A DECEITFUL SPRING AND CRAFTY OSPREY
Public Policy Formation And Its Environmental Consequences

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"*What we observe is not nature itself, but nature exposed to our method of questioning.*"
Werner Heisenberg -- 1958

Creeping in on the failing winds of drought, a moderately wet spring teasingly greened the parched hills of California's rolling Coast Range this year. Beginning in mid-February, long-absent rain finally swept in with a series of Alaskan cold fronts that continued through most of March. Then, it ended. The fronts decamped to the north and by May the hills soon shouldered their summer-brown mantels. Briefly streams ran full, and for watersheds fortuitously near the coast, lakes filled and tardy wildflowers bloomed along their shores. It was a deceitful spring wedged into an aberrantly enduring siege of dryness.

Coast Range Spring 2014 – Photo © S. C. Bachus

But it *was* spring, and as it does with this season of promise every year, in early April my fishing rod seemed to jump of its own volition into my outstretched hand. Not to deny its desire to be out on the water, I put the well-used old rod into my truck along with the rest of my fishing gear and drove to a little lake about an hour north of my San Francisco home. As I passed over the divide that coaxes the region's rainfall either eastward into San Francisco Bay or westward to the Pacific Ocean, I could see the lake a short distance off, resting full and surprisingly clear in the narrow arms of its watershed. I drove the truck to the back end of the lake, tightened a reel on to the fishing rod, and walked through mixed pine and oak trees to the shoreline of a narrow inlet, deserted except for two sentinel ravens.

The ravens protested a bit as I invaded their territory but then became silent as I worked my way out to a rocky point still obscured in a morning mist of shadows that seemed to mute the lake of both sound and color. There were no insects flying above or caught on the mirrored surface of the water, so I decided to tie on a little weighted streamer fly that might dredge up a fish or two from the deeper water just off the shore. Struggling to get the tiny fly tied on to an equally microscopic leader, my concentration was broken by the

ravens who at that exact moment decided to return to their incessant clamor – only this time they seemed really upset with me. I thought to myself, hey, if they don't think that little streamer is a good fly, at the least they could tell me with a bit more courtesy.

Then, between the shrill *caws* and *cawks* of the ravens, I heard a periodic *chirping* -- a sound which has become increasingly familiar to anglers fishing Coast Range lakes and reservoirs. Reflexively I looked up and there, high in the now brightening sky, was an osprey circling above the tall firs of the inlet. Banking his turns with subtle changes in a magnificent six foot wingspan, he descended down until he was no more than fifty feet above the water. More chirping announced the arrival of yet two additional ospreys, who then fell into evenly spaced intervals in the same orbit as the first bird, their wings beating a muffled cadence in the quiet morning air. Living up to their reputation as notoriously intelligent birds, the ravens departed silently without proclamation.

The ospreys' sudden appearance didn't make any sense. Typically, ospreys gather to prey on trout brought to the surface by aquatic insect hatches. In an often repeated spring drama, maturing mayflies emerge from their watery nurseries, break through the surface, fly into the air, mate, and die. This brief tragedy – a brief tragedy, at least from the mayflies' point of view – brings trout up from the deeper lake water to feed on the mayflies, either as they helplessly wiggle out of their larval shells, hang in limbo on the water's surface drying out their newly unfolded wings, or as they lustfully rise in flight to search for a mate. Trout, being the predators that they are, opportunistically feast on the mayflies – slashing at the larval nymphs as they rise to the glassy surface, gulping them down as they hang drying their new wings on that aqueous lens, or grabbing them with well timed jumps as the adult insects become airborne. Equally opportunistic, the ospreys feast on the feeding trout.

Osprey (*Pandion haliaetus*) with Fish – Photo by Suzanne Bean © 2014

But again, the ospreys' sudden appearance simply did not compute. The sun was just breaking over the far ridgeline, and the temperature remained a bit too cold for an insect hatch. Fifty years out on the water with a fishing rod had taught me that little secret, and the ospreys knew it as well. Predators don't waste energy – they feed only when

the probability of success is greatest. So, what were those three big raptors doing out there flying circles above the inlet for the last ten minutes?

My question was soon answered as the lake's stillness was assaulted by yet another sound. It was a truck engine, laboring in low gear, as it powered a heavy load up the same grade I had ascended earlier in the morning. The truck came into view as it cleared the summit. It was a tanker, gleaming governmental white in the morning sun. As it got nearer to the head of the inlet, I could see gleaming on the driver's door the very official emblem of the California Department of Fish and Wildlife. Mounted on the truck's bed was the cause of its labors up the grade – an aerated tank containing 1,000 pounds of hatchery trout, soon to be liberated into the lake for a new but probably very short life.

The ospreys were now chirping insanely. The truck driver connected a long pipe to the tank and positioned it over the water. He turned a valve and a stream of fish flowed into the lake. With the force of a canon ball, the lead osprey closest to the truck hit the water at just about the same moment the first trout did. For my feathered fishing companions, the DFW hatchery truck represented a truly movable feast. But what remains so astounding, is that those big crafty raptors were at the feast table a full ten minutes before their meal was served.

Yet, maybe the ospreys' early arrival, if not reflecting good dinner party manners, had a reasonable explanation. I remember fishing many years ago with an old angler who, although recently having come to a new home in California, learned his craft in the northern lakes of Wisconsin. We were out on little foothill reservoir when an osprey flew overhead and began a circular patrol of the cove for trout. My companion looked up with an experienced eye and said, "Hey, look there good buddy, you betcha that be one smart bird." And the old angler was indeed accurate in his assessment – smart humans and smart raptors survive by learning from experience. Those three ospreys that had just enlivened my morning's fishing had learned that the singular sight and sound of a white tanker truck ascending the watershed grade meant food was to be available both soon and copiously.

Learned behavior, or as many biologists and behavioral scientists refer to it, is adaptive behavior. It is acquired in the natural of world of the osprey only through the repetitive experience of first hearing that DFW truck coming up the summit, and then being rewarded by a meal of fat, hatchery trout. The operative words here are *repetitive* and *adaptive*. Biologists would likewise theorize that the ospreys have probably *adapted* their feeding behavior to the *repetitive* stocking of the lake with hatchery trout. Furthermore, if this behavior pattern persists over several generations, it might have survival consequences not only for the ospreys but also for other species sharing their environment.

Historically, prevalent during the 19th century, by the mid-20th century the appearance of ospreys around lakes in the San Francisco bay area was a rare occasion. However, by the late 1970s two events occurred. First, in response to a growing angler population

the California Fish and Wildlife Commission opened most of the state's lakes and reservoirs to year-round trout fishing. Previously, these waters were open to fishing only from the last Saturday in April to the second Saturday in November. In contrast for most of California's Coast Range anglers, the really good fishing occurred only from opening day to early June, and then again from the beginning of October to the end of the season in November. Local anglers knew the reason for this – it was simple, trout survive best in cold water, usually not much higher than 60 degrees (F). However, given the region's Mediterranean summer, lake surface temperatures, i.e., the upper 10 to 15 feet of the water column, warm up to well over 70 degrees (F) from early June well through most of September. As a result, the truckloads of hatchery trout that were planted in the lakes in April and May went down into the deep and colder water where they stayed until the lakes, as the anglers would say, "turned over" with the end of Indian summer in the fall.

However, the advent of year-round lake fishing changed the rules of the game – both to the benefit directly of California anglers, and indirectly to their fishing companions, the ospreys. The lakes were now open to fishing during the colder fall, winter and early spring months -- a period in which trout fed in far shallower water and thus became eminently more available to anglers willing to endure a bit of frost, or the cold winds of an arriving Pacific weather front. Recognizing this change, the Fish and Wildlife Commission made a second strategically important decision by implementing a program of scheduled trout plantings from early October to early June, based on prevailing local water temperatures. As a result, by the 1980s many Coast Range lakes and reservoirs were receiving as much as 1,500 pounds of hatchery trout on a bi-weekly basis.

And then by the late 1980s -- surprise of surprises -- with the new planting program running at full throttle local bird watchers and naturalists were suddenly and ecstatically reporting increased sightings of what had for many decades been the rarely observed ospreys. Because the hatchery trout were being planted during the colder winter months, they were also being planted at a time in which predator food resources generally tend to be leaner. For ospreys, winter foraging under natural conditions, i.e., without the artificial supplement of planted hatchery-bred fish, tends to be more difficult than in the late spring and summer months. Many warm water species typically preyed upon by the ospreys, such as bass and sunfish, retreat to the warmer, deeper water of most lakes and reservoirs. This is because, during the winter deeper lakes turn over or invert their temperature levels, so that by mid-winter the deeper water is actually warmer than the water on the surface.

With warm water fish lethargically enduring the winter at deeper water levels, and plagued by increased water turbidity as a result of winter rains, foraging at Coast Range lakes and reservoirs was not a factor in the osprey's natural cost-benefit feeding equation. Biologists have found that ospreys generally are successful in catching fish in a range of 25% to 75% of all dives made. Likewise, they typically will forage within a six mile radius of their roosting area, although during mating season, foraging distances may increase to about 15 miles from nesting sites. In short, the expended energy costs of getting to distant lakes and reservoirs, and the low success rate of dives targeting

deep water fish, greatly outweighed the benefits of the infrequently obtained protein and calories necessary for the birds' winter survival.

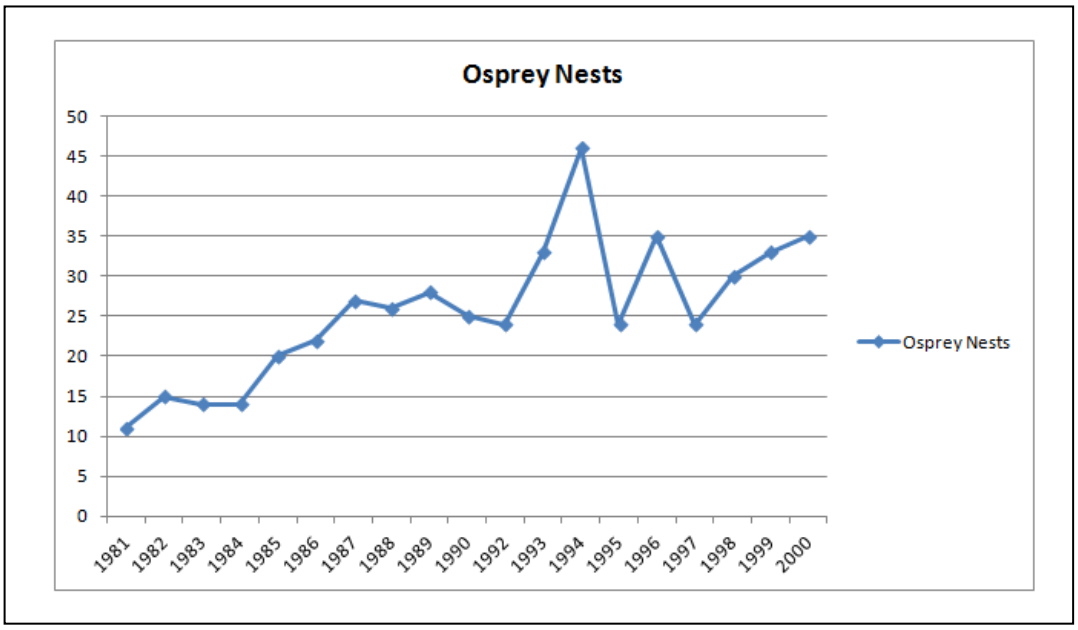
Interestingly, another consideration impacting the ospreys' foraging behavior is the size of their prey. Most biologists agree that nearly 99% of the ospreys' optimally targeted prey are medium-sized fish ranging in size from approximately 15 cm to a maximum of 35 cm – i.e., 6 to 14 inches. There is little doubt that these numbers likely will sound familiar to California trout anglers, as they represent precisely the size range of the trout that pour out the back of Department of Fish and Wildlife hatchery trucks.

So, as the 20th century came to a close, California's coastal ospreys indeed found themselves in a new land of milk and honey. Every two weeks as their food supply diminished, it was replenished with precisely the right-sized morsels – especially during the barren winter months when they needed sustenance most. And, from October through May that food continued to arrive, carried on those strange sounding white objects that lumbered up the steep hills of the local watershed. Not missing a good bet, the ospreys came to stay, and like their Bay Area human neighbors, set up housekeeping in the local, although admittedly more rural, suburbs. Actually, the lake I was fishing when the hatchery truck arrived is the second in a chain of four reservoirs strung down the watershed. The fourth lake at the bottom of chain is the largest, having its capacity increased from 16,600 to 33,000 acre-feet in 1982. Although the largest, it is also the most remote, and given its seclusion, the ospreys have established a thriving nesting colony there.

Osprey Nest – Photo © Sheldon Bachus 2003

A 2012 study by Avocet Research Associates (ARA) shows that the colony is quite stable and supports between 24 and 46 active nests annually. As one might surmise, given the foraging conditions, the average annual osprey chick survival rate is high at 1.4 chicks per nest. This is sufficiently in excess of the 0.8–1.3 survival rate considered necessary to establish a sustained, viable population. When the reservoir's capacity was increased in 1982, a decision was made not to remove redwood and fir trees from the lake's tributary arms. As the trees died from the rising waters, they released added

nutrients to the aquatic food chain, and as the resulting snags dried and bleached out over the years, they became nesting platforms for the ospreys. The ARA study found that, either because of availability or choice, the ospreys placed only 29% of their nests in the dead trees or snags. However, and most importantly, the ARA study also demonstrated that, consistent with the observations made by local trout anglers, the overall osprey population grew significantly in parallel with the increased and scheduled planting of hatchery trout during the last two decades of the previous century:



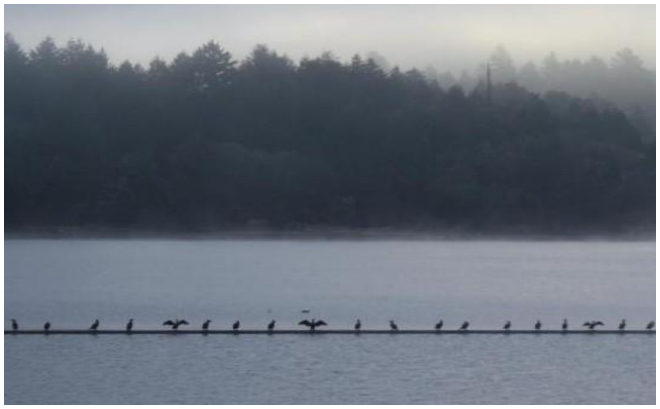
Statisticians are, of course, quick to advise that correlation does not necessarily imply causality – i.e., the osprey population of the watershed *per force* increased because of a correlative increase in the planting of hatchery trout. But intuitively most anglers, and probably a fair number of biologists are, by the evidence available, compelled to believe that the augmented and consistently scheduled planting of DFW hatchery trout was indeed beneficial to the local osprey colony's long-term growth and sustainability. I became aware of this, and its impact on the environment generally, about a decade ago when I hiked into the lower watershed to view the osprey nests for the first time. As I left my truck in the early morning, the weather was bright and clear. But, as I worked my way down the desolate canyon toward the colony, a quickly moving Pacific front came in and painted the sky gray with high cirrus ice clouds. The clouds provided a perfect backdrop for the little drama I was about to witness when I got to the lake and spotted the first osprey nest.

Located near the middle of one of the lake's tributary inlets, the nest was perched about 40 feet up on a weathered old snag. An apparently jumbled pile of broken limbs and sticks, the nest was easily 5 feet in diameter. It appeared unoccupied, but I thought I saw a small head occasionally peering over its top-most branches, so I sat down behind a bit of cover and waited to see if the mother bird would return to her fledglings. After about 10 minutes, my wait was rewarded with the distinctive chirps of an osprey flying

up the inlet. She had just turned into the inlet's mouth from the main stem of the lake, which was a little more than a quarter mile across open water from the nest.

To this day I still don't know why I turned my head to look in the opposite direction back up the canyon at the head of the inlet, but there silhouetted in sharp relief against the incoming storm clouds was, what I believed to be, another osprey. It must, I thought, be the osprey family's father. The bird dropped below the canyon walls, and became a silent black shadow that seemed to accelerate as it approached the nest. At the speed it was going it was clearly going to overshoot the nest, but then at the last minute, when it was directly opposite my vantage point on the far shore, its wings flared into a rigid foil. The bird literally stopped in mid-air, dropped into the tangled rim of the nest, and then lifted itself back into flight with a screaming osprey chick in its talons. The bird that I initially thought was the osprey father provided me with my first and very memorable view of an American bald eagle.

The eagle quickly gained elevation as it accelerated down the inlet. Then, in one of those this-should-be-very-interesting moments, I realized that the eagle was on a collision course with the incoming osprey mother. Although the eagle's white mantle marked him as an adult bird, his size seemed a bit small and, if not a juvenile, he clearly seemed to lack well honed hunting skills -- otherwise he would have seen the mother osprey on his approach to the nest. With what seemed just seconds to spare, the eagle must have spotted her, for with a U-turn that would be the envy of any urban taxicab driver, he reversed direction back up the inlet, and with the osprey chick still firmly grasped in his talons, disappeared into the grayness of the incoming storm. The mother osprey continued on her original course, and deposited a still squirming trout into what was probably an empty nest.



Cormorants Waiting for More Than Godot
Photo © S. C.Bachus 2013

Both golden and bald eagle sightings were increasingly reported throughout the watershed during the ensuing decade, and by 2012 the ARA study reported the presence of a bald eagle nest actively occupied for five consecutive breeding seasons. Although anecdotal observations by both anglers and naturalists indicate that bald eagles will both knock captured fish from an osprey's talons as well as rob chicks from their nests, the 2012 study concludes that there is no clear evidence that the watershed osprey population's growth was dampened by the appearance of the bald eagles on a permanent basis. What is clear, however, is that over the years rare bird species are now calling the watershed home. Not only have ospreys, golden eagles and bald eagles appeared in greater numbers, so too have other species of which the double crested cormorant has

become, for watershed anglers, a truly notorious if not detested bird. Living up to their name, which literally means “sea crow”, the cormorants have cleverly learned as have the ospreys to time their foraging with the scheduled arrival of DFW hatchery trucks. Unlike ospreys, however, the gregarious cormorants will congregate in large numbers and feed voraciously on the planted fish, sometimes working a school of trout in teams of four or five birds.

Several millennia ago, well before the advent of hatchery trout and their planting in public waters, Aristotle advised us that nature abhors a vacuum. There is a contemporary corollary to that ancient proposition. Specifically, policy decisions impacting the natural world do not occur in a vacuum. In this context *the enactment of a public policy establishing year-round trout angling, supported by an expanded hatchery program, in all probability has substantially altered predator food chains in local watersheds and their surrounding environments*. Increased numbers of osprey and cormorants have come to feed on the trout. With them have also come bald eagles accompanied by other predators, all of whose foraging menus are not necessarily limited to fish. If a bald eagle shows sufficient *chutzpah* to pluck an osprey chick out of its nest, then what is to prevent that bird from doing the same thing to heron and egret chicks similarly nesting in tall redwood and fir trees immediately over the nearest ridge?

Public policy decisions impacting the natural world carry with them the seeds of unintended consequences. There are, however, ways to diminish the risk of negative outcomes. For example the German physicist, Werner Heisenberg, suggests that it’s not how we observe nature that’s important, but more a matter of the nature of the questions we ask. What Heisenberg requests of us – whether one is a Nobel scientist or simply an angler fishing a springtime lake – is to remember that we humans are all part of the same picture. We are not just looking at that picture. For better or worse, we are in it. Beyond the protocols of science, a failure to recognize this courts calamity. In forming public policy we must somehow anticipate the consequences of our actions. Contingent upon this responsibility is the survival of many species, including quite possibly our own.