Native Fish Aquariums - Gerald Pottern -- Raleigh Aquar Soc -- Aug 2009

Items You Will Need:  
Aquarium & Sturdy Stand  
Cover (glass, plastic, or screen)  
Fluorescent Light  
Filter and Pump  
Filter Media, Aragonite  
Air Tubing & Valve (for air-driven filter)  
Sand or other Bottom Material  
5-Gal Buckets and Siphon  
Chloramine Neutralizer  
Thermometer (internal)  
Plastic Scrub Pad or Razor Blade  
Test Kits: pH, Ammonia, Nitrite, Hardness  
Fish Food - dry, frozen, live  
Aquarium Nets

Other Considerations:  
Safe from Doorways, Traffic  
Electric Outlet  
Access to Sink  
Where to Fill Buckets  
Water Conditioning Barrel  
Expect Occasional Spills  
Natural Sunlight (optional)

A. Aquarium:  If you plan to keep small fishes 3 inches or less, a tank 20 to 24 inches long (10, 15, or 20 gallons) will be sufficient. For fishes 3 to 6 inches, a tank 30 to 36 inches long (20 to 50 gallons) is recommended. For fishes larger than 6 inches, a tank 48 inches long (40 to 75 gallons is recommended. Below are Standard Aquarium Sizes -- “All-Glass Aquarium” brand

<table>
<thead>
<tr>
<th>Size</th>
<th>L x W</th>
<th>Height</th>
<th>• 231 cubic inches = 1 gallon = 8.3 pounds</th>
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<td>• 1 cubic foot = 7.5 gallons = 62 pounds</td>
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<td>2.5</td>
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<td>• Tanks deeper than 20” are difficult to work in</td>
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<td>5.5</td>
<td>16 x 8</td>
<td>10</td>
<td>• Surface Area is important for O2 &amp; CO2 exchange</td>
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<tr>
<td>10</td>
<td>20 x 10</td>
<td>12</td>
<td>• Bottom Area is important for fish territories</td>
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<tr>
<td>15</td>
<td>24 x 12</td>
<td>12</td>
<td>• Several small tanks more versatile than one large tank</td>
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<tr>
<td>20H</td>
<td>24 x 12</td>
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<td>• 2.5 gal good for field observation &amp; photography</td>
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<td>20L</td>
<td>30 x 12</td>
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<td>• Larger volume → more stable water quality &amp; temp</td>
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B. Stand:  Buy a commercial aquarium stand, or build your own with lumber or angle iron, or use a sturdy piece of furniture that you don’t mind getting wet. (NOT particle-board). Check to make sure the stand surface is Flat and Evenly Supported. This is more important than being Level to prevent frame twisting and leaks. A full tank set-up weighs approximately 10 pounds per gallon. Place the stand where it’s near an electric outlet and is safe from swinging doors and other hazards.
C. Cover & Light: Commercial aquarium hoods have built-in fluorescent lights. Or, you can get two panes of glass (sand the sharp edges) to rest on the inner lip of the aquarium frame, and get a hardware store light fixture with two fluorescent bulbs the length of the tank. This will be sufficient for a variety of low-light plants. Certain plants require more intense lighting. A glass cover will reduce evaporation, protect your light fixture from splashes, and prevent fish from jumping out. Acrylic (Plexiglas) tends to warp and will not lay flat. If you plan to keep COOL water fish, the portion of the cover NOT under the light should be plastic screen to help dissipate excess heat.

D. Filter & Pump: For small fish, and species from swampy habitats that prefer slow current, an internal box filter or sponge filter driven with an air pump is recommended. Air-driven filters will not add heat to the water. For larger fish or those that appreciate more current, an external hang-on-tank filter or canister filter is recommended. These have built-in electric water pumps and do not need an air pump, but they will add more heat to the water. In general, the more filters, the better. Having multiple filters in a tank also means you can borrow one of them to "cycle" a new tank with nitrifying bacteria. An extra air pump with tubing, valve, and airstone is also useful for holding new fish in a cooler, or providing aeration if your external filter is not working.

E. Filter Media: Provides a surface for nitrifying bacteria to grow and traps waste particles. Gravel, lava rock, open-cell foam, polyester fiber, plastic pot scrubbers, plastic onion/fruit bags, or similar porous non-toxic material can be used. A sponge filter IS its own media. Many external filters use specific filter cartridges, or a "bio-wheel". Aragonite (crushed coral) filter media may be needed to buffer pH if your water supply has low alkalinity. (Most city water supplies have low alkalinity, except those that use hard well water in the coastal plain). If you can borrow filter media or "dirt" from an established tank with fish, the new tank will be ready for fish much sooner.

F. Bottom Material: Gravel or sand on the bottom is not necessary; a bare tank bottom painted flat black, dark green, or brown works fine and is easiest to keep clean. An un-painted glass bottom should NOT be used without gravel or sand, as the reflected glare from below is stressful to many fish. If you want a more natural look, use fine gravel or sand, preferably a medium to dark natural color to enhance the fishes' color. Many fish will remain colorless if the tank bottom is pale. Coarse gravel is tempting to mimic a rocky stream, but it traps food and waste and requires more effort to keep clean. For coastal plain swamp fishes, sand, soaked leaves (oak, magnolia, etc) and sphagnum peat are good natural bottom materials.

G. Buckets and Siphon: Get at least two clean 5-gallon buckets. Joint compound and latex paint buckets are safe (after washing) but don’t use buckets that previously contained petroleum products, solvents, or detergents. Label your buckets FISH ONLY so they don’t get used for anything else. Get about six feet of 5/8 or 3/4 inch flexible plastic tubing to use as a siphon for changing water. Pet shops sell "gravel vacuum" siphons with a wide end for extracting dirt from the gravel - these are useful if your tank has gravel or sand but not a lot of rooted plants.

H. Chloramine Neutralizer: Most city water supplies use chloramine, a blend of chlorine and ammonia, to kill bacteria. Make sure you buy a water conditioner or chloramine neutralizer that detoxifies ammonia; some brands eliminate only the chlorine, leaving ammonia which can kill fish. If you have space, get a plastic trash barrel for conditioning water in advance. Refill when it’s used up; then you'll always be ready for water changes and "emergency" fishing trips.
I. **Thermometer:** Get a glass floating or plastic hanging internal thermometer. Avoid metal ones with sharp edges; frightened fish get cut on these. Avoid liquid crystal digital thermometers that stick on the outside glass; they lose their accuracy after a year or so.

J. **Test Kits:** Get a pH test kit that uses Bromothymol Blue indicator dye. These are the cheapest and are reasonably accurate within the pH range (6.0 to 7.5) you'll want for most native fish. Also get an ammonia test kit (these are often combined in a chlorine/chloramine test kit), nitrite test kit, and hardness test kit; you don't need research-grade accuracy, so cheap kits are usually adequate. Make sure they are suitable for freshwater testing.

K. **Aquarium Nets:** Get two green nets: a 3 to 4 inch one and a 6 to 8 inch one for catching fish in the aquarium. Fish will flee from a moving net, but can be coaxed into a stationary net. Use the small net to herd them into the large net. This method reduces the amount of chasing, and thus stress on the fish.

L. **Plastic Dish Scrub Pad:** For cleaning algae off the front glass. Let green algae grow on the sides and back; it's good fish food, consumes ammonia waste, and looks natural. Fish do not eat blue-green algae; this should be removed. Some types of green "spot" algae may require a razor blade to remove.

M. **Fish Food:** Most minnows (shiners, dace, chubs) and mosquitofish will quickly learn to eat good-quality flake foods and pellets made for tropical freshwater and marine fish. Most sunfish, killifish, suckers, and madtoms usually require frozen foods (bloodworms, brine shrimp, krill, plankton) or fresh foods (live worms, mosquito larvae, shrimp meat) at first, but many will eventually adapt to flakes and pellets. Cooked green peas are an excellent supplement for many minnows and sunfish. Most darters, mudminnows, pirate perch, swampfish, pickerel, and pygmy sunfish usually require live, fresh or frozen foods on a permanent basis. Feed as much variety as possible to ensure adequate nutrition.

N. **Brine Shrimp Hatching Jar:** If you keep small darters or pygmy sunfish that require fresh foods, or you hope to breed your fish, newly-hatched brine shrimp are an easy and reliable live food for tiny fish. They are also an excellent food for helping newly caught or stressed fish recover from trauma. Brine shrimp eggs from Great Salt Lake are purchased dry and can be hatched in a jar of saltwater with aeration in 24 to 36 hours. An inverted soda bottle with the bottom cut off works well. Insert an air tube down to the bottle cap, so that the bubbles keep all eggs in suspension. Get a fine-mesh brine shrimp net to separate the baby shrimp from the saltwater.

**Setting Up a Native Fish Aquarium**

1. Wash tank, bucket, and all accessories, rinse well with plain water.
2. If not using gravel or sand, then paint outside bottom (and back if you want) a dark color.
3. Examine stand to ensure it is evenly supported and top is flat. Shim up the feet if needed.
4. Set tank on stand and add 2 or 3 inches of water. Push/pull up and down on each tank corner to check for even support or twisting. Place shims under stand or under tank until there is no rocking free-play.
5. Wash sand in a bucket outside (sand in plumbing is bad!) until the rinse water is reasonably clear. If using sand from a local stream (often sandstone, mudstone, shale in the Piedmont) the rinse water may stay slightly turbid because the washing process is eroding it. This will settle out in a few days. Place sand in aquarium.

6. Use buckets or hose (rated safe for potable water) to fill the aquarium, and add water conditioner to remove chloramine. (De-chlorinating in the aquarium is safe only if NO fish are present. Water should be dechlorinated in a bucket or barrel before adding it to a tank containing fish.

7. Set up the filter with appropriate filter media. If possible, use media or filter backwash from an established tank with fish to provide a starter culture of nitrifying bacteria. Or you can buy a bottle of bacterial starter culture.

8. If using an air pump, it is safer to place the pump higher than the aquarium, rather than underneath it, so that water cannot back-siphon to the air pump during a power failure. If the air pump is stronger than you need, bleed off the excess air with a valve. Don't create excess back pressure on pump.

9. Place cover and light on the tank. Commercial tank covers have a plastic strip across the back that can be cut with heavy scissors or tin snips to fit around filters and tubing. Corrugated plastic sign material can also be used, if making your own cover.

10. Voila! You're ready for fish and plants …. Well, sort of, if your tank is CYCLED.

What is Cycling and Why is it Important ?

"Cycling" is what happens when nitrifying bacteria colonize the aquarium and filter media. Nitrifying bacteria live naturally in aquatic habitats and moist soil. There are two main groups of nitrifying bacteria: 1) Nitrosomonas, which oxidizes Ammonia (NH3 and NH4) into Nitrite (NO2); and 2) Nitrobacter, which oxidizes Nitrite (NO2) into Nitrate (NO3). Ammonia is the major waste product that fish and amphibians produce. (Birds and reptiles make uric acid, the white solids in their feces; mammals make urea). Ammonia and Nitrite are toxic to fish at low concentrations, whereas Nitrate doesn’t become toxic until it reaches very high concentrations. So, the populations of each kind of nitrifying bacteria in the aquarium must be sufficient to "consume" Ammonia and Nitrite as they are produced. Unfortunately, nitrifying bacteria are much slower growing than most other bacteria, and it takes several weeks for a new tank to cycle if you're starting from scratch without a pre-cycled filter or some "grunge" from a well-established tank. They need an Ammonia source to grow: fish waste or decaying matter.

In an un-cycled tank with fish, the Ammonia concentration will increase during the first couple weeks until Nitrosomonas activity catches up with Ammonia production. Then Ammonia will decrease while the Nitrite concentration increases. Nitrite will increase for another couple weeks until Nitrobacter activity catches up with Nitrite production. After both groups of nitrifying bacteria have reached equilibrium with the tank's fish population and feeding load, Ammonia and Nitrite concentrations should remain close to zero, and the Nitrate concentration will rise. Nitrate is removed from the aquarium by changing water and by growing plants. Notice in the simplified chemical reaction below that these bacteria consume Oxygen and release Hydrogen (making the water acid) while converting Ammonia to Nitrite and Nitrate.

\[
\text{Ammonia} \quad \text{Nitrite} \quad \text{Nitrate} \\
\text{NH3, NH4+} \quad \to \quad \text{Nitrosomonas} \quad \to \quad \text{NO2--} \quad \to \quad \text{Nitrobacter} \quad \to \quad \text{NO3--}
\]
Nitrifying bacteria can be killed by chlorine, chloramine, hot water, and some medications used to treat fish diseases. They will also die if the filter clogs or stops running and becomes anoxic, or if the media dries out completely. Consider your cycled filter media as a delicate living, breathing organism and treat it with care!!

**Routine Maintenance of Your Native Fish Aquarium**

1. Turn the aquarium light on and off so that it gets about 10 to 14 hours of light per day. A lamp timer can be used, provided the light is self-starting. (Some older fluorescent lights require that you press and hold the start button for few seconds). You can vary the photoperiod to mimic the seasons if you wish. Some fish need seasonal photoperiod variation to induce breeding behavior, but many do not. Varying the photoperiod is not necessary for the fishes’ health.

2. Feed your fish a good varied diet, as much as they will eat within five minutes. If uneaten food remains after ten minutes, you’re feeding too much. Excess food will rot and pollute the water. Feeding twice a day is recommended, especially if fish will not be fed on the weekends (e.g. in a school). Well fed adult fish can be left for 7 to 10 days without food. Baby fish (1” or smaller) should be fed more often, preferably 3 or 4 times a day, and should not be left more than four days without food. Predatory fish that eat large prey may be fed 2 or 3 times per week. Darters, suckers, and killifish require frequent feeding to maintain health, especially during summer.

3. Test pH once a week; pH measures how much free Hydrogen ion (H+) and Hydroxide ion (OH-) are present in the water. If H+ and OH- are equal, then pH = 7.0 or "neutral". If there is more free H+ than OH-, then pH is acidic (less than 7.0). If there is more free OH- than H+, then pH is basic (greater than 7.0). For NC piedmont and mountain fishes the pH should be 6.2 to 7.6. Coastal plain blackwater fishes can tolerate pH less than 5.0 in nature, but such low pH is dangerous in an aquarium because nitrifying bacteria cannot function well. A pH of 5.5 to 7.0 is a good target range for blackwater species. Most aquarium pH test kits cannot measure pH less than 6.0; you would need an electronic pH meter. Aquarium pH will normally decrease after a tank cycles, because the conversion of Ammonia to Nitrite and Nitrate releases acidic H+. Add more aragonite in the filter if the pH is dropping too low.

4. Test Ammonia and Nitrite once a week. These will rise and fall during the first month or two, and should remain near zero after cycling is complete. Reduce feeding if either Ammonia or Nitrite is getting high, and add another filter or media from an established tank if possible. If ammonia or nitrite are detectable AFTER the first two months, then either you’re overfeeding, the filter capacity is insufficient, or something is inhibiting your nitrifying bacteria: too low pH, contaminants, medications, filter clogging, or other causes. Change water if in doubt!

5. Clean the filter and change water periodically. How much and often will depend on your fish load and how heavily you feed them. A tank with many fish or large fish may need service every 1 to 2 weeks; a tank with a few small fish may go 6 to 8 weeks between cleanings. Using bucket and siphon hose, siphon along the bottom to remove debris. Remove 1/3 to 2/3 of the tank volume and replace it with "conditioned" water. Rinse the filter media gently in the old tank water. The media accumulates clots of brown slimy material, a mix of waste and nitrifying
bacteria. Do NOT clean the filter media or filter box too thoroughly - just rinse away the big clots and leave a thin layer of slime on everything - these are the vital bacteria you've been waiting for. Don’t use chlorinated tap water or anything else that could harm these bacteria. If the filter is air-driven, make sure the air tube is unblocked; lime or other deposits may gradually block it and should be removed with a toothpick. If the filter is motor-driven, pull out the impeller and clean it.

6. Watch your fish! Watch how they feed, behave, interact, and how their colors change depending on time of day, mood, and age. The more you watch and understand what normal healthy fish look like, the quicker you will know when something is not right, or when fish are preparing to spawn. Look at their body shape, especially the belly to see if everyone is getting enough food. Some individuals may refuse to eat certain foods, or they may be too intimidated by a dominant fish at feeding time. Some species are naturally slow feeders and cannot compete well with fast-feeding species. Some fish are peaceful until the urge to breed takes over, when the breeders must be moved to their own tank (especially sunfish). Watch out for aggression and intimidation, and be ready to move fish elsewhere if needed. A fish that is routinely stressed by another or cannot get enough food will be more susceptible to disease.

COLLECTING AND ACCLIMATING NATIVE FISHES

Most states allow collecting of non-game fishes with a seine or dipnet with a regular fishing license. Game fish can be legally kept only if caught on hook and line. Check with your state's fish and wildlife agency to determine which fish you can or cannot legally keep. Many native fishes are hardy in aquariums once they're settled in, but are easily stressed during collecting, transporting, and acclimating to aquarium life. Stressed fish may look okay when you get them home, but then sicken and die a few days later. Here are some tips on minimizing collecting stress and easing the transition from stream to aquarium.

**In The Field**

- Fill bucket or cooler only about 1/3 full; frightened fish will jump
- Add salt to collecting bucket: 1 Tablespoon per 2 gallons, or a “bait saver” mix.
- Don't use sea salt for freshwater collecting. It will raise pH, esp in soft acid water.
- Each seine or dipnet haul should last only 5 to 20 seconds. Longer haul times will stress the fish in the net, and also allow time for the fast ones to escape. Short hauls are both more productive and less stressful.
- Transfer fish as quickly as possible from net to bucket or cooler. Transfer using a small aquarium net, or scoop hands gently under and around them. Very small fish can be picked up on a bit of aquatic plant or leaf. NEVER hold any part of a fish between your fingers; the friction damage will cause a skin infection.
- Small fish can overheat in your hand in seconds; have bucket handy BEFORE you pick them up, and DON'T study them in your hand. Use a net IN WATER or plastic bag if you have to examine them up close in the field.
- Plants or water-logged leaves in the bucket will help reduce stress; do NOT put rocks in the bucket.
- Keep invertebrates & amphibians separate from fish, without salt.
- Shrimp and crayfish should have plants, leaves, or twigs to grasp, so they don’t grab onto each other
- Keep container in shade whenever possible. A dark bucket in sun heats up quickly.
- Don't collect in very hot weather; fish are already enduring all the stress they can handle.
- Get new water (and add salt again) for the trip home, and don't overcrowd them.
- Styrofoam boxes are best for travel, as fishes snout and mouth can be damaged in rigid containers.
- The more water the better, for thermal and chemical stability during transport.
- But make sure there's plenty of air space too if container is closed, or use a battery aerator.
• Beware of hot spots on the floor or trunk of your car/truck (above the exhaust pipe).
• If traveling with fish more than one day, bring a pre-cycled filter, air pump, and tap water conditioner.
• Better to get a few fish home healthy than a lot of stressed fish that won't live.

At Home

• If fish are in darkness during transport, they should be exposed to light without any disturbance. Darters especially will go into shock and die if exposed to sudden light and handling. Put closed box where it can be left undisturbed, open lid, and don’t look inside for 10 to 15 min while the fish adjust to light.
• In cold weather, let fish warm up SLOWLY to room temp. A box filter or sponge filter borrowed from a well-established, preferably crowded tank (lots of nitrifying bacteria) will reduce ammonia in the transport box.
• After room temp is reached, transfer fish to permanent aquarium. Discard old stream water.
• For “nervous” fish like pinewoods shiner and darters, put a towel or cardboard around tank for a day or two. This helps them get used to glass walls, and reduces fright whenever someone walks by.
• Feed promptly with live or frozen foods; a good meal reduces stress and replaces lost body salts.
• Watch carefully for signs of disease: scratching, twitching, cloudy eyes, eroding fins -- treat only if needed.
• The most common diseases likely to affect newly-caught freshwater fish are Ichthyophthirius (ick), gill flukes, and Flavobacterium (aka Flexibacter, Columnaris, mouth fungus, tail rot).

Captive Care of Freshwater Fish Families

1) Minnows: examples = crescent shiner, redlip shiner, satinfin shiner, creek chub, bluehead chub, stoneroller, fathead minnow, rosisyde dace, redbelly dace. Some are delicate to collect and transport, especially slender silvery species from open-water areas, like rosefin and pinewoods shiners. Others are very hardy. Nearly all minnows are easy to feed on flakes, pellets and frozen foods. They adapt to dry foods quicker than other fish families, often within minutes after being placed in an aquarium. Some mountain and upper piedmont species need to be kept cool, below 75 F.

2) Suckers: examples = creek chubsucker, black jumprock, northern hog sucker. Slow-feeding bottom feeders with small mouths. Need live worms, chopped earthworms, or frozen bloodworms at first. Some will train to dry foods, some won’t. Require frequent feedings, as they have tiny stomachs and graze constantly. Suckers do not compete well with aggressive-feeding minnows and sunfish. Most grow too large for aquaria, but black jumprock and creek chubsucker stay reasonably small. Safe to keep as scavengers with very small fish.

3) Catfishes: examples = yellow bullhead, snail bullhead, tadpole madtom, margined madtom, channel catfish. Madtoms stay small, bullheads and channel cat grow large. Most are hardy and easy to feed on frozen foods, fish/meat chunks, and cichlid pellets. Sensitive to some parasite medications.

4) Pickerels: examples = redfin pickerel, chain pickerel. Game fish, can be legally kept in NC only if caught on hook and line. Netted fish should be released. Small ones suitable for aquaria, but need live food at first (fish, worms). Some will learn to accept fish or shrimp meat chunks. Despite their large mouth and teeth, they do not compete well against sunfish, bass.

5) Mudminnows: example = eastern mudminnow. Small, hardy, engaging personality. Basically brown, but iridescent highlights when in good condition. Good fish for small tanks, preferably with live plants. Feed live foods at first; will usually train to frozen and meaty foods. Some may eventually take flake and pelleted foods but many will not.
6) Pirate perch & Swampfish: Slow-moving, nocturnal, good for small aquaria with dense plants. Need live foods only, and do not compete well with other faster-feeding fishes. Despite its slow, clumsy behavior, the pirate perch may eat smaller fish at night. For swampfish, use fine sand, leaves, or peat moss on bottom; they get trapped and die in coarse gravel.

7) Livebearers: examples = eastern mosquitofish (Gambusia), least mosquitofish (Heterandria). Gambusia is hardy and easy to feed all foods, but aggressive, a fin-nipper. Marbled color variant occurs from Wilmington area southward. Other NC piedmont and coastal populations are the normal olive-gray unspotted variety. Heterandria, called "Least Killfish" (but NOT a killfish), is peaceful, tiny, more colorful, and equally hardy. Occurs from Wilmington southward to Florida along coastal plain. Sailfin molly occurs in brackish water.

8) Killifishes: examples = lined killfish (coastal plain), speckled killfish (piedmont). Susceptible to infections during collecting & acclimation, but hardy and easy to feed once established. Start on live or frozen foods; most quickly adapt to floating dry foods. Require frequent feeding to maintain health.

9) Pygmy Sunfishes: examples = banded pygmy sunfish, Everglades pygmy sunfish. Max size is 1.5 inch, suitable for very small tanks & bowls with dense live plants. Needs live foods to start, some will adapt to frozen bloodworms, mosquito larvae & brine shrimp. Feed small amounts frequently; does not compete well with faster feeding fishes. Fascinating breeding behaviors and beautiful iridescent colors (males).

10) Small Sunfishes: examples = blackbanded sunfish, banded sunfish, bluespotted sunfish. Excellent aquarium fish, max size 3 inches. Found mainly in acidic blackwater, but adapt well to neutral, clear water. Start on live or frozen foods; most will eventually accept baby cichlid pellets, especially if soaked in thawed brine shrimp. Watch out for aggression, & subordinate fish not getting enough food (like cichlids).

11) Larger Sunfish and Bass: examples = bluegill, pumpkinseed, redbreast, warmouth, flier, crappie, rock bass, largemouth bass. Game fish, can be legally kept in NC only if caught on hook and line. Netted fish should be released. Small ones suitable for aquaria, can be purchased from commercial fish farms. Wild fish may need live food at first (worms), but quickly adapt to fish/shrimp chunks, frozen foods, and pellets.

12) Darters and Sculpins: examples = tesselated darter, johnny darter, swamp darter, Roanoke darter, seagreen darter, gilt darter, greenside darter, mottled sculpin. Some darters stress easily during collecting; keep dark if possible, and expose slowly to light once they're home. Rapid change from dark to bright light may kill them. Need live food, worms to start. Most will adapt to frozen foods & fresh shrimp chunks, but some continue to demand live food. Some mountain and upper piedmont darters (and all sculpins) need to be kept cool, below 75 F. Warning: sculpins can swallow fish 2/3 their own length!

13) Bowfin and Gar: These grow very large; suitable for aquaria when young. Require live foods at first, but most will adapt to frozen foods, occasionally pellet foods. Make sure you have a plan for disposing of adults before you take home babies! It is better NOT to release fish held in captivity; they might carry diseases not present in the stream where you intend to release them.

14) Silversides: examples = brook silverside, inland silverside. Delicate, stress easily and susceptible to infections during collecting & acclimation. Cover sides of aquarium for the first two weeks; they have trouble adapting to confinement and corners, and may injure themselves against the glass. (Small ones adapt better than large ones). Reasonably hardy and easy to feed once established. Start on live or frozen foods; most quickly adapt to floating dry foods. Require frequent feeding to maintain health.

15) Gobies: Primarily brackish and marine, but a few species occur in tidal freshwaters. Use 1 teasp salt per gallon for “freshwater” gobies. Require live foods at first, but most will adapt to frozen foods, occasionally flake and pellet foods. Most remain small enough to keep in 10 to 20 gal brackish or marine tanks.
16) American Eel: Minimum size allowed by NC fishing regs is 6 inches. Keep tightly covered or they will escape from coolers and aquaria. Feed live worms and fresh shrimp chunks at first; most will adapt to frozen foods, some will take pellet foods.

17) Other Families Not Recommended for Home Aquaria: Lampreys, Sturgeon, Paddlefish, Mooneye, Anchovies, Shad, Herring, Trout. These species require special water conditions, foods, or tank set-ups, better left for public aquariums. Some require round or oval tanks with circular current and no corners. Some are also NC protected species.

**Websites**
North American Native Fishes Association, NANFA: [www.nanfa.org](http://www.nanfa.org)

Raleigh Aquarium Society, RAS  [www.raleighaquariumsociety.com](http://www.raleighaquariumsociety.com)
RAS Yahoo Group: [http://groups.yahoo.com/group/raleighaquariumsociety/](http://groups.yahoo.com/group/raleighaquariumsociety/)

Southeastern Fishes Council: [http://www.flmnh.ufl.edu/fish/organizations/sfc/SFCart.htm](http://www.flmnh.ufl.edu/fish/organizations/sfc/SFCart.htm)
(a professional org dedicated to fish habitat conservation & advocacy in the southeast)

(hatchery for propagation and research of endangered and threatened fish species)

Responsible Fish & Pond Keeping - Habitattitude: [http://www.habitattitude.net/](http://www.habitattitude.net/)

NC Wildlife Resources Commission:  [www.ncwildlife.org/](http://www.ncwildlife.org/)
Fishing Licenses & Regulations: [http://www.ncwildlife.org/fs_index_03_fishing.htm](http://www.ncwildlife.org/fs_index_03_fishing.htm)

Protected Species Info:  [http://www.ncwildlife.org/fs_index_07_conservation.htm](http://www.ncwildlife.org/fs_index_07_conservation.htm)
NC Crayfish: [http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/nccrayfishes/index.html](http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/nccrayfishes/index.html)

NC Div.Water Quality, Biological Assessment Unit:  [http://www.esb.enr.state.nc.us/BAU.html](http://www.esb.enr.state.nc.us/BAU.html)
Includes links to Excel spreadsheet of Fish Species by River Basin, and DWQ fish sampling data: [http://www.esb.enr.state.nc.us/NCIBI.htm](http://www.esb.enr.state.nc.us/NCIBI.htm)


(check where stream flows are running high or low)