

API® Lesson 1 | Community Aquarium Ecosystem Setup

This lesson plan provides how to properly setup an aquarium ecosystem. A properly set up aquarium is the basis to ensure the fullest measure of learning, pleasure and enjoyment with your aquarium.

For Instructor/Teacher/Parent

Make sure to read through the entire lesson plan before beginning this with students/family members as materials will need to be purchased and information prep will need to be done.

Learning Objectives

After completing the activities outlined in this lesson plan, students should be able to:

- Explain the components needed to set-up an aquarium ecosystem
- Clearly explain the difference between cold water and tropical ecosystems
- Discuss the importance of treating tap water
- Why it's important to test your water, how to test, what the results mean and how to correct them
- Clearly explain the Nitrogen Cycle and why it is important
- Understand the basics of nutrition for fish

Length

This activity will take 4 to 6 weeks for completion (this factors in the time to set-up an aquarium).

Materials to complete activity

- Aquarium, Aquarium Cover, Aquarium Light, Aquarium Stand
- Aquarium Filter
- Heater (tropical fish only)
- API® Freshwater Master Test Kit
- Water Conditioners and Bacterial Products
 - API STRESS COAT™ water conditioner
 - API AQUARIUM SALT
 - API QUICK START™ nitrifying bacteria
 - API STRESS ZYME™ bacterial cleaner
- Gravel
- Decorations
- Fish
- API Fish Food

Key Terms

Review key terms (printable sheet included at the end of the lesson) with students/family members.

- 1) ECOSYSTEM
- 2) TROPICAL
- 3) COLD WATER
- 4) NITRIFYING BACTERIA
- 5) BENEFICIAL BACTERIA
- 6) AMMONIA, NITRITE, & NITRATE
- 7) ELECTROLYTES
- 8) pH
- 9) NUTRITION
- 10) NITROGEN CYCLE (individual printable sheet included at the end of the lesson)

Warm Up

Ask a couple of questions to warm up for the lesson:

- 1) Do you currently have any fish? If so, what kind?
- 2) Can you name some types of fish?

Before You Start

- 1) For this lesson we're going to walk you through setting up a general community aquarium ecosystem.
 - a) Note: Determining different types of environments or ecosystem is dependent on the type of fish selected. As an example, fish from South America prefer water with a lower pH and lower general hardness. Fish from African Rift Lakes are referred to as African Cichlids prefer water with a higher pH and higher general hardness. It is important to determine the type of fish early so you can set up your aquarium to meet their specific needs. The type of fish will also be a guide to the decorations that may suit them best. This guide will not replicate any specific environment but is for a mixed or general community aquarium ecosystem.
- 2) The type of fish will determine if your community aquarium is going to be a "Tropical" aquarium or "Cold water" aquarium. Tropical simply means warm water and this type of aquarium requires a consistent temperature. Most aquarium fish are tropical, however fish such as goldfish and Koi are considered cold water and do not require a heater.
- 3) A 'general community' aquarium has a cross selection of fish that will live in a neutral pH of 7.0 and moderate hardness. It is important to only select fish that are compatible to this pH and will not grow too large for the size of your aquarium. As an example, an Oscar in the store at 1" may look like a great fish to add to a community aquarium, however this fish will grow fast and big. Typically, an Oscar can grow at 1" month and reach 12 to 14" in length and not be compatible with other smaller fish.
 - a) Note: some fish for selection could be:
 - i) Cold water aquarium goldfish are a fish to choose and they do not require a heater.
 - ii) Tropical fish come from tropical and subtropical regions of the world. As such your aquarium water needs to be kept warm - a range of 74° to 78° F (23° - 26° C). You could choose a mixture of peaceful "good neighbors" for your community. You could

- also choose more challenging aggressive fish, such as cichlids but we advise for your first classroom/at home adventure to select a peaceful grouping.
- 4) You will need to find the best location to install your aquarium. The location should be away from direct source of light, heat, or overly loud noise or an area where it is likely to get bumped into. The aquarium needs to be on a level and very sturdy piece of furniture or stand. Remember water is heavy, it weighs 8.2 pounds (3.7 kg) per gallon (3.785 Liters). You will also need to be accessible to an electrical outlet to plug in your filter, heater and light.
 - 5) Selecting the size of your aquarium is important. The bigger the aquarium the easier it is to keep in balance and clean, and the more fish you can have.
 - a) To give you a better understanding, the following are example populations for a 15 to 20-gallon aquarium (50 to 90 Liters).
 - i) Community Aquarium could be a group of 8 to 15 fish
 - ii) Coldwater Aquarium could be a maximum 4 common goldfish or 6 fancy goldfish or 6 to 12 white cloud minnows.

Instructions for Set-Up

1. Position the aquarium in the selected location ensuring it is level.
2. Rinse your gravel before placing it in the aquarium. Then place it in the bottom of the aquarium.
3. Add your decorations leaving enough room for your fish to easily swim about.
4. Install your equipment (filter, heater, etc.). Wait before you connect them to the electric
5. Fill your aquarium with tap water.
 - a. Note: to keep the gravel from being disturbed from the water entering the aquarium place a small plate on top of the gravel and pour water slowly onto the plate. This will keep your decorations and gravel in place.
6. Now we can plug in your electrical equipment. It is advised to allow everything to run for a period, perhaps overnight, to ensure all equipment is working properly. This will also give your aquarium heater time to bring the water up to the set temperature, as tap water is generally colder than needed for tropical fish.
7. Check your temperature to ensure your aquarium heater is set properly. If you are keeping cold water fish this step can be skipped.
8. Conditioning your water. This is one of the most important steps for success.
 - a. Add API STRESS COAT water conditioner to instantly make your tap water safe. Tap water is full of chemicals that will harm your fish. Tap water contains chlorine and chloramines which keeps tap water safe for us (humans) to drink but are harmful to our fish. It is easy to treat and important!
 - b. Add API AQUARIUM SALT. API AQUARIUM SALT adds electrolytes into the water that fish need, and it helps them breathe easier.
 - c. Add API QUICK START nitrifying bacteria. This kick starts the biological filter aka the Nitrogen Cycle. It contains the bacteria that convert poisonous ammonia (fish waste) into nitrite (also harmful to fish) and then into nitrate. Nitrate is then consumed by plants and algae or reduced through routine water changes. API QUICK START ensures your biological filter is established. This process (picture available at the end of the lesson) is called the nitrogen cycle, and it occurs in all underwater ecosystems. These bacteria continue to grow as your aquarium ages - living on the top layers of the aquarium gravel, decorations and filter media.
9. Now that your water is conditioned you are ready for fish. Always be sure to test your water and check your temperature before introducing fish to any aquarium. Test your water with the API FRESHWATER MASTER TEST KIT. The directions will help you on how to test, determine what the test results mean, and advise on any adjustment that may be needed to your aquarium water
10. Introduce your fish. It is advised to let your fish float in the bag they came in, in the aquarium for about 10 minutes to ensure the temperature in the bag is the same as the water temperature in the aquarium.
 - a. When you release your fish into the aquarium, it's advised to add additional API STRESS COAT to provide your fish with the best conditions. Adding STRESS COAT, will reduce the stress of on the fish of entering their new home, enhance their protective slime coat, help to heal any damaged tissue from transport, and/or netting.
11. Once the fish have been introduced, it is OK to offer them a little bit of food (a small pinch of flakes or 4-5 pellets), but just a little until they are settled. The amount of food should be consumed within 3 to 5 minutes.

Routine Care and Maintenance

1. Feed your fish twice a day when possible and only the amount they will consume within 3 minutes, always follow the feeding directions on the label. Feeding the correct nutritional content is essential to keep your fish healthy and active. It is also important to choose a food developed for the type of fish you are keeping. Whether they are cold water fish like goldfish or a mixture of tropical, there are fish foods designed for the specific needs of the fish.
 - a. Note: Most of the time you could select a tropical community food like API Tropical Flakes or API Tropical Pellets for most of your fish. If you have goldfish, select API Goldfish Flakes or API Goldfish Pellets, formulated for cold water fish. Some of your fish may be bottom eaters like Corydoras, catfish, or Plecostomus. The fish will require a diet designed for them like API Algae Eater Wafers or API Bottom Feeder Shrimp Pellets.
2. Testing water is the best way to ensure your aquarium is in balance.
 - a. Over the first few weeks testing water every other day is a great way to learn about the nitrogen cycle. Record all test results and develop a chart to show the changes to water chemistry as the beneficial nitrifying bacteria in API QUICK START become established consuming the unwanted ammonia and nitrite from the aquarium. After the initial setup and the aquarium is cycled (ammonia and nitrite are no longer present) testing weekly is advised to ensure the aquarium stays balanced.
3. Every 2 to 3 weeks perform a partial (20 to 25%) water change. A partial water change is better than a larger or complete water change. Fish live in water and the change in chemistry happen slowly and fish adjust to it even if it is not ideal. Sudden drastic changes to water chemistry from large water changes fish cannot tolerate very well and will be stressed by it. So partial (20 to 25%) water changes are best and always remember to treat your tap water with API STRESS COAT to make tap water safe for your fish. Routine water changes will also help to decrease any accumulation of nitrate over time.
 - a. In addition to API STRESS COAT, we recommend adding API AQUARIUM SALT to replace electrolytes fish need but only add for water being replaced during the water change
4. If you have a Tropical tank, keep track of your water temperature to ensure you heater is working properly.
5. Maintain the aquarium filter. Your filter is an integral part of continued aquarium success. Follow the manufacturer's recommendation on how often to change the cartridge or components. Between changes make sure the water flow is correct.
 - a. Remember if your water tests indicate any concerns then specific ready to use filtration materials are available to add to your filter. A ready to use media pouch can be added to remove items such as ammonia, nitrite, nitrate, or phosphate. If your water is not quite clear you may want to select a carbon resin blend media pouch to remove dissolved organics for crystal clear water. Regular care to your filter and replacement of media is a great choice to obtain clean, clear, healthy water.
6. Add API STRESS ZYME weekly to help keep your aquarium clean. It contains five different strains of beneficial bacillus bacteria that digest uneaten fish food, fish waste, decaying plant materials, and other organic matter. The bacteria in API STRESS ZYME were specifically selected for their unique ability to consume organic matter that accumulates in aquarium.

Questions

- Pass out the Questions worksheet (printable sheet included at the end of the lesson) to each student/family member.
- Review the answers to the questions during the discussion section of the lesson.

Discussion

- After finishing the items above including the questions and key terms, engage students/family members in a brief discussion about the lesson:
 - Where are fish found?
 - What kinds of fish do we have in the aquarium?
 - Show students/family members pictures of the wide varieties of fish found all over the world.
 - How do fish reproduce?
 - What is a school of fish?
 - How do fish breathe?
 - Why are bacteria important?

Quiz

- Once you've finished the discussion, pass out the Quiz worksheet (printable sheet included at the end of the lesson) to each student/family member.
 - Have them complete the quiz and then review the answers/have an open discussion about the answers with them. Answers are below.
1. Describe your favorite fish in our aquarium and what region of the world they are found.
 - As an example: Swordtails are commonly found in Central America and produce live bearing babies. Swordtails can grow upwards to 4 to 5" in length and can live on average 3 to 5 years.
 2. Why can we not just add tap water to an aquarium without treating it? What are we treating it for?
 - Common tap water contains disinfectants such as chlorine and chloramines and are highly toxic to aquarium life. Both tap water and well water can contain heavy metals such as copper, lead and zinc also a concern to aquarium life. The use of a water conditioner, like API Stress Coat, instantly makes tap water safe by detoxifying heavy metals and neutralizing chlorine and chloramines.
 3. How many gallons/liters is our aquarium and how much does it weigh?
 - Calculate your aquarium size and remember water will weigh 8.2 pounds (3.7 kg) per gallon (3.785 Liters).
 4. What is the difference between a tropical fish and a cold water fish?
 - The major difference between Tropical and Coldwater is the temperature.
 5. Why are electrolytes important to fish and what supplies electrolytes for our fish?
 - Electrolytes are essential for the uptake of oxygen, and the release of carbon dioxide and ammonia across gill membranes. The lack of electrolytes can cause serious health problems for fish. API Aquarium Salt provides essential electrolytes fish need to survive in an aquarium.
 6. What is a fish school and why is it important?
 - A fish school is when fish swim in a group. Many fish such as the White Cloud Minnow and the Cardinal Tetra are fish that do better in a group than alone. Fish that typically school do not feel safe when alone and are always stressed. When providing enough of the similar species to an aquarium helps them to relax.

Additional Support Information

- 1. How big is the aquarium?** If you bought it new the packaging would have indicated the size. It is important to know the size of your aquarium to know how much of any product to treat with or when determining gallons/liters when performing a partial water change during routine maintenance.
 - One gallon of water contains 231 cubic inches. If you measure your aquarium in length, width and height in inches then multiply then the divide by 231 you get an answer in gallons. An example is a standard 15-gallon aquarium measure 12" x 12" x 24". When you multiply these numbers, you will get 3,456 then when you divide this number by 231 you will get 14.96 gallons. So now you can see the average 15-gallon aquarium holds 14.96 gallons.
 - One Liter of water contains 1,000 cm³. If you measure your aquarium in length, width and height in centimeters then multiply then the divide by 1,000 you get an answer in liters. An example is an aquarium promoted as 60-liter that measures 60" x 30" x 30". When you multiply these numbers, you will get 54,000 then when you divide this number by 1,000 you will get 54 Liters. So now you can see the promoted 60-liter aquarium holds 54 Liters.
- 2. Decorations are not just for you to look at!** Decorations in an aquarium should serve a benefit for the type of fish being kept. Some fish naturally like to hide in plants or under rocks. Some will be very active, and others will seem to lie around. Some fish are naturally active at night while others will be out during the day. Each type of fish has habits that are unique to their type of fish. When you first enter fish into any aquarium they are stressed and will need time to acclimate. Providing them with different decorations to meet their specific needs helps them to adjust to their new home.
- 3. Lights help us see the fish** and if you have live plants the lights also help the plants to grow. Fish need to relax just like we need to sleep. Keeping the light on all the time is not natural for them. So be sure to either turn your light off at night or better yet set your light on a timer.
- 4. An aquarium cover is important to keep your fish in the aquarium.** Fish naturally will swim fast to get away from a predator or jump when scared. If another fish in the aquarium gets too aggressive or someone walks up to the aquarium too fast, it will scare the fish. The fish will naturally swim fast to get away from the concern and may even try to jump out of the water. Without a lid the fish could end up on the floor without water to survive. Having the aquarium covered prevents the fish from jumping out. The cover is also important to prevent things from spilling into the aquarium as well.
- 5. The Nitrogen Cycle is important.** The fish produce waste from their gills and fecal matter in the form of ammonia. A chemist would write ammonia as NH₃, that is nitrogen and hydrogen. The beneficial nitrifying bacteria consume/converts the ammonia from NH₃ to NO₂ this is called nitrite. Both ammonia and nitrite are bad/toxic for fish. In nature another beneficial nitrifying bacteria consumes/converts the NO₂ (nitrite) to NO₃ (nitrate). Nitrate is safe but not in large amounts. When you make routine water changes the nitrate is diluted.

The chemical process from NH₃ to NO₂ to NO₃ is called the nitrogen cycle. To determine the success of your nitrogen cycle, test your water using the API FRESHWATER MASTER TEST KIT. Add API QUICK START to provide the nitrifying bacteria important for nitrogen cycle. As the fish produce more waste more bacteria are needed to maintain the proper balance. Over the first few weeks after setting up your aquarium, the nitrogen cycle is becoming established. When the ammonia and nitrite remain at zero, your nitrogen cycle is considered established and functioning properly.

- 6. pH is a measurement of acidity.** Most aquarium fish live in a pH range of 6.5 to 8.2. If water is below 7.0, we say it is acidic. If water is above 7.0, we say it is alkaline. Neutral water is at a pH of 7.0. The desired pH range that is ideal for specific fish species can vary greatly from species to species. Fish from the Amazon normally prefer a pH of 6.5 or even lower. Fish from the African Rift Lakes called African Cichlids prefer a pH of 8.2 or even higher. Fish from Central America normally do best at a pH around 7.5. When we mix a grouping of fish from around the world together, we call that a community aquarium and normally target a pH of 7.0. It is easy to test the pH of your water using the API FRESHWATER MASTER TEST KIT. If you need to adjust your water, you can use API pH Up or pH Down or select API PROPER pH

7.0. Proper pH is a series of buffers and pH adjusters that will automatically establish your aquarium pH to 7.0.

7. **Algae is expected in any aquarium.** Algae is not harmful in aquariums, but it is not always something we may want to see as it takes from the serene setting. Algae attaches to the glass, rocks, gravel and decorations. If you scrape it away from the glass, you can then remove it. You can buy fish that will eat it, such as a Plecotomus or pleco for short, or Otocinclus catfish, another smaller algae-eating fish. You can also buy algae removing water treatment such as API ALGAEFIX™.
8. **Fish need a balanced and complete diet.** In nature fish eat whenever they are hungry and often rely on eating live food. Things change when they are kept in aquarium setting. Fish need proteins, carbohydrates, vitamins, minerals and fats. Providing these in the correct balance is important because feeding too little is bad for them and feeding too much will pollute their environment. API Fish Food have been formulated to provide your fish with all the ingredients fish need in the correct balance.

Feed your fish once or twice a day the amount they will consume in a few minutes. The food should be completely eaten. Over feeding will cause cloudy water and produce more ammonia in the water. Any food that is not eaten that is left over decays on the bottom and pollutes the water even more. Feeding is a good time to check your fish. Watch them carefully to make sure everyone is eating. Observe them to assure their fins and body are in proper condition. Observe their behaviors and colors.

9. **Fish need electrolytes.** Fish actively maintain a natural balance of electrolytes in their body fluids. Electrolytes such as potassium, sodium, chloride, calcium, and magnesium are removed from the water by chloride cells located in their gills. These electrolytes are essential for the uptake of oxygen and release of carbon dioxide and ammonia across gill membranes. The lack of electrolytes can cause health problems in your fish. API AQUARIUM SALT is an all-natural salt, providing essential electrolytes fish need to survive.

KEY TERMS

ECOSYSTEM

a system of live interacting organisms along with the nonliving components of the environment all interacting harmoniously.

TROPICAL

A hot and humid environment or region.

COLD WATER

Also called Temperate, subject to ambient or room temperature.

NITRIFYING BACTERIA

Bacteria that utilize nitrogen as a food source. Typically, in an aquarium these bacteria are consuming ammonia-nitrogen, nitrite-nitrogen and nitrate-nitrogen.

BENEFICIAL BACTERIA

Bacteria that provide a benefit. Typically, in an aquarium these bacteria are of the genus bacillus and consume organic waste.

AMMONIA, NITRITE, & NITRATE

Byproducts of organic waste breaking down in the aquarium. The key three water parameters to understand the efficiency of the nitrogen cycle.

ELECTROLYTES

Also called salts, these are minerals that carry an electric charge. Essential in fish for vital physiological functions of the fish, such as growth rate, breathing, transfer of energy between cells.

pH

Measure of acidity.

NUTRITION

The food that is essential for maintenance, growth, reproduction, overall health. A balanced diet must contain proper amount and proportions of carbohydrate, protein, fat, vitamins, minerals and fiber.



THE CYCLE

Fill in the blanks to complete the cycle discussed in this lesson.



THE NITROGEN CYCLE



COMMON FISH

For more information on fish choices for a community aquarium, see here:
<https://apifishcare.com/post/selecting-fish-freshwater-community-aquarium>



GOLDFISH



GOURAMI



TETRA



SWORDTAIL



GUPPY



WHITE CLOUD MINNOW

COMMON FISH



PLATY



CORYDORAS



ANGELFISH



MOLLY



CHERRY BARB



LOACH

QUESTIONS

1. Name each type of fish in the aquarium.
2. How big will each type of fish you selected grow to?
3. Are the fish male or female?
4. How do they normally live, in solidary or as a school?
5. What is their normal diet in nature?
6. What is in tap water that can be harmful to fish?
7. Identify the region of the world the fish in the aquarium are found.

QUIZ

1. Describe your favorite fish in our aquarium and what region of the world they are found.
2. Why can we not just add tap water to an aquarium without treating it? What are we treating it for?
3. How many gallons/liters is our aquarium and how much does it weigh?
4. What is the difference between a tropical fish and a cold water fish?
5. Why are electrolytes important to fish and what supplies electrolytes for our fish?
6. What is a fish school and why is it important?



CONTACT US & ADDITIONAL RESOURCES

For more information regarding this lesson plan, API® brand, or any general fishkeeping questions and/or comments, feel free to contact us below.

- Website: <https://apifishcare.com/contact>
- Telephone Number: 1-800-847-0659

