

## Attachment 1 Food Web Activity Student Sheet



**Shad in the Schools, N.C.**

### **Background Information:**

The coastal rivers and shallow marine environments along the coast of North Carolina are home to complex ecosystems. Within these freshwater and saltwater ecosystems there is an intimate relationship between many different producers and consumers. These producers and consumers create an interconnected food web. Each organism is dependent on clean water, oxygen, and healthy riparian corridors on the lands adjacent to these waters. The disruption of just one component of any food web can disturb all living things, including humans.

American shad, a member of the herring family, is one species of fish that plays a critical role in the river and near shore shallow marine ecosystems of North Carolina. Shad are an **anadromous** species, meaning they live in the ocean but return to the rivers of North Carolina in the spring to **spawn**, or reproduce, each spring. This means that shad serve as a food source for many animals living in both inland freshwater and marine environments. Predators of shad include other fishes such as striped bass and king mackerel, bald eagles, bottlenose dolphin, and humans.

Bald eagles have evolved to raise their young at the same time that anadromous fishes, such as shad, return to the rivers to spawn so that the young eaglets will have a plentiful food source. This evolutionary trait highlights the connectivity that can be found within food webs. Bald Eagles can be viewed now through a new technology, web cams. To see eagles that feed on herring near North Carolina, view <http://www.friendsofblackwater.org/camhtm2.html>.

Scientists have learned through observation that American shad have great hearing. And, this helps them elude one of their greatest threats – Dolphins. They believe that this is possible through a unique swim bladder that allows them to better interpret the clicks that dolphins use to hunt for food.

**Overfishing and building dams** along rivers can drastically change an aquatic ecosystem and can negatively impact many populations of fish species dependent on the river. The species particularly impacted by dams are anadromous fishes such as shad, herring, and striped bass. The decreased numbers of these types of fishes in the rivers negatively affects the food chain and can have a domino effect throughout the ecosystem.

Water **pollution** is another threat to the natural balance of the river and near shore marine ecosystems. Fishes, aquatic plants, and aquatic insects, which serve as the base of the food chain, are the first to be impacted by water pollution. **Sediment**, one of the most common sources of pollution in N.C., such as dirt runoff in urban areas, can clog the gills of fishes and aquatic insects killing them. Polluting nutrients, like nitrites and nitrates found in fertilizer, can concentrate in aquatic habitats and cause algal blooms which cover the surface of the water and block sunlight from underwater plants. Without sunlight, the plants die. The loss of plants in aquatic ecosystems reduces hiding places for organisms and the **decomposing** plants in combination with the algae consuming oxygen, reduces oxygen levels needed to sustain fishes and aquatic insects.

To counteract the effects of pollution, overfishing, and dam building on the shad populations in North Carolina the U.S. Fish and Wildlife Service and the N.C. Wildlife Resources Commission have joined efforts in a shad restoration project. Biologists are raising and releasing juvenile American shad into the Roanoke River in an effort to restock the river, which is part of their historical range.

**Directions:**

1. Read the article, “American Shad” profile (Attachment 2). As a group discuss and summarize what your group learned about shad. Answer the question: What three factors have contributed to the decline of American shad populations in North Carolina?

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2. Read the “Profile of a Biologist” (Attachment 3) about biologist Mike Wicker and his work with restoring American shad in North Carolina. Discuss this article with your group. Answer the following questions on the profile:

1. Why is the calculation of stream flow important in restoring American shad?
2. What major human activity, that has caused a decrease in shad numbers, is being worked on by biologist Mike Wicker and a team of other fisheries professionals?

3. Cut out the “Near Shore Food Web Cards”. Work with your groups and use the cards to create a food web focused on shad. Refer to the diet descriptions of each organism listed on the back of the cards for help. Glue each organism into its place in the food web on a larger sheet of paper. Draw arrows to show the flow of energy in the web. Write the names of all members of your group on the food web posters.

**Questions on the food web for discussion:**

1. What animal that preys upon American shad can be detected by the shad’s unusual swim bladder?
2. What type of plankton is most targeted by juvenile shad?
3. How can increasing juvenile shad numbers affect the other animals in the same ecosystem? Be specific.
4. How can increasing juvenile shad numbers impact the food supply for humans?