the field, and we will do the other half. Power it up and hit the start program button. As the pictures come in, you can look at them right away."

Ms. Renee hands the remote to Seth and starts walking to the field with the rest of us. The buzz of a drone zooms over our head!

Ms. Renee says, "Let's see if we can scout faster than the drone! But be careful not to step on the plants or little strawberries."

We don't find any Spider Mites or bronze leaves in the field, but Ms. Renee says that even if we don't seem them, it doesn't mean they aren't there. It just means the spray reduced the population. The second half of our IPM plan is to add the mites that eat Spider Mites to the field. We can do that now! Ms. Renee releases the mites and says, "We will be able to harvest our strawberries in about four weeks."

Chapter 12:
THE FRUITS OF OUR LABOR

I know I started by saying, "I'd been waiting for this day all year!" when we were going to learn about our class project. And that was a pretty exciting day, I just did not realize it would take four months to grow the strawberries! So, really, **this** is the day I am really excited about. Today is our harvest and strawberry sundae sale!

Mr. Bower brings 20 people to our class, and we walk to the field. Seth stays on the blacktop and says he would watch from there. I can tell he is a little sad, but I promise him I will bring him some fresh strawberries to eat.

Mr. Bower introduces us to the group of people and says, "These people are here to help you pick your perfectly ripened strawberries! It is a good thing we got the Spider Mites under control, or this day wouldn't have happened. My harvest crew is going to help pick. They will start on that end of the field, and you all can start on that end." We all grab baskets and off we go.


Strawberry
Sundae
Sale!!

On the way to the field, I ask Mr. Bower, "Can we eat some of the strawberries?"

Mr. B says, "Don't eat them until you wash them. You never know what is on the strawberries in the field. A lot of these strawberries have sand on them and maybe even some mites! Don't worry I brought a portable wash station, so you can eat them while we are in the field. By the way, don't eat them all or we won't have any for the strawberry sundaes!"

I hope Mr. Bower is kidding about mites being on the strawberries, I don't want to eat mites! By the time I finish filling my one basket, Mr. Bower's harvesting crew has picked the whole field. I wash a bunch of strawberries, and Seth and I eat all that our stomachs can hold. We both agree these are the best strawberries we have ever eaten. The rest of the class comes out of the field, and we spend the afternoon cleaning and preparing strawberries for the sundaes.

The local grocery store arrives with gallons of ice cream. We make a big sign that says, "Strawberry Sundae Sale! Today Only!" Starting right after school people begin to show up, it seemed like the whole community comes for our sale, and we make a lot of money.

The next day in class, Mr. B says, "After we took out all the expenses of raising the strawberries and buying materials for the strawberry sundae sale and setting aside money to buy new plants for next year's fourth grade class project, we have $5,000 remaining!"

I raise my hand and say, "Maybe we could use it to put a blacktop path out to the strawberry field?"

"That is an excellent idea!" says Mr. B.

Seth looks at me and smiles. The class votes to use the money for the path so now every student could get to the field easily as they do their fourth grade project!

This has been a *berry* great school project!

A Berry Good Project

BY RICK HENNINGFELD

"Plants just grow, right? I mean, they're everywhere. How much work can it be?"

When Rowan's class is put in charge of the strawberry field this year, he thinks it will be all sweet reward. However, he quickly learns that humans aren't the only ones around that love strawberries. With the project's success on the line, Rowan's class must think fast how to save the strawberry crop.

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