LESSON MAKER PRO

Water for Both

Use water data to weigh human and habitat needs.

HIGH SCHOOL · HS-ENV2-7

HS-ENV2-7 "Analyze computational tools and other technologies that allow for the management of natural resources. Evaluate the trade-offs of these tools regarding human physical and cultural needs versus sustainability and biodiversity."

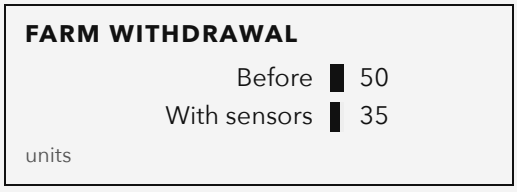
NAME _____ DATE _____

CHECK BOTH NEEDS

Water-saving technology can leave more river water for wildlife. Subtract the new withdrawal from the old withdrawal to find water saved, then subtract the new withdrawal from the river supply to find water left. Compare both amounts with the needs of people and wildlife.

WORKED EXAMPLE

Sensors change a farm's river withdrawal as shown. The river has 80 units of water. The farm needs at least 30 units, and fish need at least 40 left in the river. How much water is saved, and are both needs met?



1. Water saved: 50 - 35 = 15 units.
2. Water left for fish: 80 - 35 = 45 units.
3. The farm gets 35, which is at least 30. Fish get 45, which is at least 40.

Answer: The sensors save 15 units. Both needs are met.

PRACTICE 4 problems

1 A smart valve lowers withdrawal from 36 to 24 units. How much water does it save?

ANSWER _____

2 A river has 64 units of water. A pump withdraws 28 units. How much remains in the river?

ANSWER _____

3 A river has 75 units. A sensor-controlled pump withdraws 32 units. Fish need at least 45 units left. Is the fish target met? By how much?

ANSWER _____

4 A farm withdraws 26 units from a river with 70 units. The farm needs at least 29 units, and fish need at least 38 units left. Which need is met?

ANSWER _____

APPLY IT Show your work

1 Your school's sports field uses a smart valve that needs battery changes. It lowers creek withdrawal from 48 to 34 units. The creek has 100 units; the field needs at least 32, and fish need at least 60 left. How much water is saved? Are both needs met? Name one drawback.

WORK SPACE

ANSWER _____

2 A community needs at least 38 units of river water for a festival. Fish need at least 72 units left in the river, which has 120 units. Which pump setting meets both needs? State one environmental trade-off of that choice.

FESTIVAL PUMP SETTINGS

Setting	Withdrawal	Power
A	42 units	Diesel
B	54 units	Solar

ANSWER _____

CHALLENGE One step up

A satellite-guided pump cuts river withdrawal from 63 to 49 units. The river has 116 units. Homes need at least 43 units withdrawn, and fish need at least 70 left. Find the water saved. Does the new withdrawal meet both needs? If not, give a withdrawal that does and explain why.

WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A smart valve lowers withdrawal from 36 to 24 units. How much water does it save?	**12 units**
2	A river has 64 units of water. A pump withdraws 28 units. How much remains in the river?	**36 units**
3	A river has 75 units. A sensor-controlled pump withdraws 32 units. Fish need at least 45 units left. Is the fish target met? By how much?	**No. The river has 43 units left, which is 2 units below the target.**
4	A farm withdraws 26 units from a river with 70 units. The farm needs at least 29 units, and fish need at least 38 units left. Which need is met?	**The fish need is met: 44 units remain. The farm need is not met: it receives 3 units too few.**

PART 2 · APPLY IT

1. **The valve saves 14 units. The field receives 34, and 66 remain for fish, so both needs are met. Battery changes are a drawback.** Subtract 34 from 48 to find savings and from 100 to find water left. Compare 34 with 32 and 66 with 60.
2. **Setting A meets both needs: the festival gets 42 units, and 78 remain for fish. Its diesel power produces exhaust, unlike setting B's solar power.** Setting A leaves 120 - 42 = 78 units; B leaves 120 - 54 = 66. Only A meets both minimums, but it uses diesel.

CHALLENGE

The pump saves 14 units. At 49 units withdrawn, 67 remain, so the fish target is missed by 3. A withdrawal of 46 units meets both needs: homes receive 46, and fish have 70 left.

Accept any withdrawal from 43 through 46 units for the challenge if the student checks both targets. For the festival trade-off, accept a specific environmental effect of diesel use, such as exhaust emissions.