

## The Environmental Change and Conflict Over Commercial Fishing in Nineteenth-Century Delaware

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The growth of capitalism has been the greatest force for environmental change in America, but how to cast this story remains elusive. Can this transformation be reduced to the tale of a single vast mode of production -- Donald Worster's agroecological model - writ large through American history? Or could this transformation, as William Cronon and others suggest, be better understood from social history's "bottom up" perspective? Such an approach could resurrect individual action and crucial local contexts from otherwise faceless and monolithic modes of production. Looking at capitalism from the "bottom up" can also answer new and even more tantalizing questions. For example, now that we know the transformative power of capitalist agriculture from sixteenth-century New England to the 1930s Dust Bowl, how aware were Americans of the environmental changes they were creating?'

Such questions of causality and intent are central to environmental history, and as Cronon suggests, will be answered first in local studies. This work is an unrepentantly local study of one man and one river through an extraordinary period of social and economic change, the capitalist transformation of the new United States after the American Revolution. The man was Judge Richard Cooper, a crusty, cantankerous justice of the Delaware Supreme Court. The river was the St. Jones, twenty miles of broad, shallow tidal river meandering through central Delaware from the state capitol in Dover to the Delaware Bay and Atlantic Ocean six miles away (see Figure 1). Both man and river were products of a small, intimate state where local conditions and personalities loomed large.

Trouble began in the spring of 1816 when Judge Cooper built a weir, a fish trap, across the St. Jones River to catch migrating shad and herring. He intended to sell his catch in Dover and throughout the region. Angry that Cooper's weir could catch every fish in the river, a group of irate neighbors marched onto his property and demanded he dismantle his trap. Harsh words ensued, and Judge Cooper aimed a swivel gun he had mounted on his fish weir into the crowd. They backed down and Cooper held his fire. Undeterred, his neighbors immediately marched two miles north to the capitol where they lodged a formal-and informative-complaint with the state legislature.<sup>2</sup>

This formal complaint and the dozens of petitions and counter-petitions that followed chronicled a growing and increasingly sophisticated awareness of environmental change. This understanding matured as people struggled to reform agriculture and faced increasingly volatile markets. Men such as Judge Cooper scrutinized their farms and forests for new opportunities with unparalleled vigor. Each opportunity came at a price. Tenants, laborers, and other landless people lost valuable privileges, especially traditional rights to fish and graze common land. Hard times and a prickly republican sensitivity to liberty and equality under the law kept both sides in court. By 1820, ample evidence of a growing awareness of environmental change reached every level of Delaware society. Rather than alienating people from nature, capitalism made people more aware of their environment than ever before.

Colonial Delaware was well suited to commercial agriculture. At the center of the Middle Atlantic colonies, Delaware straddled east-west trade routes between the Chesapeake and Delaware Bays and north-south trade routes from New England to the Caribbean. Central Delaware was first settled in the 1630s, but only in 1680s that large numbers of Dutch and English settlers began carving farms out of the fertile, sandy soils and the thick oak and gum forests of the lower Atlantic Coastal Plain. These farms supplied the growing markets of Philadelphia, New York, and Baltimore. As early as 1762, merchants from central Delaware could travel by boat to Philadelphia, conduct their business, and return home in the same day. The grain, timber, and livestock shipped through this and other colonial ports found their way to customers throughout the Americas, Europe, and the Caribbean. As a result, almost twenty thousand people lived in central Delaware by 1800.<sup>3</sup>

Trade encouraged competition, and by 1804, the average farm in central Delaware was less than half the size of farms only forty years earlier. Land prices were high, and only four in ten families owned land. The rest lived as tenants on rented land. Delaware's prosperous colonial economy kept labor dear and wages high. Landlords courted tenants, allowing many to work some of the best land in the state. Archaeological evidence indicates that landowners and tenants worked farms nearly identical in fertility, access to transportation, distance from town, and other important features. The best farms had the region's most fertile soils, a series of fine-grained, sandy foams known locally as "sassafras" soils. These soils were especially well suited to corn, wheat, and other small grains. By 1805, American geographer Jedidiah Morse could boast that Delaware wheat grew "in such perfection as not only to be particularly sought throughout the Union," but was also "distinguished for its superior qualities in foreign markets." Foremost among these qualities was that the Delaware wheat made superior ship's biscuits. These hard, dry biscuits, a staple of foreign trade, stored for months, even in tropical climates.<sup>4</sup>

Such perfection combined with Delaware's central location to foster an openly commercial economy that created a level of material prosperity that men such as Richard Cooper soon came to expect. By 1775, some measure of prosperity reached nearly every household. Landowners enjoyed rising land prices and because of the demand for labor during wheat harvests offered tenants and laborers increasingly liberal terms. Farm rents were generally paid in cash, and all but the poorest inhabitants paid cash at local stores. Shallow draft vessels plying Delaware's broad tidal streams brought back the finest domestic goods available in Philadelphia and Baltimore. Some of these goods, such as hand-painted pearlware and porcelain tea sets and other fine ceramic vessels, found their way onto the tables of tenants and landowners alike.<sup>5</sup>

Prosperity only made farmers more desperate during the hard times that followed. Beginning in 1783, the state's economy endured a series of crises. High grain prices collapsed after the war, and escalating French and British attacks on American ships in the 1790s crippled trade in the Middle Atlantic. Worse was yet to come. Embargoes from 1807-9 and war again in 1812 closed even more markets. When peace returned in 1815, grain prices plummeted to their lowest point since the American Revolution. Even the weather turned hostile. Atmospheric dust from the explosion of an Indonesian volcano in 1815 brought six years of cold, rainy summers that destroyed crops throughout the eastern seaboard with deadly regularity. By 1817, Governor Daniel Rodney could offer little hope. "Should the happiness of man be thwarted in this quarter of the Globe," he announced, "then indeed we may reasonably conclude that felicity is not the lot of man."<sup>6</sup>

One of the least felicitous men in the state that year was Judge Cooper. This lawyer and gentleman farmer was accustomed to profit from his investments. When that income faltered, Cooper looked closely at each of his three farms. One parcel, a 147-acre tenant farm just south of Dover called "Poplar Farm," stood out. Cooper had already cultivated as much of it as he dared, but it had one other advantage. Poplar Farm was located on the east bank of the St. Jones River and had one of the few remaining pieces of solid bank along the entire river from Dover to the Delaware Bay. This area was called "Fishing Point" (see Figure 2) and Cooper decided to construct a fish weir to capture thousands of migrating shad and herring he could sell throughout the region.<sup>7</sup>

Fishing Point was important because it was "fast land," the local name for solid riverbank—in this case, bank firm enough to anchor a fish weir against tidal currents. Delaware farmers were especially keen to distinguish useful fast land from its dreaded opposite, "cripple land." Cripple land was soft, muddy, brush-choked land found along the edges of marshes and streams. Cripple land was difficult to improve and was best left as marginal woodland and grazing for free-roaming hogs and other hearty beasts. Surveyors understandably avoided cripple land, and without any trees large enough to mark, were forced to use stakes usually impossible to relocate. Tax assessors were equally loath to enter cripple and kept everyone happy by assessing it at low "marsh and cripple" rates.

Marsh and cripple dominated the land between the many sharp bends on the St. Jones and along the river itself. By 1817, the St. Jones was a changed and changing river. The river was about forty yards wide and increasingly muddy. The river was also notoriously sluggish, largely because the entire twenty-mile river drops less than twenty feet in elevation from Dover to sea level at the Delaware Bay. High tides on the bay could also make the St. Jones flow both ways, especially near its mouth. This natural action of the river, locals realized as early as 1809, helped to keep the river channel open to navigation.<sup>8</sup>

The fish Cooper and his neighbors sought were ocean-dwelling American shad (*Alosa sapidissima*) and several species of herring that ascended the St. Jones every spring by the tens of thousands to spawn. Shad were by far the tastier and preferred fish. They weighed about six pounds, and although more difficult to catch than herring, could still be caught by hand. The two largest and most important of the herrings were probably blueback herring (*A. aestivalis*) and hickory shad (*A. mediocris*). These fish weighed between two and four pounds apiece.<sup>9</sup>

Whatever their size, these shad and herring were an important source of free protein to hundreds of local families. Poor folks with neither the land nor resources to raise their own livestock especially valued this meat. The cost of keeping livestock seemed sure to dramatically increase as the state legislature recently outlawed all freeroaming swine in the neighboring town of Smyrna. This law forced people to pen and feed their hogs, expenses that few poor tenants, laborers, and widows could meet. In 1816, rumors flew through the winter that Dover was next. All eyes turned to the St. Jones. The fish they expected to catch would be the first meat many would taste that hard winter.<sup>10</sup>

Cooper's weir dashed these hopes. Weirs were simple, but highly effective fish traps. They consisted of a loose line of wooden stakes, poles, and brush driven into the bottom of a river to form a "fence" extending out from the banks. Migrating fish follow the weir into an area they cannot escape. Nor do the fish even try. Shad and herring have such a strong spawning instinct that they will not turn around to swim downstream. The effectiveness of fish weirs was well known throughout Europe. If any further evidence was necessary in the New World, the first European settlers had to look no farther than the beautiful and complex fish traps constructed by Native Americans from Maine to Georgia and Alaska to California.<sup>11</sup>

Cooper's threat of violence to protect his monopoly was especially galling and further emphasized what others regarded as the selfishness of his act. After confronting Cooper and his swivel gun, sixty-three people petitioned the state legislature to outlaw his weir in time for the next run in spring 1817. Their case was simple. Cooper's weir was an obstruction that left upstream areas "without a fish to be seen" and many of the "poorer classes destitute of fresh meat."<sup>12</sup>

Cooper welcomed the challenge. Besides profiting from his weir, Cooper was also forcing the legislature to tackle a fundamental problem in agricultural reform. Did landowners have the right to improve their farms to the detriment of others and to defend those improvements in court? Setting weirs on public land had been illegal since at least 1736, but Cooper's weir was on private land. This made Cooper's weir private property, an improvement to his land he had the right and privilege to develop. Would the courts recognize his right to improve and defend his property in this way? Without the ability to defend improvements, Cooper reasoned, others might refuse to invest in the other agricultural changes the state so desperately needed.<sup>13</sup>

Cooper's primary motivation must have been profit as he could hardly have chosen a worse test case. Weirs clearly created a monopoly that enriched one man at the expense of everyone else. Foremost among these injured neighbors were upstream landowners robbed of both free fish and the chance to improve their property with their own weir. Cooper and twenty-five other men faced these charges head-on in a counter-petition filed in 1817. His weir, they claimed, was the type of improvement to private property Delaware farmers needed to make. Moreover, Cooper's weir neither caught all the fish nor blocked the river. In fact, they argued, Cooper's weir actually improved navigation by "confining water to its proper place" and deepening the main channel. As for claims that his weir caught all the fish in the river, they estimated that it caught no more than a quarter of the fish

run. A "great many of the very poorest class of people," they assured legislators, could certify that they were still catching enough fish to feed their families for "two-thirds of the year."<sup>14</sup>

The legislature appointed three freeholders to investigate the problem. Disturbed by Cooper's show of arms, the commission agreed with his upstream neighbors and advised the legislature to outlaw all weirs on the St. Jones. The legislature agreed, and after six spirited votes in early February 1817, outlawed the use of "weirs, hedges, and gill nets" in the St. Jones River. "Hedges" were stake and brush barriers set near weirs to funnel more fish towards the trap. The 1817 law was simple: anyone constructing a weir in the St. Jones had to remove it by the first of March or pay a \$32 fine for every month of operation. Whoever reported the weir received half the fine. The other half went to the Trustees of the Poor. Weirs still not removed would be destroyed by order of a justice of the peace.<sup>15</sup>

Unlike weirs, gill nets could not monopolize a fishery and were not mentioned again in the 1817 law. This omission points to an important nuance in the politics of fish weirs. The problem was not how many fish could be caught and sold, but how many people could fish. No one ever questioned Cooper's or anyone else's right to sell their catch. Cooper's weir was a problem because unlike gill nets, fish weirs were permanent structures that essentially allowed one man to "fish" twenty-four hours a day. Gill nets had to be tended regularly and required the labor of many men. They were open fabric meshes attached to weighted and floating lines. In rivers, they could either be staked in one place or allowed to drift with the current. Drifted nets caught more fish but were more vulnerable to damage by submerged trees and other debris. Whether staked or drifted, gill nets were expensive and easily damaged. They could be set for days at a time but had to be tended often to remove fish and keep the net perpendicular to the current. Snags and mud could also easily make setting and retrieving any gill net into a job for a dozen men and a team of horses.<sup>16</sup>

Given the state's failing economy and Cooper's heavy-handed ways, the legislators' decision to outlaw weirs in 1817 was not surprising. As hard times worsened, this same anxiety paradoxically increased support for fish weirs. By January 1819, only two years later, more than one hundred people petitioned the legislature to legalize weir fishing. Even more surprising, 40 percent of these new supporters had spoken against weirs in 1816-17. Why so many people changed their minds about weirs in such a short period reflected a growing awareness of environmental change. <sup>17</sup>

People changed their minds so quickly because they recognized how fast the St. Jones River was changing. In two short years, petitioners noted, the St. Jones River had become so "Generally muddy" that fisherman using nets or spears could not see their quarry. Weirs had become the only practical way to catch any fish at all. Netting fish had become enormously difficult because "the said Creek bounds or touches fast land at but few places." Where weirs could be set for an entire season, gill nets had to be set and tended every few days. Retrieving catches from nets was an even greater nightmare. Fish caught in weirs could be scooped into a boat, but nets had to hauled ashore to be emptied. This work became even more frantic when the run was at its peak and fish had to be removed before they spoiled or tore the net. Soft banks and mud shoals made this work even more difficult and net fishermen soon discovered that even successful sets simply meant more foundered horses and broken equipment. Fishing efforts and catches soon declined accordingly. Where weirs took 250,000 shad and herring in 1816 alone, net fishermen caught only 25,000 herring and a few shad over the next two years.<sup>18</sup>

The failure of traditional fishing methods quickly made weir fishing more popular. Few fish profited no one, and by bringing higher prices, worked to the disadvantage of everyone, especially the poor. Weirs promised both abundant catches and low prices for all. Some even argued that weirs had even become a "necessary public convenience" for families "without money or Carriage to go fishing" could now enjoy the harvest.<sup>19</sup>

But the most explosive problem remained. Weirs still allowed a few downstream landowners to monopolize an important resource. Pressure on lawmakers was growing. Cooper and his ilk effectively robbed upstream fishermen. But if weirs were now the only way to catch fish, they were no longer a luxury. Tempers frayed. In 1819, one group of especially bitter petitioners urged the legislature to continue to ban weirs "unless your Honorable bodies think these individuals are entitled to a monopoly of this provision designed by Providence for General Use." Pro-weir groups countered that their opponents "had no facts" and were forcing people to buy fish from neighboring Maryland.<sup>20</sup>

The legislature heard identical arguments throughout 1818. America's first national financial crisis, the Panic of 1819, was brewing, and bad news reached the Delaware legislature from every quarter. Hundreds of Delaware families moved west to "wherever the sun shines and the wind blows." Legislators responded by authorizing a desperate variety of agricultural reforms. One change was to legalize weirs in the St. Jones River, which passed in January 1819 after five specific conditions were added. Weirs had to be "placed and set" according to the direction and written license of three "disinterested and judicious" freeholders. They could not be set without the written permission of adjacent landowners or extend across more than half of the channel. Nor could they be set at any river bends or within 660 feet of another weir. Weir owners had to remove their traps once a year to "clean the bottom of said creek where the wear [sic] stood." Finally, no submerged or "blind" brush hedges could be set in the river to extend the reach of weirs. Offending weirs would be destroyed and the owner fined \$30 for every week they continued.<sup>21</sup>

The specificity of these five conditions for legal weirs reflects a practical knowledge of weirs and how they affect rivers. The first four conditions were designed to avoid conflict between competing landowners and to keep at least part of the river open to navigation and upstream fishermen. The last condition, demanding that fishermen scour their weirs of accumulated mud, however, was an attempt to minimize the known environmental effects weirs had on rivers, especially increased sedimentation. In a muddy river such as the St. Jones, weirs slowed the current enough to allow even more suspended sediment to settle. Weirs collected enormous quantities of mud and silt, especially in tidal rivers like the St. Jones where sediments accumulated on both the upstream and downstream sides of obstructions. These sediments slowed the current even further, encouraging more mud to settle. Forcing fishermen to scour their weirs couldn't prevent these deposits but might keep the river clear.

Where this mud came from remained a mystery to Judge Cooper and his neighbors. Recent scientific studies suggest likely sources. Naturally slow and muddy, Delaware's tidal rivers were now carrying the additional burden of nearly a century and a half of deforestation and cultivation. By 1816, nearly two-thirds (65 percent) of the forests in the St. Jones watershed had been cut down. This high level of cultivation was common throughout central Delaware as early as 1797, the first year detailed tax assessments were made. Because it was so rare, mature woodland was valued at \$18 per acre in 1816, \$4 more per acre than cleared land improved with a frame farmhouse and outbuildings. Cooper's Poplar Farm on the St. Jones was one such highly cultivated farm. By 1797, 80 percent of the farm's 147 acres had been cleared. Cooper's commercial interests kept it that way even as late as 1842 when a plat made of Poplar Farm showed how little forest remained (see Figure 2).<sup>22</sup>

Other evidence of deforestation in central Delaware abounded. In neighboring Duck Creek and Little Creek Hundreds where 80 percent of the forests had been cleared, farmers sought laws to control free-roaming swine and liberate themselves from the increasingly expensive burden of fencing their fields. Elsewhere, farmers shot errant hogs on sight and were forced to import fence rails from New Jersey. Others were experimenting with thorn hedges and trying to protect widows from unscrupulous woodcutters.<sup>23</sup>

It is not surprising that weirs became one of the first places the effects of this deforestation were noticed. Removing forest cover sharply increases subsequent erosion and sedimentation. From springtime floods through summer droughts, forests act as massive "sponges" regulating watershed activity. Without this sponge, stream flows become wildly erratic, and erosion increases. One recent study found that one severe rainstorm on a single hectare of cleared land moved six tons of soil into its watershed. Rivers

transport this load in two ways, suspended in the current and pushed along the channel bed. The bed load moves more slowly but typically carries a much greater amount of debris. Bed load sediments also tend to be larger and more varied in size than those found in suspended loads. This wider mix of particle sizes is important because how much sediment a river carries also depends on the relative mix of coarse and fine grains. Add fine-grained sand to a coarse bed load and total sediment load increases dramatically. Coarse streambeds make the current "rougher" and more turbulent. More turbulence enhances the current's ability to entrain more sediment. These effects are magnified by forest loss. Deforestation not only increases the amount of sediment available for transport but also makes floods more frequent and severe, especially in the spring when most snow melt and runoff occur. Rivers carry their greatest sediment loads during the few days or weeks when stream flow and turbulence are greatest. In Delaware, this period of greatest stream flow would have coincided with peak fish migrations. Cooper and his cronies were setting weirs at exactly the time when the St. Jones was most vulnerable to erosion and subsequent sedimentation.<sup>24</sup>

This sedimentation took many forms. New sandbars formed and existing marshes crept towards the main channel as the current slowed and deposited more debris. Marsh and cripple grew as flooded brush and timber slowed currents even more. Heavy currents scoured other parts of the river, especially sharp bends where currents entrained even more sediment and debris. The general movement of these materials was towards the mouth of the St. Jones, but this movement was not certain. Downstream obstructions and tidal changes could easily slow or divert the river's flow. Incoming tides were especially dangerous as they could slow and even reverse the flow of the river. These reverse currents could carry coastal sediments far upstream and deposit them almost anywhere in the St. Jones. Heavy rain and strong outgoing tides could carry river sediments directly into the Delaware Bay.

Delaware fishermen remained more interested in catching and selling lots of fish than stream hydrology. Weirs were now legal, and more fish were being caught than ever before. Predictably, both sides claimed victory. Weir owners and other agricultural reformers successfully defended their right to profit from improvements to private property. Even their staunchest opponents had to admit that fish were cheaper and more plentiful than ever before. By all estimates, weirs caught ten times more fish in 1819 than had been caught in both the 1817 and 1818 runs. Prices dropped by more than two-thirds, and by 1824, fish that sold for one dollar a hundred in 1818 cost only thirty cents a hundred.<sup>25</sup>

Despite the obvious success of weirs, the 1819 law did not go unchallenged. A simple pattern emerged over the next several years. Opponents revived their oldest and best argument: weirs robbed upstream residents of common property once enjoyed without limit or cost. Pro-weir forces maintained their winning argument that weirs were necessary improvements to private property. Without the ability to defend improvements, legislators knew, agricultural reform was doomed in Delaware.

This stalemate might have continued indefinitely had weirs not caused the St. Jones to deteriorate even faster. Dozens of weirs were built after 1819. By 1824, fishermen were complaining that "anyone however ignorant" could build a weir for five dollars capable of "supplying ten families with fish for a year." Competition for the few remaining weir sites was fierce. Anxious fishermen headed downstream to the last bits of fast land near the mouth of the river. Downstream weirs also promised to intercept fish before they reached upstream weirs.<sup>26</sup>

Setting weirs closer to the Delaware Bay was not easy. The mouth of the St. Jones was the southern end of an enormous forty-thousand-acre tidal marsh. This sea of cattails and mud changed with every storm and shift in the Delaware River's main channel. One such shoal at the mouth of the St. Jones was known locally as "No Man's Friend." This notorious mud shoal had frustrated fishermen and merchants for decades.<sup>27</sup>

Unfortunately, and just as legislators had feared in 1819, the dozens of new weirs triggered an avalanche of ecological change in the St. Jones. Again, recent scientific studies suggest a likely sequence of events. Weirs would have intercepted any sediments

carried along the bed of the river. These sediments would have included both the largest and some of the smallest materials carried by the St. Jones. Clogged weirs slowed the current even more, encouraging ever-finer suspended sediments to settle. Current speed would have increased wherever the channel was not blocked by weirs. This current, as Cooper noted in 1817, would have scoured the outside edge of the weir and kept the channel open. Entrained sediments simply went downstream to the next obstruction. Weirs also collected sediment along their downstream sides as incoming tides brought mud from No Man's Friend and other coastal deposits. With mud accumulating on both sides, weirs caused new marshes and mid-channel bars to form overnight, especially after silt and debris floated past weirs at high tide only to become trapped when water levels dropped.<sup>28</sup>

This race between humans, mud, and tide quickly forced weir fishermen farther downstream to even more marginal sites. Changes to the river accelerated accordingly. As new marsh encroached on the last few bits of fast land, these sites were quickly outfitted with weirs in the hopes of monopolizing the catch. Both sides of the weir debate keenly observed the rapid decline of the St. Jones and kept even the smallest problems before the legislature. By 1820, after only one year of wholesale weir construction, landowners along the lower St. Jones discovered that new mud flats were destroying access to valuable wharves and riverfront storehouses. Not only was the St. Jones becoming shallower, they also claimed to see it widen. What they were witnessing was the impact of flooding on muddy rivers with soft, sandy banks. Once accumulated sediment clogs the main channel, floodwaters are forced over one or both banks. These banks then collapse, widening the river and adding even more debris to the flood. Once normal flows return, the river is wider and shallower. A wider, shallower St. Jones was the last thing Dover merchants wanted. The best solution, they reasoned, was to make weir owners scour their traps even more often to remove accumulated mud. More scouring only aggravated the ecological problems weirs caused. Scouring removed some mud, but only dislodged the rest and sent it downstream to the next weir. By 1822, only five weir sites remained on the entire St. Jones. The rest had silted in.<sup>29</sup>

Fishermen were now in a terrible bind. Weirs had to be set on fast land, but once in place, they inevitably turned that land into marsh. Competition for new fast land forced them nearer the river's mouth and onto even more marginal sites. Weirs then made the river even muddier but had now become the only practical way to catch any fish at all.

Frantic fishermen then turned to seining in a last ditch attempt to catch commercial quantities of fish. Seines were large nets strung across the river, but unlike weirs and gill nets, seines were never left untended. Once the seine was spread across the river, its ends were hauled upstream to capture any encircled fish. Success depended on dragging the seine close to the bottom and banks and closing it before fish escaped. Once pursed, the entire seine then had to be hauled ashore by teams of men and horses. Snags were a constant problem, and most seines caught more debris than fish. Seines at least collected less mud and debris than weirs and staked gill nets. Soft banks and treacherous marsh and cripple remained major problems, especially when nets had to be hauled. In 1824, seine fishermen complained bitterly that "very few seines [sic] could be hauled" because the St. Jones was "increasingly bounded in most places with marshes." Some fishermen even lost their nets completely. A damaged weir cost little to rebuild, but a lost seine was a major expense.<sup>30</sup>

Seining the St. Jones was also complicated by another telling feature: fishermen were forced to fish at night. Seines work best when fish cannot see the net until it is too late to escape. Muddy water helped, but other factors related to increased sedimentation worked to severely limit seine fishing. As the St. Jones muddied, it also became shallower and its current slowed. Less current meant that fewer shad and herring returned to the river and those that did stayed for shorter periods. Since shad and herring do not make nests and there was no clear, deep channel to concentrate them, fish tended to move around even more frantically. Moving fish were much harder to seine and as fishing pressure increased, roaming schools became even more skittish. Soon fish moved only after dark, forcing fishermen to set their seines at night. Seining after dark was difficult and dangerous. Frustrated fishermen turned to "thrashing" the water with poles to hopefully drive fish into their nets. This frantic activity created even more

confusion and scattered whatever small schools of shad and herring remained. By spring 1825, the only parts of the St. Jones River left to seine were tight bends where weirs were illegal and where the current was fast enough to scour the bottom. These bends were so tight that only short, relatively ineffective nets could be used. Soon the only hope of catching any fish at all lay in more fish weirs.<sup>31</sup>

More fish weirs only brought more trouble for the St. Jones. This connection was not lost on weary legislators who in 1824 enacted a supplement to the 1819 act legalizing weirs on the St. Jones. The 1824 supplement did not change any part of the earlier law, but merely reminded people to scour their weirs regularly and to set them in prescribed places.<sup>32</sup>

The declining navigation of the St. Jones was not so easily solved. In 1824, Dover residents discovered that they had lost more than six miles of navigable river south of town. More weirs meant new mud shoals and even more unpredictable shifts in the main channel. These changes were all too evident to Dover merchants who roundly cursed the valuable time lost avoiding mud shoals and awaiting successive high tides to navigate past shallow spots.<sup>33</sup>

As the St. Jones declined, weir petitions were replaced by even more frantic calls to dredge and straighten the river. In 1825, petitioners described the St. Jones as the "most difficult" river in the state. In the six miles between Dover and the Delaware Bay, surveyors found fifteen miles of river convoluted into several difficult "bights" or bends two or three miles in circumference but less than 200 yards across at the neck. Channeling across these necks, they hoped, would "considerably increase" the current and secure "a greater depth of water." Without this "almost miracle" in the St. Jones, petitioners feared, shipping would end, and the economy would continue to sink.<sup>34</sup>

Although no one had any idea where the money to dredge the St. Jones would come from-some suggested a lottery- everyone agreed that weir fishing had to stop. By 1826, the negative effects weirs had on the river were apparent to all. Seven years of unrestricted weir fishing confirmed every suspicion and added a sense of urgency to every discussion of the river's future. Improving navigation on the St. Jones, petitioners concluded in 1826, "could be effected by a little exertion and that it will be done if the channel of the Creek is not again obstructed by Wears [sic]." If the legislature would again prohibit weirs, surely the river would recover and trade again flourish.<sup>35</sup>

By spring 1826, there were few weirs left to outlaw on the St. Jones. A commission appointed in 1825 to again investigate weirs on the river never reported back to the legislature. The issue was allowed to die, and by 1830, weir fishing ceased. Where once weirs promised trade and prosperity, they now clearly threatened both. Cheap fish were no substitute for a navigable river, and given the widely known environmental consequences of weirs, the decision to abandon them would have been simple.<sup>36</sup>

The battle against weirs had been won, but the war was still lost. With the St. Jones too muddy for any fishing at all, net fishermen turned to the Delaware River itself. There they met stiff competition from Pennsylvania and New Jersey fishermen who enjoyed setting gill nets and seines in Delaware waters without limit or restriction. By 1828, Delaware fishermen were complaining that fishing was impossible because over one hundred "enormous" nets blocked their access to the river. Some of these nets were over one hundred fathoms (600 feet) long, much longer than any Delaware fishermen ever dreamed of using in the St. Jones or any other tidal river. The solution, Delaware fishermen informed the state legislature, was to regulate fishing in the Delaware River at least as stringently as Pennsylvania and New Jersey. The legislature was happy to oblige and in January 1829 passed a comprehensive act to regulate and tax "gill-nets and gill seines" on the Delaware side of the river. All nets had to be licensed annually and were taxed at the rate of five dollars for every net 65 fathoms (390 feet) in length or smaller. Larger nets could be licensed for another dollar per foot. Heavy fines were added to keep the extra-long nets preferred by non-resident fishermen out of Delaware waters. No attempt was made to regulate the number of non-resident fishermen. Simply taxing large

nets at much higher rates was apparently enough to discourage competition. Whether this law worked or not is unknown for it was repealed without public comment one year later in 1830. Net fishermen never again petitioned the legislature.<sup>37</sup>

One reason for their silence may have been declining fish stocks. While the population dynamics of shad and herring are quite complex, overfishing, habitat degradation, and inconsistent flows certainly contributed to declining migrations up the St. Jones and probably even the Delaware River. In 1824, only ten thousand fish were caught in the St. Jones, a dismal catch that met only 10 percent of local need. Two unusual petitions made in 1832 and 1833 suggest even more pitiful harvests. Three men petitioned the legislature for permission to create fishponds from parcels of public marsh along the St. Jones. These ponds, they hoped, might keep alive fish caught in the spring runs. No mention was made of attempting to breed the fish, but these men could hardly have been averse to the prospect. Although permission was granted in each case, none of the ponds were ever built. With so few fish to catch, weir fishing would simply have been too risky to continue.<sup>38</sup>

The St. Jones River itself was in equally sad shape. By 1830, Samuel Dickson's land just south of Poplar Farm was reduced to marsh and cripple along nearly its entire two miles of riverbank (see Figure 3). No Man's Friend got bigger and even less friendly to ships on the river. Sporadic dredging and operations and attempts to straighten channels kept the St. Jones more or less open to navigation until 1925 when the last steamboat left Dover. The river was then allowed to silt in nearly completely. Today the channel of the St. Jones River at Fishing Point is only a few feet wide (see Figure 4). Beneath this nearly stagnant water lies fifteen feet of mud.<sup>39</sup>

The sorry state of the St. Jones today belies the river's tumultuous history. What began as an attempt to monopolize commercial fishing opportunities in 1816 quickly escalated into a contest over private property, public resources, and environmental change. Weirs aggravated these environmental changes and by 1820, both weir fishermen and their opponents knew the St. Jones to be a changed and changing river.

This epiphany then forced people to assign legal responsibility for their failing river. Weir owners were the most obvious and convenient culprits. Litigious spirits kept their eyes on the river and trumpeted even the smallest changes to the St. Jones. More weirs opened Pandora's box even wider, and the pace of environmental change accelerated. Where weirs once promised cheap fish for all, more weirs only brought bigger marshes, muddier banks, and smaller catches. More fingers were pointed, and by 1826, people's awareness of their role in environmental change was complete. Never separate from the land, these capitalists were now more in tune with their river than ever before.

The story of Cooper and his weir challenges fundamental assumptions about capitalism and people's awareness of human-made changes to the land. The standard assumption is that capitalism separates people from the land as surely as it separates capital from labor. This alienation is the result of capitalism's defining tendency to reduce nature to mere possession and profit. The effects of this separation is one of environmental history's favorite morals: nature is vulnerable to human action, and whenever people arrogantly separate themselves from nature, ecological disaster surely follows. Donald Worster used this separation of people from the land to explain both the causes and consequences of capitalist agriculture on the American Great Plains in the 1930s. Worster even introduced his book on the Dust Bowl with Karl Marx's famous statement: "All progress in capitalistic agriculture is a progress in the art, not only of robbing the laborer, but of robbing the soil."<sup>40</sup>

Further reflection has convinced Worster that capitalism's relentless transformation of world and human history is the single most important paradigm in contemporary environmental history. It has, in his words, done nothing less than create "a new, distinctive relation of people to the natural world." The essence of this new relation is well known. Capitalism reduces nature to possession and profit and separates people from the land. This separation encourages people to change nature even more and to produce surpluses for profit. The nature of capitalism, Worster argues, is to encourage people to radically simplify the natural ecological

order into profitable but shortsighted monocultures. Other environmental historians, especially William Cronon, Timothy Silver, and Michael Williams, might question Worster's single-minded approach but still trace capitalism's initial transformation of America to the mideighteenth and early nineteenth centuries.<sup>41</sup>

Other American historians have uncritically accepted the assumption that capitalism alienates people from the natural world. Social and economic historians writing about the capitalist transformation of the new nation after the Revolution have been particularly susceptible to simple environmental interpretations. Charles Sellers's book *The Market Revolution* is typical. In his first chapter, Sellers writes "History's most revolutionary force, the capitalist market, was wrestling the American future from history's most conservative force, the land." Seller's comments are exactly what historians expect to hear: capitalism and progress are invariably at odds with nature. Wealth has to be wrestled from the land. This plays well, for it comes from good environmental history. With such sanction, the market revolution of early America now becomes the epic struggle to subdue and make fruitful the American wilderness. From Slater's Mill in Rhode Island to iron-shod plows along the Missouri, the genius of early-nineteenth-century America was to more effectively and efficiently transform nature for human benefit than ever before.<sup>42</sup>

Under this all-American rubric, nineteenth-century agricultural change subtly becomes agricultural reform, change with a singularly positive trajectory. Hopeful farmers, relying on their own luck and pluck, adapt ever more successfully to new opportunities as America trades revolutionary rags for Victorian riches. Some reforms rise to the exalted status of "progress" and make heroes of Eli Whitney, Silas McCormick, and others. The appeal of this optimistic, evolutionary model for nineteenth-century agricultural change reaches in every direction in American history. For historians concerned with later periods, this burst of antebellum reform sets the stage for subsequent urbanization and industrialization. For colonial historians, this model offers an appealing precapitalist past inhabited by farmers more interested in harmony than profit. After all, a stable, communal eighteenth-century "before" makes the nineteenth-century "after" even more exciting and innovative.<sup>43</sup>

Many environmental historians have accepted this cult of agricultural progress without question. Indeed, some have a vested interest in keeping it alive because the more revolutionary and transformative nineteenth-century capitalism becomes, the more significant subsequent changes in the land are. Agricultural reform thus becomes the process of simply learning how to more effectively subdue nature, a conclusion that, as Richard White has noted, is nearly as deeply ingrained in the American psyche as the cult of progress. The result is a sense of impending disaster whenever capitalism and agriculture are mentioned in the same breath. Since capitalism's ability to exploit nature is obvious, how can people continue their wasteful and arrogant ways? The roots of this tragic blindness must lie in capitalism's ability to alienate people from their environment for if people knew what they were doing to the land, they would change their ways. This logic is just as easily applied to the past. If the first triumph of capitalist agriculture was in the nineteenth century, this blindness must have its roots there. Thus capitalism's implied alienation of people from the land becomes the cause, consequence, and solution of many environmental problems.<sup>44</sup>

Judge Cooper and his neighbors were all capitalists, but over time, they became more-not less-aware of human-made changes to the land. Weir fishing gave them plenty to watch, and for two decades, environmental changes were predicted, recognized, and then acted upon. Capitalism may have been at odds with nature in Delaware, but it certainly didn't ignore it. Nor did it blind people to subsequent human-induced changes to the land. Since people know nature through work and capitalist agriculture is certainly work, paying close attention to your farm was common sense. In Delaware, capitalism both shaped and recognized changes in the land.<sup>45</sup>

This growing awareness of human-induced environmental change in nineteenth-century Delaware also evolved as the river changed. At the root of this awareness was the domestication of the St. Jones River. As people began to think of the fish in the river as commodities, they viewed the river as private property. Capitalism domesticated the St. Jones and made people-individuals such as Judge Cooper-responsible for subsequent changes. Litigious spirits headed directly to state courts that by

default became arbiters of increasingly contentious land use issues. The more complex the issues became, the more attention people paid to the St. Jones and even its most minute changes. The nature of capitalism is not to separate people from the land but to unite them more closely than ever before. The more profit-minded farmers are, the greater the personal stake they have in the environment and its changes.

The story of Judge Cooper's weir suggests that historians need to reassess three common assumptions about agricultural and environmental change in early-nineteenth-century America. The first is a matter of chronology. Standard accounts are quick to date the beginning of capitalist agriculture to the capitalist transformation of America after the Revolution. This chronology is based largely on two traditional political milestones, the Revolutionary War and the War of 1812. Although significant in other respects, these dates mean little within the context of long-term environmental change. One of the strengths of environmental history is its focus on the tongue duree-- long-term processes not easily divided into standard chronologies. In environmental terms, the capitalist transformation of Delaware began in the colonial period when farmers sold more grain than they ate, cleared as much forest as they dared, and watched their rivers run dark with silt. Farms and forests, not wars and peace treaties, are the important milestones in this story.<sup>46</sup>

Failing to recognize the long history of many nineteenth-century farms leads historians to assume that Cooper and his ilk worked their capitalist wiles on the everelusive "virgin land." Casting precapitalist America as an unspoiled, or at best, less-spoiled, Eden resonates well with environmental history's cautionary tale of capitalism and agriculture. Both assumptions are equally shortsighted. Precapitalist America may have been unspoiled by modern standards, but it certainly was neither static nor unchanged by colonial farmers. While ecologists have moved beyond concepts of climax communities and environmental stability, historians have been slower to abandon such familiar ground. Not only are the new models of dynamic, even chaotic environmental change distinctly less orderly, they take away from the historian's all-American story of progressive nineteenth-century agricultural reform. Without a stable, precapitalist before, the capitalist transformation of America becomes distinctly less transformative and perhaps even less capitalist.

Judge Cooper and his neighbors had little time for such storytelling. They were practical men who inherited farms that by 1815 had been shaped by more than a century of natural and human forces. Indeed, this long history helps to explain why the St. Jones declined so precipitously after weirs became widespread in 1819. The river was already loaded with sediment. More weirs simply accelerated and intensified natural processes. It also explains why Judge Cooper and his neighbors so quickly identified problems caused by weirs--they had been watching anxiously similar changes to their farms and rivers for generations.

The third assumption is that America's first capitalists were optimists taking advantage of exciting new market opportunities. Standard accounts transform these capitalists into "can-do" farmers working towards the all-American goals of efficiency, increased production, and harmony. In central Delaware, these men were decidedly pessimistic. After all, Judge Cooper and his neighbors inherited an unhappy combination of old farms, high expectations, and declining prospects. Cooper's weir was a desperate attempt to regain lost income and commercial advantages that by 1815 he had come to expect. Training a swivel gun on your neighbors over a fish trap is hardly the work of an optimist. Neither is facing down the threat and keeping the issue alive for years in local courts. The desperation on both sides of Cooper's weir suggests entirely new motives for some early agricultural change.

Rethinking the nature of capitalism also begins to bridge a fundamental split in the field of environmental history. Is environmental history the story of people and their changing environment? Or is it more properly the history of changing ideas about the human place in nature and the subsequent environmental movement? This split is both tragic and unnecessary. Environmental history can and should tell both stories because people do not neatly separate their experiences with a changing natural world into tidy intellectual camps. Judge Cooper and his neighbors certainly made no such fine distinctions. They were,

without conflict or contradiction, both capitalists and environmentalists. They were capitalists because they sold fish for cash in faraway markets. They were environmentalists because they knew intimately their environment, how it worked, and how it was changing. Even though they were not "green" in the modern sense, people in early-nineteenth-century Delaware still recognized their own agency in environmental change.<sup>47</sup>

## Notes

1. The broad outlines of the current dialogue generated by Professor Worster's agroecological approach appears in the March 1990 issue of the *Journal of American History*. See especially Donald Worster, "Transformations of the Earth: Toward and Agroecological Perspective in History," *Journal of American History* 76 (March 1990): 1087-1106; and replies by William Cronon, "Modes of Prophecy and Production: Placing Nature in History," *Journal of American History* 76 (March 1990): 1122-31; and Richard White, "Environmental History, Ecology, and Meaning," *Journal of American History* 76 (March 1990): 1111-16.

2. The confrontation between Cooper and his neighbors is described in a petition to the Delaware State Legislature in January 1816. The petition can be found in Delaware Legislative Papers, RG 1111, Delaware State Archives, Dover, Delaware. Delaware Legislative Petitions hereafter cited as DLP.

3. Victor H. Paltsits, *Journal of Benjamin Mifflin: The Record of a Tour from Philadelphia to Delaware and Maryland, July 26 to August 14, 1762* (New York: New York Public Library, 1935), 16-17. Population data taken from the 1810 Federal Census (microfilm, University of Delaware Center for Archaeological Research, Newark, Delaware). A detailed discussion of the demographics of central Delaware in the mid-eighteenth century appears in Wade P. Catts et al., *Final Archaeological Investigations at the Strickland Plantation Site, A Mid-Eighteenth Century Farmstead, State Route 1 Corridor, Smyrna, Kent County; Delaware*, Delaware Department of Transportation Archaeology Series No. 119 (Dover: Delaware Department of Transportation, 1995), 17. My emphasis on the simultaneous subsistence and commercial orientation of colonial Delaware is consistent with the excellent criticisms of the current market revolution model offered by Richard L. Bushman in his article "Markets and Composite Farms in Early America," *William and Mary Quarterly* 40 (July 1998): 351-74, and Daniel Vickers, "Competency and Competition: Economic Culture in Early America," *William and Mary Quarterly* 47 (January 1990): 12-13.

4. Jedidiah Morse, *The American Universal Geography* (Boston: Thomas and Andrews, 1805), 571. Landownership and tenancy rates calculated from a systematic 25 percent random sample (N=71) of taxables listed in the 1803-4 tax list of Dover Hundred (microfilm, Delaware State Archives, Dover, Delaware). Data on pre-1760 farm size abstracted from Lu Ann De Cunzio and Wade P. Catts, *Management Plan for Delaware's Historical Archaeological Resources* (Newark: University of Delaware Center for Archaeological Research, 1990), 39, 48. Data on farm sizes in 1804 is based on a statistical analysis of a 25-percent random, systematic sample of farms described in the 1803-4 tax assessment of Dover Hundred. Mean farm size in Dover Hundred in 1804 was 194 acres (N=41). Changes in farm size between 1797 and 1860 in Kent County are also discussed

in David J. Grettler et al., *Marginal Farms on the Edge of Town: Data Recovery Investigations of the Moore-Taylor, Benjamin Wynn Tenancy (Lewis-E), and H. Wilson-Lewis Farmsteads, Kent County, Delaware*, Delaware Department of Transportation Archaeology Series No. 124 (Dover: Delaware Department of Transportation, 1994), 32. Comparisons of tenant and landowners farms in Kent County are discussed in Jay F. Custer and David Grettler, "Analysis of Historic Archaeological Site Locations of the Delaware Coastal Plain," University of Delaware Department of Anthropology Monograph No. 7 (Newark: University of Delaware Center for Archaeological Research, 1991), 32-33.

5. Agricultural conditions, including tenant life, are discussed in Richard O. Bausman and James A. Munroe, "James Tilton's Notes on the Agriculture of Delaware in 1788," *Agricultural History* 20 (July 1946): 76-87, and J. Ritchie Garrison, "Tenancy and Farming," in *After Ratification: Material Life in Delaware, 1789-1820*, ed. J. Ritchie Garrison, Bernard L. Herman, and Barbara McLean Ward (Newark: University of Delaware Museum Studies Program, 1988), 21-38. The archaeology of tenant life in Delaware in this period is discussed in Grettler et al., *Marginal Farms on the Edge of Town*, 199-224. See also De Cunzio et al., *John Darrach Store Site*, 306-16, and Angela Hoseth, Wade P. Catts, and Rebecca Tinsman, *Status, Landscape, and Tenancy at Mount Vernon Place: Final Archaeological Investigations of the Jacob B. Cazier Tenancy Site #2, State Route 896, New Castle County, Delaware*, Delaware Department of Transportation Archaeology Series No. 104 (Dover: Delaware Department of Transportation, 1994), 88-102. The prosperous colonial economy of Delaware has been ably explored by many authors including Marc Egnal, "The Changing Structure of Philadelphia's Trade with the British West Indies, 1750-1775," *William and Mary Quarterly* 32 (April 1975):156-79; Harold Hancock, "Agriculture in Delaware, 1789-1900," in *Delaware: A History of the First State*, ed. H. Clay Reed, 2 vols. (New York: Lewis Historical Society, 1947), I: 373-89; and John Munroe, "The Philadelphians: A Study of the Relations Between Philadelphia and Delaware in the Late Eighteenth Century," *Pennsylvania Magazine of History and Biography* 69 (April 1945): 128-49.

6. Message of Governor Rodney, 1817, DLP. The single best economic history of Delaware and the Philadelphia hinterland in this tumultuous period is Diane Lindstrom's *Economic Development in the Philadelphia Region 1810-1850* (New York: Columbia University Press, 1973), 1-22. A more detailed discussion of conditions in central Delaware can be found in David J. Grettler, "The Landscape of Reform: Society, Environment and Agricultural Reform in Central Delaware, 1780-1840" (Ph.D. diss., University of Delaware, 1990), 1-34.

7. Cooper's tenant farm at Poplar Point was the subject of extensive historical and archaeological investigations by the University of Delaware Center for Archaeological Research. The results of these investigations, including additional reconstructions of the historic landscape, can be found in JoAnn Jamison et al., *The Archaeology of Nineteenth Century Agricultural Change: Final Excavations at the C. Kimmey Tenant Farm Site, State Route 1 Corridor, Kent County, Delaware*, Delaware Department of Transportation Archaeological Series No. 125 (Dover: Delaware Department of Transportation, 1996), and David J. Grettler et al., *Phase II Archaeological Survey of All Historic Sites in the Early Action Segment of State Route 1 Relief Route, Kent County, Delaware*, Delaware Department of Transportation Archaeological Series No. 87 (Dover: Delaware Department of Transportation, 1991), 235-72.

8. Comments on the "natural course" of water in central Delaware rivers and ditches can be found in the 1809 Legislative Petitions concerning the Cow Marsh Ditch and Brice's Ditch in the DLP.

9. Maynard S. Raasch and Vaughn L. Artemus, Sr., *Delaware's Freshwater and Brackish Water Fishes* (Dover: Delaware State College Center for the Study of Del-Mar-Va Habitats and Society History of Delaware, 1991), 31-35.

10. James C. Booth, *Memoir of the Geological Survey of the State of Delaware: Including the Application of the Geological Observations to Agriculture* (Dover: S. Kimmey, 1840), 14-15.

11. Two of the most famous prehistoric fish weirs in early America are the Boylston Street Fish Weir in Boston and the weirs used in North Carolina painted by John White in 1585. See F. Johnson, *The Boylston Street Fish Weir*, Papers of the R. S. Peabody Foundation for Archaeology, vol. 4 (Andover: R. S. Peabody Foundation for Archaeology, 1949). John White's beautiful paintings of weir fishing in North Carolina have been reproduced in Paul Hulton, *America 1585: The Complete Drawings of John White* (Chapel Hill: University of North Carolina Press, 1984), 73. Recent archaeological investigations of the Osprey Site on the lower Coquille River in Oregon uncovered the remains of extensive wooden fish weirs used from ca. 1100 AD

to 1850. A summary of these investigations including historic photographs of the weir appears online at <http://www.coquilletribe.org/osprey.html>. Changes in fisheries and fishing methods in medieval Europe is ably explored by Richard C. Hoffman, "Economic Development and Aquatic Ecosystems in Medieval Europe," *American Historical Review* 101 (June 1996): 631-69.

12. Legislative Petitions, 1817, DLP.

13. An ancient state law passed between 1777 and 1736 prohibited weirs not set on private property or as part of mill dams on every river in the state except Lewes Creek in southern Delaware. *Laws of the State of Delaware from 17 October 1700 to 18 August 1797*, vol. i, chapter 42 (New Castle, Del.: Samuel and John Adams, 1797), 101.

14. *Ibid.* Although Cooper did not sign his name to this petition, one of the first people to sign was Joseph Kinney, Cooper's tenant at Popular Farm in 1817.

15. "An Act Prohibiting the Use of Weirs, Hedges, and Gill Nets in [St.] Jones Creek," Chapter 149 of Acts Passed, 1817, DLP.

16. Fishing with gill nets is discussed in a 1816 legislative petition from St. Georges and Appoquinimink Hundreds. See 1816 Legislative Petitions, DLP.

17. Of the 128 people who signed more than one petition, 40 percent changed their minds about weirs.

18. Legislative Petitions, 1818, DLP.

19. *Ibid.* and Legislative Reports, 1818, DLP.

20. Legislative Petitions, 1819, DLP.

21. "An Act for Regulating the Construction and Use of Weirs [sic] in St. Jones Creek," Chapter 214, Acts Passed, 1819, DLP. The manuscript version of the bill in the DLP has the notation "Disagreed to, but insisted on" written into the margin of each section.

22. Statistics based on a 25-percent systematic, random sample of farms described in the 1803 (N=41) and 1816 (N=59) tax assessments for Dover Hundred (microfilm, Delaware State Archives, Dover, Delaware.) In this period, Dover Hundred (or St. Jones Hundred as it was also known) contained almost the entire St. Jones River watershed.

23. Additional evidence of deforestation, especially as it related to fencing issues and conflict over hogs in central Delaware, is discussed in David J. Grettler, "Environmental Change and Conflict Over Hogs in Early Nineteenth-Century Delaware" *Journal of the Early Republic* (summer 1999): 197-220. See also Bernard L. Herman, "Fences," in *After the Revolution: Material Life in Delaware, 1789-1820*, ed. J. Ritchie Garrison, Bernard L. Herman, and Barbara McLean Ward (Newark: University of Delaware Museum Studies Program, 1988), 7-20.

24. David Pimental et al., "Soil Erosion and Agricultural Productivity," in *World Soil Erosion and Conservation*, ed. D. Pimental (Cambridge: Cambridge University Press, 1993), 283-84, and Marie Morisawa, *Streams: Their Dynamics and Morphology* (New York: McGraw Hill, 1968), 41, 50-55, 77. See also Henry K. Anderson, "Relative Contributions of Sediment from Source Areas and Transport Processes," in *Forest Land Use and Stream Environment; Proceedings of a Symposium*, October 1970, ed.

James T. Krygier and James D. Hall (Corvallis: Oregon State University Press, 1971), 6061; Graham R. Thompson and Jonathan Turk, *Modern Physical Geography: Earth Sciences and the Environment* (Fort Worth, Tex.: Saunders College Publishing, 1993), 279; and Jack Rotacher, "Regimes of Streamflow and Their Modification By Logging," in *Forest Land Use and Stream Environment; Proceedings of a Symposium, October 19-21, 1970*, ed. James T. Krygier and James D. Hall (Corvallis: Oregon State University Press, 1971), 51. The seminal discussion of the connection between forests and floods is George Perkins Marsh, *Man and Nature; or Physical Geography as Modified by Human Action* (New York: Charles Scribner, 1865), 183-84. An especially good discussion of the connections between forest, floods, and commercial fishing in medieval Europe is Richard C. Hoffman, "Economic Development and Aquatic Ecosystems," 638-89.

25. Legislative Petitions, January 1819 and January 1824, DLP. Fish prices taken from Legislative Petitions, January 1824, DLP.

26. Legislative Petitions, January 1824, DLP.

27. Algernon Sydney Logan, *Amy Warren: A Tale of the Bay Shore* (Philadelphia: National Publishing Company, 1934), 117. Other accounts of this marsh and the futile efforts to drain it can be found in the petitions and other records of the St. Jones Marsh Company in the January 1819 DLP.

28. Similar changes caused by weirs have been seen in other parts of the world, particularly England, where weirs set in tidal rivers were once popular. R. L. Welcomme, *Fisheries Ecology of Floodplain Rivers* (New York: Longman Incorporated, 1979), 14, and Geoff Petts and Ian Foster, *Rivers and Landscape* (London: Edward Arnold, 1985), 110-19. A good introduction to the mechanics of stream sediment transport can be found in Marie Morisawa, *Streams: Their Dynamics and Morphology*.

29. Changing river conditions are discussed in Legislative Petitions, 1822 and 1824, DLP. The five weirs sites are discussed in Legislative Petitions, 1822, DLP.

30. Legislative Petitions, 1824, DLP. Seining salmon on the Columbia River is beautifully described by Richard White in his elegant *The Organic Machine* (New York: Hill and Wang, 1995) 42-43

31. As both shad and herring tend to return to the rivers where they spawned, stronger river currents would have provided a larger, freshwater "path" for returning fish. Romeo Mansueti and Haven Kolb, *A Historical Review of the Shad Fisheries of North America*, Chesapeake Biological Laboratory Publication no. 97 (Solomons, Md.: Chesapeake Biological Laboratory, 1953), 7-11, 54. Attempts to drive fish into seines by "thrashing" the St. Jones are described in Legislative Petitions, 1825, DLP.

32. "A Supplement to the Act entitled 'An Act Regulating the Use of Weirs, Hedges, & Gill nets in St. Jones Creek;" Chapter 214, Acts Passed, 1824, DLP.

33. Benjamin Eastburn's 1737 map of Delaware and its navigable rivers notes that the St. Jones River was navigable twenty miles upstream to shallows, shallow-draft vessels of approximately two tons burden. Eastburn's map is reprinted in John A. Munroe and John C. Dann, "Benjamin Eastburn, Thomas Noxon, and the Earliest Maps of the Lower Counties," *Delaware History* 31 (fall-winter 1985), 217-32. An 1824 petition for the improvement of the St. Jones River notes that the town of Lebanon was at that time the head of navigation. This change represents a loss of almost six miles of navigable waterway.

Similar changes have been seen for other major drainages of central Delaware, particularly the Smyrna River (Duck Creek), Leipsic River (Little Duck Creek), and the Little River. David C. Bachman, David J. Grettler, and Jay F. Custer, *Phase I Survey*

of the Proposed Route 13 Corridor, Kent County, Delaware, Delaware Department of Transportation Archaeological Series No. 69 (Dover: Delaware Department of Transportation, 1988), 38-45.

34. Delaware Legislative Petitions, 1826, DLP. Undated petitions, probably from 1825, are included in this file.

35. Legislative Petitions, 1837, DLP. Underlined in the original.

36. Ibid.

37. Legislative Petitions, 1829, DLP.

38. Legislative Petitions, 1825, 1832, and 1833, DLP. The problem of overfishing in historical contexts is ably discussed by Joseph E. Taylor, "Burning the Candle at Both Ends: Historicizing Overfishing," *Environmental History* 4 (January 1999): 54-79.

39. From 1884-1911, the U.S. Army Corp of Engineers dredged at least 923,000 cubic yards of sand and mud from the lower St. Jones River. These efforts failed to keep the channel open and were abandoned during the Depression. REPORT OF THE CHIEF OF ENGINEERS, U.S. ARMY for 1911 (Washington, D.C.: Government Printing Office, 1911), 270-71. The later industrial and transportation history of the St. Jones is documented in Edward Heite, *Archaeological Data Recovery on the Collins, Geddes Cannery Site*, Delaware Department of Transportation Archaeological Series No. 83 (Dover: Delaware Department of Transportation, 1990), 58-60.

40. Donald Worster, *Dust Bowl*, 3. Marx's statement appears in Section 10 of Chapter 15 of *Capital*, abridged edition edited by David McLellan (Oxford: Oxford University Press, 1995), 298.

41. Worster, "Transformation of the Earth," *ibid.* For discussions of how capitalism and environmental degradation went "hand-in-hand" in early America see William Cronon, *Changes in the Land: Indians, Colonists, and the Ecology of New England* (New York: Hill and Wang, 1983), 54-81, 161-62. See also Timothy Silver, *A New Face on the Countryside: Indians, Colonists, and Slaves in South Atlantic Forests, 1600-1800* (Cambridge: Cambridge University Press, 1990), 141, and Michael Williams, "Clearing the United States Forests: Pivotal Years, 1810-660," *Journal of Historical Geography* 8 (1982): 1:12-13, 25.

42. Charles Sellers, *The Market Revolution: Jacksonian America, 1815-1846* (New York: Oxford University Press, 1991), 6. The seminal definition of the capitalist transformation of early America remains Steven Hahn and Jonathan Prude, eds., *The Countryside in the Age of Capitalist Transformation: Essays in the Social History of Rural America* (Chapel Hill: University of North Carolina Press, 1985). Two essays in this work emphasize the role of environmental factors in social and economic change: Gary Kulik, "Dams, Fish, and Farmers: Defense of Public Rights in Eighteenth-Century Rhode Island," 25-50, and Robert C. McNath, "Sandy Land and Hogs in the Timber: (Agri)cultural Origins of the Farmer's Alliance in Texas," 205-32. An excellent recent essay exploring the role environmental factors in the market transformation of the coastal South is Harry L. Watson, "'The Common Rights of Mankind': Subsistence, Shad, and Commerce in the Early Republican South," *Journal of American History* 83 (June 1996): 13-43

43. A good summary of the implications of the current debate over the nature of the colonial economy within the context of agricultural history can be found in Allan Kulikoff, "Households and Markets: Toward a New Synthesis of American Agrarian

History," *William and Mary Quarterly* 50 (April 1993): 342-55. Another exceptionally balanced and well-reasoned treatment can be found in Richard L. Bushman, "Markets and Composite Farms," 351-74.

44. The connections between the capitalist transformation model and the moral foundation of environmental history are also discussed by Richard White. White also cautions against reducing Professor Worster's current assumptions about capitalism and agriculture to crude Marxist terms. As White argues, Worster's agroecological model is indeed more Braudelian than Marxist. See Richard White, "Environmental History, Ecology and Meaning," 1112-15.

45. White, *Organic Machine*, especially ix and 4-7.

46. Similar criticisms of the capitalist transformation model in American history can be found in Allan Kulikoff, "Households and Markets," 353, and "The Transition to Capitalism in Rural America," *William and Mary Quarterly* 46 (January 1989): 120-44. See also Daniel Vickers, "Competency and Competition," 3-29, and Richard Bushman, "Composite Farms and Markets," 351-74.

47. The different historiographic traditions within environmental history and their relationship to capitalism and Worster's agroecological perspective are discussed in Cronon, "A Place for Stories: Nature History, and Narrative," *Journal of American History* 78 (March 1992): 1123, and White, "Environmental History, Ecology, and Meaning," 1114.

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