

HEALTH of aquatic life

a real problem?

Focus Question

How healthy is the aquatic site?

ACTIVITY



Activity Overview

What does water temperature, dissolved oxygen, and water clarity tell you about the health of an aquatic site?

Aquatic animals and plants are sensitive to the water quality of their environment. Water temperature, dissolved oxygen, and water clarity are some of the factors that can change water quality. Changes in water temperature and clarity affect the amount of oxygen in water. Oxygen is critical to the health of aquatic life. Human actions are often responsible for poor water quality that can have a negative effect on aquatic life.

Researchers performed water quality tests to determine the health of a local aquatic site. Table 1 shows monthly average values for water temperature, turbidity, and dissolved oxygen. The data was collected at the same location. You will examine the data and use the TI-73 Explorer™ to graph and analyze the values.

How does water temperature, turbidity, and dissolved oxygen change over a period of a year? What conclusions can you make about the relationship between water temperature, turbidity, and dissolved oxygen?

Table 1

Month	Water Temperature (°C)	Turbidity (NTU)	Dissolved Oxygen (mg/L)
1	6.2	3.2	12.4
2	10.1	8.8	10.1
3	12.7	20.1	9.2
4	17.1	34.7	6.9
5	15.3	28.1	7.4
6	19.8	39.9	6.1
7	25.8	55.9	4.3
8	24.8	50.7	4.7
9	18.8	38.6	6.4
10	17.9	36.2	6.8
11	11.2	13.4	9.7
12	9.1	7.2	10.6

Note: The months are represented by numbers in order to easily graph the values (1=January, 12=December).



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Procedure

- 1 Transfer the water quality data to your TI-73 Explorer™.
- Use the link cable to connect the TI-73 Explorer™ without water quality data to the TI-73 Explorer™ with water quality data.
 - Turn on both graphing devices.

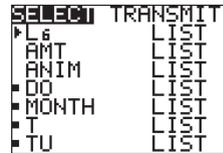
TI-73 Explorer™ without water quality data.

- Press **[APPS]** to display the **APPLICATIONS** menu.
- Select **1:LINK** and press **[▶]** to display the **Link RECEIVE** menu.
- Select **1:Receive**. The message **Waiting...** and the busy indicator are displayed. The receiving unit is ready to receive the water quality data.

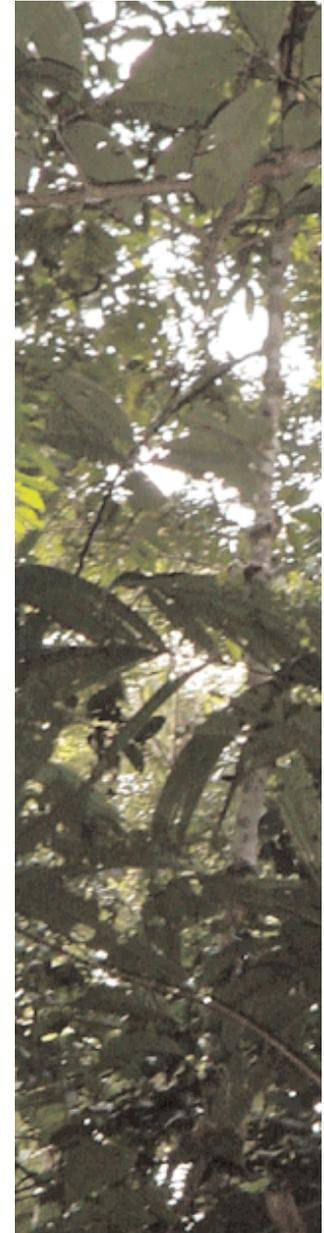


TI-73 Explorer™ with water quality data.

- Press **[APPS]** to display the **APPLICATIONS** menu.
- Select **1:LINK** to display the **Link SEND** menu.
- Select **4:List** to display all the data items (see Key below). Press the **[▲]** and **[▼]** to move the selection cursor (**(E)**) to each data item for water quality (**DO**, **MONTH**, **T**, and **TU**) and press **[ENTER]** to select each item. Once selected the items will be marked with a black box (■).
- Press **[▶]** to display the **TRANSMIT** menu.
- Select **1:Transmit**. The name of each data item is displayed line by line on the sending unit as the item is sent, and on the receiving unit as each item is received. After all selected items have been sent, the message **Done** is displayed on both devices.



Key for Data Items
DO = dissolved oxygen
MONTH = months of the year
T = water temperature
TU = turbidity



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Data Analysis

Answer questions 1 - 13 in your Journal.

A. Examine changes in water temperature (T) over the year.

Graph water temperature and months on a line graph and answer the following questions.

- Press **2nd** [PLOT] **1** [ENTER].
- Press **↓** **↓** [ENTER] to select line graph (↘).
- Press **2nd** [STAT], use the arrow keys to select **MONTH** for the X-axis and press [ENTER].
- Press **2nd** [STAT], use the arrow keys to select **T** for the Y-axis and press [ENTER].
- Press [GRAPH].
- Press [ZOOM] **7** to fit the graph on the screen.



Press [TRACE] and use the left and right arrow keys (←, →) to move the cursor along the line.

- Which month had the highest water temperature during the year?
- Which month had the lowest water temperature during the year?

B. Examine changes in turbidity (TU) over the year.

Graph turbidity and months on a line graph and answer the following questions.

- Press **2nd** [PLOT] **1** **↓** **↓** **↓**.
- Press **2nd** [STAT], use the arrow keys to select **TU**, for the Y-axis and press [ENTER].
- Press [GRAPH].
- Press [ZOOM] **7** to fit the graph on the screen.



Press [TRACE] and use the left and right arrow keys (←, →) to move the cursor along the line.

- Which month had the highest turbidity during the year?
- Which month had the lowest turbidity during the year?

C. Examine changes in dissolved oxygen (DO) over the year.

Graph dissolved oxygen and months on a line graph and answer the following questions.

- Press **2nd** [PLOT] **1** **↓** **↓** **↓**.
- Press **2nd** [STAT], use the arrow keys to select **DO** for the Y-axis and press [ENTER].
- Press [GRAPH].
- Press [ZOOM] **7** to fit the graph on the screen.



Press [TRACE] and use the left and right arrow keys (←, →) to move the cursor along the line.

- Which month had the highest dissolved oxygen level?
- Which month had the lowest dissolved oxygen level?

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D. Sort the data in ascending order.

- Press **2nd** [STAT] **▶** to display the **OPS** menu.
- Select **1:SortA(**.
- Press **2nd** [STAT], use the arrow keys to select **T** and press **ENTER** **,**.
- Press **2nd** [STAT], use the arrow keys to select **TU** and press **ENTER** **,**.
- Press **2nd** [STAT], use the arrow keys to select **DO** and press **ENTER** **)**.
- Press **ENTER**.

```
SortA(L1, L2U, L3O
)
```

E. Examine the relationship between turbidity (TU) and water temperature (T).

Graph turbidity and water temperature on a line graph and answer the following questions.

- Press **2nd** [PLOT] **1** **ENTER**.
- Press **▼** **▶** **ENTER** to select line graph (L₁).
- Press **▼** **2nd** [STAT], use the arrow keys to select **T** for the X-axis and press **ENTER**.
- Press **▼** **2nd** [STAT], use the arrow keys to select **TU** for the Y-axis and press **ENTER**.
- Press **GRAPH**.
- Press **ZOOM** **7** to fit the graph on the screen.

```
Plot1 Off
Type: L1
Xlist: T
Ylist: TU
Mark: +
```

Press **TRACE** and use the left and right arrow keys (**◀**, **▶**) to move the cursor along the line.

- Does the turbidity level of the water increase or decrease as the water temperature increases?
- Based on your data and the information provided in the research article, at what temperature(s) was water clarity the best? When? Why?
- At what temperature(s) was water clarity the worst? When?

F. Examine the relationship between dissolved oxygen (DO) and water temperature (T).

Graph dissolved oxygen and water temperature on a line graph and answer the following questions.

- Press **2nd** [PLOT] **1** **ENTER**.
- Press **▼** **▶** **ENTER** to select line graph (L₁).
- Press **▼** **2nd** [STAT], use the arrow keys to select **T** for the X-axis and press **ENTER**.
- Press **▼** **2nd** [STAT], use the arrow keys to select **DO** for the Y-axis and press **ENTER**.
- Press **GRAPH**.
- Press **ZOOM** **7** to fit the graph on the screen.

```
Plot1 Off
Type: L1
Xlist: T
Ylist: DO
Mark: +
```

Press **TRACE** and use the left and right arrow keys (**◀**, **▶**) to move the cursor along the line.

- Does the dissolved oxygen in the water increase or decrease as the water temperature increases?
- Based on your data and the information provided in the research article, at what temperature(s) was dissolved oxygen at its "healthiest" level? When? Why?
- At what temperature(s) was the dissolved oxygen level low enough to put aquatic life in danger? When?
- Based on your data and the information provided in the research article, during which month(s) was the water quality poor? During which month(s) was the water quality good? Why?

