

### **Coastal development scenarios paper slips for Game 3.**

*Increased fishing pressure:* Your group is in charge of managing the recreational red drum fishery for your state's Fish County. Studies show that the population of your state's coastal counties is expected to increase by over 50% by 2030. With this increase, wildlife managers expect an increase in recreational fishermen, as well. To represent this increase in fishing, each person in your group will double the amount of fish he or she catches at the end of each season (e.g., if your group catches 10 fish, then remove 20 [ $10 \times 2$ ] fish from your group's population at the end of the season). As a group, use one or more of the management tools to prevent overharvest due to this increase in fishing pressure.

*Toxic algal bloom:* Your group manages the recreational red drum fishery for Fish County in a middle Atlantic state. The population of Fish County has been steadily increasing for the last 50 years. This has resulted in increasing amounts of nutrients (i.e., nitrogen, phosphorus) entering coastal waters from fertilizers and sewage. These nutrients run off into coastal waters from multiple inland sources—a phenomenon known as *nonpoint source pollution*. The increased nutrients in the water have resulted in a bloom of the toxic dinoflagellate (plankton) *Karlodinium veneficum*, leading to fish kills in your area from karlotoxin. In addition, when all of the plankton died, the bacteria that decomposed them used up enormous amounts of oxygen in the water—leading to even more fish deaths as the fish suffocated due to lack of oxygen. To represent this fish kill, your group will remove 40 additional fish from your total population for season 1 only. As a group, use one or more of the management tools to combat this fish kill and prevent the red drum population from crashing.

*Blackened redfish craze:* The citizens of your coastal county have decided to revive the famous blackened redfish dish that caught southern restaurants by storm in the 1980s. As a result, many more recreational fishermen are targeting red drum in hopes of making the dish themselves! To represent this increase in fishing, each person in your group will double the amount of fish he or she catches at the end of each season (e.g., if your group catches 10 fish, then remove 20 [ $10 \times 2$ ] fish from your group's population at the end of the season). As a group, use one or more of the management tools to prevent overharvest due to this increase in fishing pressure.

*Habitat destruction:* A construction company just built a brand new housing development on one of your county's salt marshes, destroying 75% of the estuary habitat that juvenile red drum depend on. As a result, fewer young-of-the-year (YOY) are surviving and entering the total red drum population each season. To represent this decrease in survival, your red drum population cannot produce any YOY for any season (i.e., births = 0 for all seasons). As a group, use one or more of the management tools to prevent the population from crashing.

*Point-source pollution:* A new factory has started operating several hundred miles up the Pretty River, dumping toxic waste into the river and eventually spilling into the estuaries on your coast. This is an example of point-source pollution because the polluting source can be pinpointed to a single location (i.e., the factory's waste pipes). The toxic waste in the estuary is causing disease in red drum, and increased death for the entire population. To represent these deaths, remove an additional 10 red drum from your population at the end of each season. As a group, use one or more of the management tools to prevent the population from crashing.