Duplicate the **Taiga Field Notebook** worksheets (beginning on the next page), one set for each student. The notebook is designed to be printed on **both sides** of seven (7) sheets of paper and folded in half to create a small, 28-page booklet.

Use your printer’s duplex feature to print the pages front-and-back. **Optional**: Duplicate (in color) one copy of the **Field Notebook Cover** for each student.

Distribute the **Taiga Field Notebook** worksheets and cover materials and have students assemble their notebooks in the following manner:

- Make sure the pages are in the correct order by checking that the right-hand sides contain the odd-numbered pages from 1–13.
- Fold the stacks in half along the perforation.
- Distribute the notebook covers provided OR allow students to design their own covers.
- Insert sheets into the cover and staple together.
- Have students write their names in the **Field Investigator** box on the cover of the notebook.
Reflections on the mystery...

Use this space to reflect on your experiences at Taiga National Park.

INTRO: Getting Started

Welcome, new recruit! You are about to join a dedicated group of teens and young adults whose mission is to right wrongs, solve social problems, and make the world a better place, using their knowledge, wits, and persuasive powers!

<table>
<thead>
<tr>
<th>Remixer</th>
<th>What they do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theodore</td>
<td></td>
</tr>
<tr>
<td>Belle</td>
<td></td>
</tr>
<tr>
<td>TekAnn</td>
<td></td>
</tr>
<tr>
<td>Collector</td>
<td>Matt</td>
</tr>
<tr>
<td>Gatekeeper</td>
<td>Adam</td>
</tr>
</tbody>
</table>

What problem is worrying the Remikers now? What will be your ROLE in *Mystery of Taiga River*? What SKILLS do you think you will need there?
## Terms You Need...

<table>
<thead>
<tr>
<th>Terms</th>
<th>Sources and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis</td>
<td>A <strong>hypothesis</strong> is a tentative (not certain) explanation for an observation or scientific problem. This is only a proposed idea— it doesn’t yet have any proof to back it up. In science, a hypothesis must be testable. A <strong>working hypothesis</strong> is one that is currently being tested.</td>
</tr>
<tr>
<td>Mg/L</td>
<td><strong>Mg/L</strong> is a unit of measure that means “1 milligram per liter of liquid.” It is a way to measure a substance that has been dissolved or diluted in something like water or soil. Another description meaning the same thing as mg/L is <strong>ppm</strong> (parts per million).</td>
</tr>
<tr>
<td>Dissolved Oxygen (DO)</td>
<td><strong>Dissolved oxygen</strong> (DO) is the amount of oxygen gas available in water. Oxygen is very important to life on the land and to life in the water. Levels between 5 and 6 parts per million (ppm) are necessary for most large fish to thrive. Levels below 3 ppm are very stressful to aquatic life. Low levels of dissolved oxygen can be caused by rotting vegetation, high temperature, low rates of underwater photosynthesis, and lack of mixing of the water with the air.</td>
</tr>
<tr>
<td>pH / Acid Rain</td>
<td><strong>pH</strong> is a measure of water acidity. Different pH levels support a variety of aquatic life. Between 6.5 and 7.5 are considered good pH levels. Lower than 5.5 or higher than 8.5 are usually bad for aquatic life. The pH can be affected by mining waste and <strong>acid rain</strong>... Rain in polluted air with a pH below 5.0</td>
</tr>
<tr>
<td>Turbidity / Sediment</td>
<td><strong>Turbidity</strong> is a measure of water cloudiness. This cloudiness mostly comes from suspended particles floating in the water. Values of 5 NTU (turbidity units) or less are best for many freshwater fish. Values greater than 25 NTU are dangerous for most fish. When turbidity is high, less sunlight can reach algae and larger plants underwater. Turbidity can be caused by sediments from soil erosion or a disturbance to the bed of the water body.</td>
</tr>
<tr>
<td>Nitrates (Nitrate and Phosphates)</td>
<td><strong>Nitrates</strong> are vital for plant growth. Nitrate values below 0.3 ppm are excellent, while values above 2.0 ppm are poor. High nitrate levels can cause so much plant growth that when the plants die and decay, a lot of dissolved oxygen is used up in the process. <strong>Phosphates</strong> are crucial to plant growth. Phosphate levels in water that are below 0.1 ppm are excellent, while values greater than 3.0 ppm are dangerous to fish. High phosphate levels in waterways may cause so much plant growth that when the plants die and decay, a lot of dissolved oxygen is used up in the process.</td>
</tr>
</tbody>
</table>

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**Outro: What Happens Now?**

Use the space to record your observations in this final mission. What is different about Taiga National Park five years into the future? What remains the same? How do the stakeholders greet you? Can you see Taiga Fish in the river?
Making Decisions: contd.

Have you succeeded in creating just the right combination of REGULATIONS to save the Taiga Fish problem without harming any of the stakeholders? WHY do you think those particular regulations created the right balance of human and environmental needs?

Mission One: Stand back! I’m going to try science!

Use this space to add notes, sketches, and data you gathered during your investigations for this mission.
Mission One: contd.

**Chain of Reasoning Tool**
How did you organize claims and evidence in Abbie’s Chain of Reasoning Tool?

---

**The Regulations I Set....**

1. **Logging Regulations**
   - Check Box for: Ban cutting down trees within 300m of the river bed?
   - Check Box for: Require that a tree must be replanted for every tree that is cut?
   - Check Box for: Require that a tree must be at least 30 years old before being cut down?
   - Check Box for: Ban Build-Rite lumber company from Taiga Park?

2. **Fishing Regulations**
   - Check Box for: Ban removing more than 2000 fish from the river within a year?
   - Check Box for: Require that the fishing tournament be moved to after the spawning season?
   - Check Box for: Ban the use of live bait for fishing in Taiga Park?
   - Check Box for: Ban all fishing from Taiga River?

3. **Farming Regulations**
   - Check Box for: Require that all farm animals be prevented from grazing near the river?
   - Check Box for: Ban the use of fertilizer on Greenleaf Farms?
   - Check Box for: Ban farming within 200 meters of the river bed?
   - Check Box for: Ban Greenleaf Farms from Taiga Park?

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**The Consequences...**
Making Decisions: contd.

The Regulations I Set....

1. Logging Regulations
- Ban cutting down trees within 300m of the river bed?
- Require that a tree must be replanted for every tree that is cut?
- Require that a tree must be at least 20 years old before being cut down?
- Ban Build-Rite Lumber company from Taiga Park?

2. Fishing Regulations
- Ban removing more than 2,000 fish from the river within a year?
- Require that the fishing tournament be moved to after the spawning season?
- Ban the use of live bait for fishing in Taiga Park?
- Ban all fishing from Taiga River?

3. Farming Regulations
- Require that all farm animals be prevented from grazing near the river?
- Ban the use of fertilizer on Greenleaf Farms?
- Ban farming within 200 meters of the river bed?
- Ban Greenleaf Farms from Taiga Park?

The Consequences...

Mission Two: Exploring Your Options
Write in the names of the people you meet in mission two, next to the map key symbol for their location
### Mission Two: contd.

**Consider the Stakeholders**

<table>
<thead>
<tr>
<th>GROUP</th>
<th>MEMBERS OF THE GROUP AND WHAT THEY BELIEVE</th>
<th>WHERE THEY'RE LOCATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taiga Park Employees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K-Fly Fishing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Build Rite Lumber</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green Leaf Farms</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**The Regulations I Set....**

1. **Logging Regulations**
   - Is cutting down trees within 300m of the river bed allowed?
   - Is it required that a tree must be replanted for every tree that is cut?
   - Is it required that a tree must be at least 20 years old before being cut down?
   - Is Build-Rite Lumber company from Taiga Park allowed?

2. **Fishing Regulations**
   - Is removing more than 2000 fish from the river within a year allowed?
   - Is it required that the fishing tournament be moved to after the spawning season?
   - Is the use of live bait for fishing in Taiga Park allowed?
   - Is all fishing from Taiga River allowed?

3. **Farming Regulations**
   - Is it required that all farm animals be prevented from grazing near the river?
   - Is the use of fertilizer on Greenleaf Farms allowed?
   - Is farming within 200 meters of the river bed allowed?
   - Is Greenleaf Farms from Taiga Park allowed?

**The Consequences...**
Making Decisions: contd.

The Regulations I Set....

1. Logging Regulations
   - Ban cutting down trees within 300m of the river bed?
   - Require that a tree must be replanted for every tree that is cut?
   - Require that a tree must be at least 20 years old before being cut down?
   - Ban Build-Rite Lumber company from Taiga Park?

2. Fishing Regulations
   - Ban removing more than 2000 fish from the river within a year?
   - Require that the fishing tournament be moved to after the spawning season?
   - Ban the use of live bait for fishing in Taiga Park?
   - Ban all fishing from Taiga River?

3. Farming Regulations
   - Require that all farm animals be prevented from grazing near the river?
   - Ban the use of fertilizer on Greenleaf Farms?
   - Ban farming within 200 meters of the river bed?
   - Ban Greenleaf Farms from Taiga Park?

The Consequences...

End of Mission Two: Begin the Investigation Missions

After reporting to Ranger Bartle at the end of mission two, you got to choose which stakeholder you think should be investigated next. On the following pages you will find places to fill in notes on the FISHERS, LOGGERS, and FARMERS. Skip to the pages you need for adding notes, sketches, and data for these investigations.

<table>
<thead>
<tr>
<th>Stakeholder Group</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>FISHERS: How many is enough?</td>
<td>8–11</td>
</tr>
<tr>
<td>LOGGERS: Muddy Waters</td>
<td>12–15</td>
</tr>
<tr>
<td>FARMERS: Water Bloom</td>
<td>16–19</td>
</tr>
</tbody>
</table>

At this time, I think I would blame the ____________________________ Stakeholder Group Pages
Fishers: How Many Is Enough?
What do other people around Taiga have to say about the fishing company? What evidence beyond quotes from people have you gathered? Use the next three pages to take notes, draw sketches, and record your observations as you investigate K-Fly Fishing and its effect on the fish of Taiga River.

The Regulations I Set....

1. Logging Regulations
   - Ban cutting down trees within 500m of the river bed?
   - Require that a tree must be replanted for every tree that is cut?
   - Require that a tree must be at least 20 years old before being cut down?
   - Ban Build-Rite Lumber company from Taiga Park?

2. Fishing Regulations
   - Ban removing more than 2000 fish from the river within a year?
   - Require that the fishing tournament be moved to after the spawning season?
   - Ban the use of live bait for fishing in Taiga Park?
   - Ban all fishing from Taiga River?

3. Farming Regulations
   - Require that all farm animals be prevented from grazing near the river?
   - Ban the use of fertilizer on Greenleaf Farms?
   - Ban farming within 200 meters of the river bed?
   - Ban Greenleaf Farms from Taiga Park?

The Consequences...

Mission Tasks

◊ Construct Hypothesis:
  ◇ Talk with Bartle
  ◇ Get advice from Abbie

◊ Test Hypothesis:
  ◇ Find fish spawn info
  ◇ Talk to Melinda
  ◇ Get photos at K-Fly

◊ Evaluate Hypothesis:
  ◇ Build evidence chain
  ◇ Evaluate overfishing consequences
Explore Mission: Making Decisions

You can visit this activity several times during Mystery of Taiga River... In fact, you will have to keep trying until you get it right! You will need to set at least one REGULATION for each of the stakeholder groups. Use the following pages to record your choices and make notes on the results of your decisions.

Tell me what YOU think!

I think...
Have you finished your investigations? If you’re ready to tell Ranger Bartle who is to blame, skip to page 20 to make your notes on Making Decisions.
Have you finished your investigations? If you’re ready to tell Ranger Bartle who is to blame, skip to page 20 to make your notes on Making Decisions.
Loggers: Muddy Waters

What do other people around Taiga have to say about the logging company? What evidence beyond quotes from people have you gathered? Use the next three pages to take notes, draw sketches, and record your observations as you investigate Build Rite Lumber Company and its effect on the fish of Taiga River.

Mission Tasks

◊ Construct Hypothesis:
  ◊ Get advice from Abbie

◊ Test Hypothesis:
  ◊ Get photos at Build Rite
  ◊ Get water sample
  ◊ Talk to Director Dee
  ◊ Visit Science Center

◊ Evaluate Hypothesis:
  ◊ Build evidence chain
  ◊ Evaluate turbidity consequences

We think...
Farmers: Water Bloom

What do other people around Taiga have to say about Green Leaf Farms? What evidence beyond quotes from people have you gathered? Use the next three pages to take notes, draw sketches, and record your observations as you investigate Green Leaf Farms and their effect on the fish of Taiga River.

Mission Tasks

◊ Construct Hypothesis:
  ◊ Get advice from Abbie

◊ Test Hypothesis:
  ◊ Get photo at Green Leaf
  ◊ Get water sample
  ◊ Ask Nola for info
  ◊ Get data at Science Cen.

◊ Evaluate Hypothesis:
  ◊ Build evidence chain
  ◊ Evaluate eutrophication consequences

We think...
Have you finished your investigations? If you’re ready to tell Ranger Bartle who is to blame, skip to page 20 to make your notes on Making Decisions.
MYSTERY
OF
TAIGA RIVER