Water Conservation

# BASELINE AUDIT, GRADES 9-12

Consider contacting local, regional or state water conservation non-profits, and/or your water municipality for assistance conducting the audit. Their involvement is a great way to connect to the community, inspire students, demonstrate career possibilities and share resource expertise.

Invite parents and community members to participate in the auditing process. Students can participate in Public Participation in Scientific Research [(PPSR)](https://en.wikipedia.org/wiki/Citizen_science) projects. This experience is a great way to build community.

## REQUIRED METRICS

1. Number of water using devices monitored.
2. On average, by how many gallons has the school’s water usage decreased?

## SURVEY

Before starting the water audit or going further, survey students and record the average response.

1. We have an infinite source of usable water. True False Unsure
2. Our school’s water sources are free of contaminants, such as bacteria and lead.

 True False Unsure

1. Water use has environmental and financial impacts. True False Unsure On a scale from 1-10, 10 being the most important and 1 being the least important,
2. How important is the topic of water conservation to you?
3. How important is it to install water conserving appliances or devices?

## SCHOOL MAP

Using a highlighter, mark the locations on a school blueprint map (typically provided at the beginning of the year to show fire escape and safe room locations), where auditing will occur. Work with the team/class to complete the audit and calculations. These tables and charts will be used to draw conclusion about water use and to inform the action plan to make recommendations for better water stewardship at the school.

## TABLE 1. DEFINING THE STUDY SITE

|  |  |
| --- | --- |
| 1. Our school’s water sources have been tested for the following contaminants.\* (faucets, fountains, showers)2016 WIIN Act – Provision, Sec. 2107: Lead testing in [school and child care program drinking water](https://www.epa.gov/dwcapacity/wiin-grant-lead-testing-school-and-child-care-program-drinking-water) |  lead bacteria iron mercury copper nitrates unsure |
| 2. What is the source of the school’s water supply? |  well municipal water supply unsure |
| 3. If a municipal water supply, what is its source? |  lake or river well (aquifer/groundwater) N/A unsure |
| 4. Where does water used inside the school go? Check all that apply. |  on-site septic systems drainage field municipal sewer system recycled for use as grey water |
| 5. How much is the district charged for water use? |  dollars per gallons |
| 6. How many gallons of water does the school and district use each year? |  gallons per year at the school gallons per year at the district |
| 7. What is the estimated total cost for water use at the school and district? |  dollars per year at the school dollars per year at the district |

\*Do you have questions regarding water quality at school? The [Healthy Schools Pathway](https://www.nwf.org/Eco-Schools-USA/Pathways/Healthy-Schools) can help. If the team needs a timely response, please contact us at eco-schoolsusa@nwf.org.

# HEATING AND AIR CONDITIONING (HVAC)

## CHART 1. HEATING AND AIR CONDITIONING (HVAC)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. Does your school have boilers (commercial hotwater systems)? |  |  |  | Yes  |  | No |  | Unsure |
|  |  |
| If yes, continue answering questions 2 and 3. If no or unsure, go to the summary questions at the bottom ofthe page. |
| 2. How many boilers does the school haveinstalled? |  |
| 3. The average commercial boiler uses 193 gallons of water per hour. Estimate the number of gallons the boiler(s) uses at the school. | Hours in use x gallons of water per hour = gallons used by boiler(s)/day |

### Think about the following questions as you summarize the information in Chart 1.

1. What prior knowledge did students have related to water usage in school heating and cooling systems?
2. How might this information help inform the student’s action plan?
3. Are their alternatives to boiler systems, new technology in the pipeline? What are they? What is their return on a schools initial investment (ROI)?
4. Do students have ideas about how to engineer a better system?

# IRRIGATION

## CHART 2. GENERAL IRRIGATION

|  |  |
| --- | --- |
| 1. After walking the school grounds, what type of land cover was observed most? |  grass and/or other natural plant cover natural rock ground covers concrete/asphalt turf or man-made ground covers |
| 2. Water consumption for irrigation is sometimes billed separately from in-school water consumption. If known, how many gallons ofwater is used per year for irrigation? |  gallons of water per year |
| 3. What is the water rate the district pays forirrigation? |  dollars per gallons |
| 4. What is the average rainfall, in inches, for each mo<https://www.usclimatedata.com/>August | nth during the school year, August through June? in. |
| September |  in. |
| October |  in. |
| November |  in. |
| December |  in. |
| January |  in. |
| March |  in. |
| April |  in. |
| May |  in. |
| June |  in. |

Continued on the next page.

## CHART 3. IRRIGATION SYSTEM

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1. Is an irrigation system installed throughout theschool grounds? |  |  |  Yes |  |  No Unsure |
|  |
| If yes, continue answering questions 2-4. If no or unsure, go to Chart 5. |
| 2. What is the irrigation schedule? |  |
| 3. How many stations/zones are installed? |  |
| 4. Survey the heads, drips and/or bubblers in each zone/station. How many were observed to bebroken, leaking or cut? |  |

CHART 4. SPRINKLERS WITH A HOSE ATTACHMENT

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. Are sprinklers used to irrigate school greenspaces? |  |  |  | Yes |  | No |  | Unsure |
|  |  |
| If yes, continue answering questions 2-4. If no or unsure, go to the summary questions at the bottom of thepage. |
| 2. What is the sprinkler schedule? |  |
| 3. How many sprinklers are used around the schoolgrounds? |  |
| 4. Survey the outdoor faucets, hoses andsprinklers. How many were observed to be leaking, worn out or broken? |  |

### Think about the following questions as you summarize the information in Charts 2-4.

1. What do landscape design (or lack of) and weather have to do with water conservation and irrigation?
2. Do schools have local or state regulations or guidelines regarding irrigation? Explain.
3. Explain any concerns teams/classes have regarding the results of their irrigation audit? Who can they contact?
4. What actions can the team/class take to improve water conservation on the school grounds?

# CHART 5. SCHOOL BATHROOMS

Using a highlighter, mark the locations on a school map, where auditing will occur. Work with the team/class to complete the audit and calculations. These tables and charts will be used to draw conclusion about water use and to inform the action plan to make recommendations for better water stewardship at the school.

* 1. Automatic (S) Sensor (M) Manual (GPF) Gallons per Flush (GPM) Gallons per Minute

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Location or****Room Number** | **Toilets** | **Urinals** | **Bathroom Faucets** | **Shower Heads** | **Other** |
|  | **A** | **S** | **M** | **GPF** | **A** | **S** | **M** | **GPF** | **A** | **S** | **M** | **GPM** | **A** | **S** | **M** | **GPM** | **A** | **S** | **M** |  |
| **Girls locker room****next to Gym A** |  |  | **X** | **3.5** |  |  |  |  | **X** |  |  | **2.5** |  |  | **X** | **2.5** |  |  |  |  |
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|  |
| **Total appliance numbers observed at each location** | **A** | **S** | **M** | **A** | **S** | **M** | **A** | **S** | **M** | **A** | **S** | **M** | **A** | **S** | **M** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Any observed leaks?** | Yes No |  Yes No |  |  |  Yes  |  | No |  |  |  Yes  |  | No |  |  |  Yes  |  | No |
|  |  |  |

# CHART 6. KITCHEN

## Collect data on up to three areas that best represent the kitchen equipment found at the school. For safety reason, student may not be allowed in the kitchen area. If that is the case, work with the kitchen manager to collect the data.

(A) Automatic (S) Sensor (M) Manual (GPF) Gallons per Minute (GPM) Gallons per Hour

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Location or****Room Number** | **Sinks** | **Sink Disposal** | **Dishwashers** | **Steamers** | **Other** |
|  | **A** | **S** | **M** | **GPM** | **A** | **S** | **M** | **GPM** | **A** | **S** | **M** | **GPM** | **A** | **S** | **M** | **GPH** | **A** | **S** | **M** |  |
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|  |
| **Total appliance numbers observed at each location** | **A** | **S** | **M** | **A** | **S** | **M** | **A** | **S** | **M** | **A** | **S** | **M** | **A** | **S** | **M** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Any observed leaks?** | Yes No |  Yes  | No |  |  Yes  |  | No |  Yes  |  | No |  Yes  |  | No |
|  |  |  |  |

# CHART 7. OTHER WATER USING APPLIANCES

## Collect data on up to five areas that best represent other water using appliances or devices found at school.

(A) Automatic (S) Sensor (M) Manual (GPHP) Gallons per Hundred Pounds (GPM) Gallons per Minute (GPL) Gallons per Load

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Location or****Room Number** | **Ice Makers** | **Lab Faucets** | **Clothes Washing****Machines** | **Utility Closet(s) or****Other Faucets** | **Water Fountains** | **Other** **\_** |
|  | **A** | **S** | **M** | **GPHP** | **A** | **S** | **M** | **GPM** | **A** | **S** | **M** | **GPL** | **A** | **S** | **M** | **GPM** | **A** | **S** | **M** | **GPH** | **A** | **S** | **M** |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  |
| **Total appliance numbers observed at****each location** | **A** | **S** | **M** | **A** | **S** | **M** | **A** | **S** | **M** | **A** | **S** | **M** | **A** | **S** | **M** | **A** | **S** | **M** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Any observed****leaks?** | Yes No |  Yes No |  Yes No |  Yes No |  Yes No |  Yes No |

### Think about the following questions as you summarize the information in Charts 5-7.

1. Provide an overall assessment of water use at your school using Charts 5-7.
2. What’s an estimate for the gallons of water used by all of the in-building sources audited?
3. Explain any concerns teams/classes have regarding the results of their in-building audit? Who can be contacted?
4. What actions can the team/class take to improve water conservation inside the building?

## TABLE 2. WATER CONSERVING APPLIANCES, DEVICES AND PRACTICES

|  |  |
| --- | --- |
| 1. Is the school certified as an Energy Star School? |  Yes No Unsure |
| 2. Do all indoor faucets/showerheads have aerators? |  Yes No Unsure |
| 3. Do any appliances and/or devices bear the WaterSense label?<https://www.epa.gov/watersense/types-facilities> |  Yes No Unsure |
| 4. Estimate what percentage of the school’s toilets and urinals are considered low-flow/high-efficiency? |  % |
| 5. Does the school use greywater?<https://greywateraction.org/greywater-reuse/> |  Yes No Unsure |
| 6. Does the school have water bottle filling stations? |  Yes No Unsure How many?  |
| 7. Does the school encourage students to bring and use reusable water bottles? |  Yes No Unsure |
| 8. Does the school have functioning rain barrels? |  Yes No Unsure How many?  |
| 9. Does the school have functioning cisterns? |  Yes No Unsure How many?  |
| 10. Does the school use native grasses, trees, shrubs and flowers in its landscape design? | Yes No Unsure Estimate % of Native Plants  |
| 11. Do any parts of the school grounds use xeriscaping, have installed rain gardens or bioretention ponds? | Yes No UnsureEstimate percentage?  |
| 12. List any other water conserving practices used at the school. |  |

### Continued on the next page.

**Think about the following question as you summarize the data in Table 2.**

1. Based on the responses in Table 2, how would the team/class rate their water conservation measures currently in use? Explain.
2. In what area(s) of water conservation do students feel they can have the most impact?
3. What actions can students take to improve water stewardship?

### Review of All Data

* 1. Based on what is known and has been learned, what claims can be made based on the data and other evidence collected?
	2. Be prepared in the post-audit to explain the role **systems and system models** play in understanding water conservation at school.
	3. Be prepared in the post-audit to explain **cause and effect** relationships related to water conservation.
	4. Be prepared in the post-audit to explain **patterns** students have identified through their investigations.
	5. Be prepared in the post-audit to explain the relationship **matter and energy** have on water conservation at the school.