Ecological Research – Some ethical scenarios

These research scenarios are based, at least in part, on actual experiments performed in the field. Briefly outline your initial "gut" reactions to these studies. What are the positive *scientific* outcomes of such experiments? The negative ones? What are the positive *ethical* outcomes of such experiments? The negative ones? Are scientific and ethical outcomes separate in terms of their moral standing, in your opinion, or are they parts of the same moral framework? Apart from these studies, can you think of other scientific studies you have read that made you stop and think, "hmmmm...was that okay to do?" Why or why not?

1) You are studying a fundamental question in ecology: the extent to which populations are regulated by intraspecific competition with neighbors. For several years, you have been studying dozens of black-throated blue warblers in plots in New Hampshire that were previously heavily logged (ideal habitat for these common birds). You conduct an experiment to experimentally reduce potential competition, by reducing population sizes within specific territories of the warbler. In two consecutive years, you shoot all black-throated blue warblers except one focal nesting pair in each of 12 territories. The number of birds culled amount to about 120 over the two years. In 12 other territories, population densities of conspecific nesting pairs are left the same. You find that the number of young fledged per territory, territory size, and the proportion of time males spent foraging are significantly greater on territories around which neighbor density was experimentally reduced compared to control territories, and this effect is particularly significant in El Niño years, when food resources are scarce.

2) In order to conserve and manage rare plant populations, we need to understand the nature of threats that contribute to population decline. One of the major hypothesized threats are invasive plant species, which can spread rapidly and competitively exclude rare plants. You devise an experiment involving six small populations of the rare plant, *Sabatia kennedyana* (Plymouth gentian), which is recorded from 10 populations in coastal dune slacks of Cape Cod. In two of the populations, you remove the invasive species, *Phragmites australis*, that is becoming dominant in the dune slack. Two other populations are left with *Phragmites* still present. You also study two additional populations of *Sabatia*, which are uninvaded, to understand performance of the plants without the invader present. During your three-year monitoring period, the two invaded populations decline to 5% of their original numbers of *Sabatia*, while no increase in *Sabatia* cover is noted in the removal plots. One of the two "control" uninvaded *Sabatia* populations remains stable, while the other declines to 20% cover as the native cranberry, *Vaccinium macrocarpon*, becomes dominant on one dune slack.

3) Island biogeography theory posits that the species richness of islands is inversely proportional to the distance from the mainland (pool of potentially colonizing species). To test this theory, you completely remove the arthropod fauna of six mangrove islands that occur at varying distances from the Florida mainland. You cover the islands with sheeting and fumigate them with methyl bromide to kill all associated insects and other invertebrates on the mangroves. You monitor recolonization of arthropods for several years on all six islands. All but one of the islands recover levels of species richness that approach pre-treatment levels, although the species composition has changed. The sixth, most distant island does not recover to pre-treatment levels after five years.

4) How do nutrient levels influence trophic relationships in whole ecosystems? In order to answer this questionand document trophic cascades definitively for the first time, you add nitrogen and phosphorus to four lakes with contrasting food webs and monitor the responses of zooplankton, pelagic primary producers, planktonic bacteria, and CO_2 exchange with the atmosphere over the next seven years. The lakes were previously unfished, unstocked, and largely unvisited by humans. Lake food webs differed in their responses to nutrient amendment, depending on the initial relative compositions of the trophic levels, but all showed significant alterations in species composition, particularly of fish. All lakes initially increased the release of carbon dioxide to the atmosphere as bacterial activity spiked, while one eventually became a carbon sink as algae bloomed. Grazers became dominant in this lake, capitalizing on increased availability of plants to eat. After seven years, food webs in the nutrient-enriched lakes were simplified relative to a reference (intact control) lake.