West Branch Study Committee
Report to the Towns of Addison and Columbia

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I. Introduction and Recent History

Natural tidal flow to the salt marshes on the West Branch of the Pleasant River was shut off in 1940 by the installation of a "clapper dam" at its mouth. Deprived of tidal flow the former salt marsh ceased to perform its role at the head of the food chain in the Pleasant River estuary and became overgrown with fresh water species of vegetation.

Since their construction the tide gates have failed several times and required frequent and expensive repairs. In 1998 the Maine DOT carried out a major renovation.

During the same period of time land owners along the Branch asked the Town of Addison to consider removing the tide gates and restoring the historic salt marshes. In response the Maine DOT had surveys and studies done as early as 1991. In 1999 and again in 2001 the Town requested the United States Army Corps of Engineers (USACE) to prepare a Preliminary Restoration Plan for the Branch. Early in 2003 the Town requested the USDA's Natural Resources Conservation Service (NRCS) to join the study by providing new surveys and analysis.

Following site visits in the summer of 2003 by NRCS and the Corps both organizations submitted reports, NRCS in December 2003 and the USACE in January 2004.

The NRCS report concluded that four road crossings of the West Branch and its tributaries would need to be rebuilt and certain homes, wells, septic systems and agricultural activities would need to be protected. The NRCS engineers also gathered data on the degree of subsidence of the ground level of the old marsh plain.

The US Army Corps of Engineers report (Preliminary Restoration Plan) outlines a four year project that would replace the existing clapper dam with an open bridge across the mouth of the West Branch and address all of the other issues identified in the NRCS report at no cost to any affected land owners. The total project budget is $2.6 million of which the federal share would be $1.7 million. The remaining $900,000 would need to be raised through non-federal contributions to the project.

The Army Corps plan would also provide for rip-rap stabilization of the Town Landing.

II. The West Branch Study Committee

During the summer of 2003 the Towns of Addison and Columbia agreed to form a committee (The West Branch Study Committee) to gather information on the pros and cons of removing the tide gates, address public concerns about such a project and develop alternatives and recommendations for the selectmen of the two towns.

Dwayne Shaw, Executive Director of the Downeast Rivers Land Trust, agreed to serve as Coordinator. Members of the Committee include Selectman Tom Batson of Addison and Planning Committee member Joan McMurray of Columbia along with Planning Committee member Donna Kausen of Addison, Terry Grant, Marilee Lovit and John Marshall.

III. Summary

The WBSC has studied the NRCS and USACE reports, solicited opinions from scientists who are considered world class in their understanding of Gulf of Maine salt marshes, researched the history of the Branch and gathered community opinion and concerns about the project.

The Committee is convinced by the evidence that removing the obstructions to natural tidal flow in the West Branch is the best course for the communities of Addison and Columbia and for the health of the Gulf of Maine as well.

The Committee is also convinced that the project can be funded almost entirely at no cost to the towns.

Finally, the Committee feels that the private property rights of landowners along the Branch must and can be protected.

i. Benefits to Addison and Columbia

The Committee first considered factors directly affecting the local Addison and Columbia economy with particular emphasis on the local shellfish industry. A more detailed discussion of salt marsh biology and its impact on fisheries in included in Appendix II.

For the shellfish industry restoring the West Branch marshes will:

- Materially increase the food resource in Pleasant Bay for clams, scallops, mussels and marine worms.
- Restore the marsh's ability to filter toxic pollutants from run-off thereby protecting the shellfish beds from contamination.
- Reduce the chance of a "red tide" or similar algal bloom in Pleasant Bay by allowing the marsh grasses to absorb excess nutrients such as nitrogen and phosphorus from run-off.

For landowners on the West Branch the committee expects the restoration to:

- Increase the market value of properties.
- Result in no upwards change in property taxes.

From a recreational perspective the restoration is expected to:

- Provide increased opportunities for waterfowl hunting, especially for greenwing teal, mallards and black ducks.
- Lead to a return of sea run brook trout to Pleasant Bay.
- Attract striped bass into the Pleasant River estuary.
- Support larger populations of smelt, tom cod, eels and other species.

From an education perspective the restoration offers a wealth of opportunities for local secondary and high school students to:

- Learn ecological concepts that are relevant to their own lives in Maine.
- Participate in baseline, before-and-after and monitoring studies on the salt marshes.

The restoration of the Branch will also foster tourism:

- By virtue of its beauty and wildlife the marsh will attract bird watchers and other nature oriented tourists, thereby supporting the local economy through their expenditures for lodging food and fuel.

ii. Benefits to the Gulf of Maine and the State

The restoration is also the right thing to do when one considers the best interest of the Gulf of Maine as a whole.

At least two thirds of commercial fin fish, shell fish and bait species, including smelt, sea run trout, striped bass, alewives, flounder, blue back herring, clams, mussels, scallops, lobsters and sand worms landed in the Gulf of Maine depend on estuaries and coastal wetland habitat at some point in their life cycles.

Many marine fish such as winter flounder and striped bass need salt marshes as breeding grounds or nursery habitats for juveniles. But other Gulf of Maine fish do not even need to enter salt marshes to benefit from their productivity. When small fish and crustaceans that feed in salt marshes move into off-shore areas and are eaten by larger predator fish, such as cod, pollock, haddock and several other species, they transfer salt marsh derived nutrients directly into the marine food web.

Every step forward towards the restoration of healthy populations of once abundant cod, had-dock, pollock and flounder is important to all of Maine. Improved habitat continuity between land and sea and increased biodiversity have less obvious, but important benefits to the Gulf of Maine as well.

IV. The Need to Act at This Time

The Committee believes the restoration will be good for the local community and for the State of Maine. But why act now?

In summary, there are four compelling reasons:

- The community leadership is presently in place to get this project done properly under local control.
- Right now we can put together a partnership of federal, state and non-governmental organizations and individuals to fund the project at extremely low cost to the towns.
- The biological situation and ultimately the feasibility of restoration will get worse with time.
- At some future time the Maine DOT may require the Town of Addison to take financial responsibility for the gates.

Residents have been asking that restoration of the West Branch be seriously considered at least since 1991. Right now we have forward looking Selectmen in both towns who can provide the critical local leadership to get this done.

Right now we also have the core funding in place. Under the direction of our local Selectmen two federal agencies, the US Army Corps of Engineers and the USDA's Natural Resources Conservation Service can presently commit multi-year budgets to this project which will provide at least 65% of the total funding.

Our federal funding for the four year project is presently secure despite the recent budget cuts to USDA and USACE. However, if we decide not to go ahead now and wished to resume the project sometime after the 2004 elections we would have no guarantee that funding would still be available at that time.

Another concern (discussed in more detail in Appendix II) is that the elevation of the West Branch marshland is slowly subsiding as oxidation eats its way through the peat rich soil. Surveys by the NRCS and by WBSC members show that about two feet of vertical height may have already been lost over much of the old marsh. Once the subsidence reaches three to four feet natural regeneration may become impossible. At that point the greatly increased costs and the physical impracticality of restoring the marsh begin to put the project permanently out of reach.

Another biological issue is that two non-native plant species, purple loosestrife and Phragmites, are already a major problem in southern Maine and are steadily spreading northwards. As things stand at the moment the old West Branch marsh plain, unprotected by occasional salt water baths, is vulnerable to invasion by these aggressive species which thrive in a fresh or brackish water environment. Once introduced they will spread and choke out native vegetation unless tidal salt water flow is present.

These alien plants are very difficult and very costly to eradicate once they are established. On a national basis invasive non-native plants degrade more habitat each year even than urban growth.

Finally, the Committee believes that we have been fortunate that the Maine DOT has maintained the tide gates at their expense up until now rather than turning them over to the town. Because these tide gates are not essential to the highway function of the bridge over the Branch the DOT would probably be within their rights to ask the town to take over their maintenance. So far this hasn't happened, but one can imagine a future budgetary and political climate in which the town would inherit a very costly responsibility.

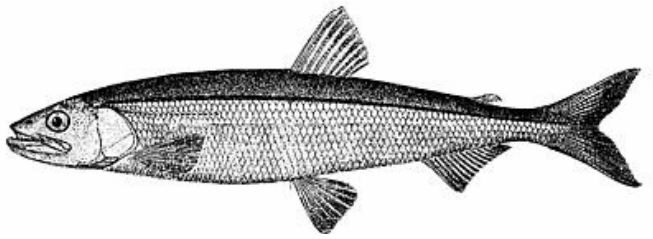
V. Conclusion

When local marshes were first managed for hay in the late 1700's their productivity was essential to support the new communities of Addison, Columbia and Columbia Falls because salt hay was the best fodder available for draft animals. At the time, and even in 1940 when the tide gates were installed, no one could have known how critical the marshes also were to the health of the Pleasant River estuary and its exceptional fisheries and shellfish beds.

It is very rare indeed to be able to reverse the apparently inevitable trend of damage to the environment. Often we must be satisfied to do no more than protect what remains of Maine's once fabulous resources without being able to undo the unintended harm that has been done in the past.

Here in Addison and Columbia we have a much greater opportunity, the chance to restore to full vitality a nearly 300 acre lost salt marsh that, if nothing is done, is headed inevitably towards the point of no return when it can no longer recover.

Today hay is no longer essential to our communities and there is no longer a compelling economic reason for continuing to exclude the tides from the West Branch. On the contrary, the health of the Pleasant River estuary, its shellfish beds and recreational fisheries are essential to our local economies and our local way of life. **The Committee believes that the greatest local good will be served by restoring the Branch salt marshes and that doing so is the right thing to do for the Gulf of Maine as well.**



Rainbow Smelt
Drawing from the Department of Marine Resources

VI. Appendicies

Appendix 1: History of the West Branch

Appendix 2: Biological Importance

Appendix 3: Community Questions and Concerns

Appendix 1: History of the West Branch

A Brief Human and Geological History of the West Branch Bridge and Salt Marshes

Author's note: This report is part of continuing research on the local history of salt marsh dykes along the Pleasant River. In this report I wrote about certain aspects of this history that seem to be relevant to the West Branch. I welcome any additional information about this local history topic. Photos are courtesy of the Maine Department of Transportation, prints made by the author using MDOT negatives.

In 1940 a new bridge with tide gates, or clapper valves, was built over the West Branch of Pleasant River in Addison. Only people born in the 1930's or earlier can remember what the West Branch was like before the bridge with clapper valves was built. A look at geological and historical records of the West Branch, its bridges, and human use of the stream and its marshes can give us a glimpse into the past as well as some perspective on the present.

The story of the West Branch began thousands of years before settlers arrived and started harvesting marsh hay.

The coast of Maine has been on a wild ride since the last glacier, pressed down by the weight of ice, then rebounding to its former level after the ice melted. About 13,000 years ago the edge of the ice sheet shrank northward, and melting ice caused sea level to rise. But the coast of Maine did not spring back as fast as the ice melted, so for a while all of Addison and much of Columbia and Columbia Falls were underwater. Compared to present sea level along the coast, the ocean was approximately 73 meters higher at its extreme "highstand" about 13,000 to 12,500 years ago (Belknap et al.1987:81). During this time, beaches and other marine shorelines were created, which are now miles inland from the coast. Pineo Ridge in Columbia is one such formation. A "wave-cut cliff" is visible along the south side of Pea Ridge Road, and is "one of the best examples in the United States of an emerged late-glacial marine shoreline"(Borns 1995:77). While ocean waves were lapping at Pineo Ridge, fine marine clay settled out over all the submerged Maine coast, leaving a layer of clay which came to be called the "Presumpscot Formation" because of having been studied near the Presumpscot River in southern Maine.

The earth finally rebounded from the weight of the ice, and the ocean retreated away from the coast to a "lowstand" 65 meters lower than present sea level, about 9,500 years ago (Belknap et al.1987:81). Since then, sea level has risen, rapidly for the first several thousand years, and slowing to around 1.44 mm per year roughly 5000 years ago (Belknap et al.1989: 99).

For thousands of years, weather worked on the marine clay left behind by the ocean eroding the clay from high spots down into lower places. As rising sea levels came higher and higher into the Pleasant River valley, tides also moved the clay. Rising tide has a greater ability to move sediment than ebbing tide, and thus more clay is brought up into the river valley on a rising tide, than is carried out on the ebb. The upper estuary is a "sediment trap" and becomes back-filled with clay (Little 2000, Pethick 1989).

The extensive mudbanks and mudflats of the Pleasant River and West Branch were formed in this way. No one has measured how deep all the mudbanks are, but the West Branch bridge construction in 1940 included pilings driven 35 feet down into mud, across the center of the stream channel, without hitting bedrock. Prior to building the main bridge over the Pleasant River in 1981, the Maine DOT tested the depth of the clay at that location, and found it to be as much as 70 feet deep.

While tides were moving more and more mud up into the Pleasant River and West Branch, salt marshes began to grow. Sea level rise was too rapid for salt marsh formation until about 4000 years ago, and that is approximately when the very first salt marshes, which still exist today, began to form on the Maine coast (Kelley et al. 1987:653).

The plant that begins to establish a salt marsh is "cordgrass" or "thatch" (*Spartina alterniflora*). This grass is able to grow in places flooded by every tide. The plants slow down tidal currents, causing even more sediment to be deposited around them. This additional sediment, with peat produced by the plants, gradually builds up to a level that is flooded less frequently. At this elevation another salt-tolerant marsh grass becomes dominant, "salt hay" or "salt marsh hay" (*Spartina patens*). A thin, wiry grass with a cow-licked appearance in late summer, salt marsh hay is the grass that was historically harvested on salt marshes. Through years of accumulating plant material and sediment, salt marshes grow upward and landward, keeping pace with rising sea level. Marsh "soil" is really a salt- and water-saturated peat, in some places up to 4 or 5 meters thick, though no marshes in Maine have been found deeper than 5 meters (Belknap et al.1989:91).

Over time the marsh develops with distinct zones of "high marsh" and "low marsh". High marsh is dominated by salt marsh hay and is flooded only irregularly, by higher than average tides. Cordgrass dominates the low marsh, which is flooded by nearly all tides. Along the Pleasant River, low marsh is mostly confined to the sloping riverbanks, where cordgrass grows from about high tide line down to nearly half-tide. Low marsh is also found along the banks of creeks and brooks flowing through the high marsh.

The distinct high and low marsh zones have made it possible for scientists to use salt marshes to study the rate of sea level rise. The roots of high marsh plants are approximately at the same level as high tide. Salt marsh peat found at different depths can be dated by radiocarbon analysis. Thus, peat of typical high marsh plants found at a depth of 3 meters and dated as nearly 3000 years old, indicates that sea level was 3 meters lower than our present sea level 3000 years ago. Addison was selected as a primary site for this type of research in 1973, and 1981-1985. Cores taken from the high marsh between Marsh Island and the mainland on the west side of the Pleasant River were studied at the University of Maine, and analyzed at the Smithsonian Institution's Radiation Biology Laboratory. Using information from the Addison salt marsh cores, and cores from other sites on the Maine coast, scientists have been able to determine the rate of sea level rise over the last several thousand years. Along the Maine coast sea level rose 1.44 mm per year from about 5000 years ago until 1500 years ago, then slowed to .5 mm per year until very recently (Belknap et al. 1989:100). Within the last century, sea level rise has accelerated to between 2 and 3 mm per year on the Maine coast (Kelley et al. 1988:662). Because Addison was chosen as a study site for this research, we have accurate information about the age and depth of one particular Addison salt marsh: roughly 4000 years old and four meters deep (Belknap 1989:104). No cores were taken on marshes farther upriver, but it is likely they are of similar age or some centuries younger.

The abundant salt marshes along the Pleasant River and West Branch were a great attraction to early settlers. Marshes provided hay, and meant animals could be fed over the winter, even before any upland was cleared and converted to field or pasture.

It is hard to pin down exactly when the first dykes were built on Pleasant River and West Branch marshes. French settlers in the Minas Basin (now Nova Scotia) had begun dyking salt marshes during the first half of the 1600's. But British settlers in New England probably did not build dykes until the 1770's on the Massachusetts coast (Smith et al. 1989:128). In 1790 a farmer's handbook was published in Massachusetts, which described in detail how to build dykes on marshes (Deane 1790). From deeds and probate records we know some dykes had been built in Addison, then Township #6, by 1793. Two of the earliest dykes, already in existence by 1793, were along the West Branch.

Early settlers could harvest salt marsh hay without altering the marsh landscape, but a better crop was had by making certain improvements: dykes, ditches and sluices. Dykes were built set back from average high tide, to allow for some higher than average tides to flow up over the outer portions of the high marsh, but to stop any extreme tides from being able to flood over the whole area of high marsh. Ditches were dug to drain marsh ponds and to channel water into other ditches and finally into creeks flowing out into the river. Sluices of various sizes, depending on the size of the creeks and ditches, were built into the creeks to facilitate drainage of the marsh. The sluices were rectangular wooden boxes, open on each end. "Clappers" or "shutters" (Deane 1790) on the downstream end of the sluices permitted water to flow out into the river at low tide, but shut against incoming tides.

French Acadians in what is now Nova Scotia used the word *aboiteau* for sluice structures. This word is unique to Canadian French and does not appear in general French language dictionaries. "The word *aboiteau* is a curious one, used not for the dyke itself but for the clapper valves (wooden gates on horizontal hinges) which opened seaward to let out the fresh water from the streams and drains behind the dykes at low tide, and were forced closed by the incoming tide" (Clark 1968:30,162). Very likely *aboiteau* and the plural *aboiteaux* are the source of the local place names in Addison and Columbia, the "First Arbatore" and "Second Arbatore", located on the road between Addison Point and the Four Corners shopping area in Columbia. This local word is spoken, but seldom written, and the spelling used here is only one suggestion. Other possibilities include "Arbadore", "Abatour", etc. There were large *aboiteau* structures at both of these local places, in each instance west of the existing road, where part of the earthen dams can still be seen on opposite banks of the streams, although the wooden *aboiteaux* are long gone. It remains a mystery how this word arrived in Addison and Columbia, since settlers in these towns were mostly Bristish, and possibly none were French. The 1790 manual for farmers published in Massachusetts, never used the Acadian word. The word does not appear in any early deeds of marsh land near the "Arbatores" in Addison and Columbia. Instead, the Columbia "Arbatore" was called the "Upper Dyke" in early deeds, and the area of the "Arbatore" in Addison was the "Great Cove" in early deeds.

Whatever the terminology, the purpose of the dykes was to keep tides from flooding the high, level areas of marsh. Dyking made the marsh peat less soggy and easier to walk or drive over with oxen, to harvest the salt hay. Also, the typical "high marsh" grass harvested as salt hay could produce a larger crop. Partly freed from salt stress, the grass could put more energy into growing stalks and leaves. The Acadians in Nova Scotia had converted salt marsh into farmland that grew crops other than hay, such as peas, wheat, and other grains (Clark 1968:164). But there is no evidence that Pleasant River and West Branch marshes grew anything other than salt marsh hay, possibly with a few minor exceptions. After retiring from M.I.T., Professor William J. Drisko of Addison Ridge plowed a small piece of his marsh on the West Branch and successfully raised turnips, but this was just a brief experiment. "In good times- i.e. when the Drisko marsh was kept free of salt water, we raised a lot of hay—marsh hay, to be sure, but it was *hay*, and a valuable addition to the English (upland) hay. After his retirement, my father, who always enjoyed new or 'experimental' projects, tried raising turnips…on the marsh and it was a great success" (Drisko 2003).

West Branch Bridge with coal shed and wharf, shortly before construction began on the new bridge, July 2, 1940.

View of the bridge, road, and tide gates in the year following construction, May 9, 1941.

The old West Branch bridge, June 26, 1924.

A steam powered hammer was used to drive pilings 35 feet down into the mud. July 24, 1940.

There is some question as to how completely the old dykes blocked the tides. According to some accounts, marsh owners would occasionally open their sluices so that extreme high tides could flood over the high marsh. The purpose for this would be to keep out unwanted fresh water plants, and to continue the dominance of salt-tolerant marsh hay. There is no evidence whether this was done in Addison, and in the memory of John B. Drisko, son of Professor Drisko, it was not done.

Even during the hey-day of dyking, it is probable that the marshes were not entirely deprived of salt water. Every tide still covered the low marsh, and higher than normal tides would at least reach the dykes and cover the high marsh outside of the dykes. Dykes and sluices leaked and sometimes failed and broke. Patricia Abbott MacNamee, daughter of Frank Abbott, recalls her father repaired leaking dykes at the Arbatore in Columbia. She also recalls the large wooden sluice at that location washing out entirely sometime in the 1920's. The tide carried it upstream nearly to Route 1, where neighborhood boys anchored it down, so they could dive from it in a swimming hole there at high tide. As the demand for hay declined, many dykes and sluices deteriorated. Professor Drisko's sluice had slowly failed and in the 1920's he built a new section of dike with a new sluice, which also failed. Though dyked in early days, the marsh which lies just north of the Ridge Road leading west from the bridge had not been drained in the 90+ year memory of John B. Drisko (Drisko 2003). A local newspaper story in 1884 gives additional evidence that the old dykes did not completely keep the tides out of the West Branch marshes. "Dykes have been kept up [on the West Branch] ever since the town was first settled at a large cost and with much controversy and want of harmony on account of titles and conflicting interests. Much loss of hay has been incurred at periods owing to the neglect of repairs on the dykes" (*Machias Union*, August 5, 1884).

The highest tides of the year occur in the winter (http://co-ops.nos.noaa.gov/restles1.html), and these may have breached some dykes without damaging a standing hay crop, especially dykes that had been allowed to deteriorate. If this did happen, the influx of salt water would have helped to ensure the continued dominance of salt marsh hay to the exclusion of fresh water plants.

Many of the old dykes are still visible, though not as prominent as when they were first built and maintained. Most dykes on the main Pleasant River were neglected and abandoned by the first part of the 20th century. Storms and winter ice have eroded them, and new marsh peat has accumulated around them, leaving less of the original dykes still above the marsh surface. Some of the smaller sluices, or parts of them, remain lodged in the more protected drainage ditches and creeks, but the larger sluices all washed away long ago. Tides have returned to all the marshes along the main Pleasant River, where salt marsh grasses, sedges and rushes flourish. West Branch marshes would undoubtedly be in the same condition, if not for the tide gates installed in 1940.

Addison Point might seem an unlikely name for the village that bears it. But this settlement was indeed a point, the point between the two branches of the Pleasant River. It was an important point for navigation and trade, and much of the activity centered on the wharves and shipyards located at the mouth of the West Branch. For much of the 19th century generations of the Nash family launched vessels from their shipyards on both sides of the West Branch at Addison Point, and wharves were built to accommodate the schooners that brought merchandise to Addison and loaded lumber for export. The current public landing at Addison Point has a long history as shipyard and loading area for sailing vessels.

Lumber was a major export item from the West Branch wharves at Addison Point. Most of the lumber came from sawmills at what is now Columbia Falls. But the West Branch also had a sawmill, built by Isaac and Abraham Nash by 1808. This mill was located in the town of Columbia, along Route 1 just west from what is now known as the Cross Roads or Four Corners shopping center. An 1811 deed also refers to a "landing" near the mill. Lumber was rafted down both branches of the river, to be loaded onto vessels at Addison Point. "Addison Point is…at the forks of the river and at the place where vessels generally stop to take in their load in consequence of taking lumber down both branches of the river, and many times to complete their load after they have been up the maine river for a part of it" (Maine State Archives).

In 1824 Addison built the first wooden bridge over the West Branch, in approximately the same location as the current bridge with tide gates. Permission from the state to build this first bridge required that it be "so constructed that a gondola loaded with hay may pass under the same" (Maine State Archives). Also in 1824 the first road was built leading west from the new bridge, across what was then dyked marsh belonging to Jeremiah Drisko (Addison town records, 1824).

It may be hard today to imagine shipyards on the West Branch near Delia's store and the Four Corners in Columbia. But for a few decades vessels were built at two or three such yards. Schooners and brigs were taller than gondolas loaded with hay, so the bridge in Addison was an obstacle. In 1850 Ransom Nash of Columbia and 52 others petitioned the State of Maine regarding Addison's bridge over the West Branch. Since the tide flowed three miles above the bridge and vessels were built at or near the head of tide waters, the petitioners requested Addison's bridge be changed to a drawbridge (Maine State Archives). One schooner built on the West Branch was the two-masted, 95-foot-long *Gertrude Plummer*, launched June 3, 1871 (*Machias Union*, June 13, 1871). Two other vessels probably built in these Columbia shipyards were the schooner *Mary*, built in 1869, and the brig *Minnie Miller*, built in 1856 (*Ship Registers and Enrollments* 1942).

By 1884 there was no more shipbuilding on the West Branch, and the *Machias Union* reported that marsh owners were looking into the feasibility of building a dyke across the West Branch just above the bridge in Addison. "Until within a few years mills and shipyards on the Branch have prevented closing the river by a main dyke. It is probable that mill proprietors and shipbuilders will make no objection as these industries no longer flourish [on the West Branch]… If proprietors of the dyke and marsh lands can agree to build a main dyke… it would do away with all dykes above and bring a large area of low marsh into valuable hay producing lands" (*Machias Union*, August 5, 1884). Apparently the marsh owners did not succeed with this idea in 1884, and the West Branch remained open until 1940.

In 1937 an unsigned "statement of facts" was filed with the state of Maine, requesting authorization to build a dam across the West Branch. Now in the state archives, this statement gave road and bridge maintenance as the sole reason for damming the stream. Extreme high tides sometimes flooded over the road leading west from the old bridge, and also a few sections of road upstream. At the 1940 town meeting Addison's voters approved the new bridge project, authorizing the selectmen to raise the town's projected share of the cost, $2,467. (There was an over-run. According to DOT records, the town ended up paying $2,467.16.)

The Branch at high tie, north of Route 1 in Columbia. This view looks east, toward the Four Corners. A saw mill had been located near this spot.

Fresh water flowing out through the clapper valves at low tide, May 9, 1941.

Construction of the new bridge began in July and was completed by the end of October, 1940. The entire length of road over the marsh was built up above the highest astronomical tides and reinforced with stone rip rap along the southern side, facing Pleasant River. The channel of the West Branch at the location of the bridge was narrowed by adding fill in the bottom and on the sides of the stream, and by construction of six side-by-side wooden box culverts with clapper valves under the bridge. The project brought jobs to Addison, such as hauling fill and stones and providing the timber and log pilings. The jobs and a new bridge must have been appreciated in Addison Point, which had suffered a devastating fire just two years earlier.

Though the hay market had declined before 1940, some owners of West Branch salt marshes still harvested salt hay, mostly for burning blueberry ground. The new bridge with tide gates meant dykes no longer had to be maintained to keep the highest tides off the high marsh. But the tide gates were a big departure from the old dyking techniques. The tide gates completely stopped the passage of fish and exchange of nutrients between the West Branch marshes and the Pleasant River, and by totally depriving the marshes of the tides that had created them, set in motion the gradual death of the marshes themselves. The West Branch now may be called a fresh water "impoundment", a much more common habitat than salt marsh. No scientific assessment has yet been made of exactly what species now occupy the fresh water impoundment, but many areas now produce fresh water and upland plants such as sensitive fern, meadowsweet, and roses. Some areas do still have hay, though probably not the true salt hay that dominates salt marsh. This is not necessarily negative, because the hay that does grow, can be very useful for agricultural purposes. What is negative, is that the type of habitat that has been displaced—salt marsh—is one of the most rare in Maine, and one of the most critical to the productivity of the estuary and coastal environment.

A recent historical study of Gulf of Maine cod stocks found that coastal cod populations declined, and many in eastern Maine disappeared, due to a combination of events over the last century. Motorized boats and new trawling techniques caught fish when they were spawning rather than feeding, and would not have been caught with bait and hook. In addition, numerous dams had decimated the stocks of shad, alewives and blue-back herring, which need to reach fresh water to spawn. Shad, alewives and blue-back-herring were primary forage fish for cod. They had drawn cod into bays like the Pleasant, and had helped sustain cod spawning grounds close to rivers. The reopening of dammed coastal streams, and restoration of river herring may be critical, if coastal cod fisheries are ever to be restored (Ames 2004).

Only time will tell if cod populations can be rebuilt close to the Maine coast. More certain, if the West Branch is opened, would be the return of smelt, tom-cod, blue-back herring and sea-run brook trout, all of which formerly occupied the West Branch, and all of which need to reach fresh or brackish water to spawn. Patricia Abbott MacNamee recalls her family netted smelt for two or three weeks each spring, in their pasture north of Route 1, along with an occasional eel or trout. Lawrence Drisko, late of Columbia Falls, was known to tell of catching "buckets" of sea-run trout in Bells Brook, a tributary of the West Branch. These fish could rapidly return to a re-opened West Branch.

In the 1969 classic, *Life and Death of the Salt Marsh* John and Mildred Teal wrote, "Unless we destroy them, our most valuable fisheries will always be those associated with the marshes and estuaries" (Teal 1969:210). Probably more than the marsh hay, valuable fisheries such as cod also attracted the earliest settlers to the Pleasant River. Jeremiah Plummer settled on Addison's West Side, and spread the news to other prospective settlers: "In 1770 word came to Martha's Vineyard that cod were plenty in

[Pleasant] River near Jeremiah Plummer's house. Mention was also made of the abundance and fine quality of meadow grass on Plummer's and other meadows" (The Addison and Harrington Register 1905:8). Today we are beginning to understand that the supplies of cod and marsh hay, both abundant in 1770, were linked. Returning tides to the West Branch, and salt marsh to its shores, would re-establish this link and recover a valuable and productive natural system to the coast of Maine.

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Appendix 2: The Biological Importance of Salt Marshes

Addison, with its local economy centered on the biological wealth of the Pleasant River estuary and of the nearby waters of the Gulf of Maine, shares an uncertain future with many American communities that are dependant on healthy wetlands and aquatic ecosystems.

According to a joint recent publication of the National Oceanic and Atmospheric Administration and the US Environmental Protection Agency the contiguous 48 states have lost 54% of their wetlands since 1800. Of more immediate concern to us is the fact that 80% of New England's salt marshes have been lost while most of the remaining salt marshes in eastern Maine have been degraded to some degree by dyking and draining. Today the coastline of Maine has only 20,000 acres of salt marsh remaining.

These losses and alterations of wetlands deprive Maine communities of the important benefits salt marshes provide: protecting water quality, providing habitat for a wide variety of plants and animals and fueling the base of the food chain supporting commercial fisheries for fin and shellfish.

A 1991 study by James R. Chambers determined that about 75% by weight of commercially harvested finfish and shellfish are dependant on estuaries and their wetlands.

Sea levels have been rising for over 10,000 years following the last great glaciation and salt marshes have proven to be remarkably adaptive systems, growing vertically to keep up with the rising ocean. Initially taking hold on tidal flats immersed twice daily by the tides, stands of *Spartina alterniflora* (smooth cord grass) build a peaty soil by capturing fine sediment from the water while the annual decomposition of the grasses adds organic material. Over the last 4,000 years such "low marshes" in eastern Maine have built soil faster than the sea level has been rising and most of eastern Maine's major marsh surfaces are now "high marsh" that are only flooded by unusually high tides.

Today Addison's salt marshes rest on a bed of up to 13 vertical feet of self-created peat. Once a salt marsh has risen to the point that normal daily tides no longer cover it, the prevalent smooth cord grass of "low marsh" will be supplanted by characteristic high marsh grass, *Spartina patens,* called salt hay. With fewer tides bringing silt to the high marsh surface the rate of vertical growth now slows so that it just keeps pace with sea level rise. Periods of high water level deliver enough sediment to help growth, but in periods of lower water levels oxidation of the peat in the soil takes place as aerobic bacteria and fungi feed on it and the marsh level subsides.

When marshes are shut off from daily tides this naturally balanced equilibrium is upset. There is no longer any sediment capture at all and the oxidative forces take over. The marsh soil is eaten away at a surprising rate and the level of the surface subsides much faster than it was built up. Whereas salt marsh with normal tidal flow can grow vertically up to 6 - 12" per century, marshes shut off from the tides may subside up to 5 or 6 times faster. Subsidence of 3' - 6' per century has been measured on former salt marshes in Maine that have been totally shut off from tidal flow.

Dr. David Burdick of the University of New Hampshire's Jackson Estuarine Laboratory estimates that once the level of a former marsh has subsided by 3 - 4' its chances of natural, unaided regeneration are poor. If natural tides are reintroduced to marshes that have subsided this much the marsh will be immersed for so long and the depth of water will be so deep at each high tide that even the low marsh grasses (cord grass) can't take hold and flourish. Restoration of marshes that have subsided to this degree

is not impossible, but it usually requires long, complex and expensive hands-on management of the recovery process. A system of electronically controlled tide gates can be used to admit only limited tidal flow while the salt grasses take hold and slowly begin to build their own soil. Extensive filling to raise the marsh level can also be done.

Because of the relatively enormous cost of such restoration efforts and the much longer time frame for recovery that one faces once subsidence reaches into the 3 - 4' "zone of no return" it is far better policy to restore natural tidal flow sooner rather than later and then allow nature to take its course. Such passive restoration projects in Maine have produced excellent recovery of biological function over the first 2 - 4 years and nearly 100% recovery within 10 years.

Salt marshes are the all important biological engines that power the productivity of the entire Gulf of Maine. Because they are rich in organic matter, nutrients and minerals they capture solar energy and convert it to plant material even more efficiently than a tropical rain forest or the most productive agricultural land of America's midwest.

The plant material produced in the marsh directly support visiting species such as migratory shore birds, teal and black ducks that eat both the grass seeds and the many small invertebrates and minnows that live and feed in the marsh. The energy rich marsh also serves as a spawning area for fish like striped bass and flounder and as a nursery for their fry.

The biomass that salt marshes produce is all important at the base of the food chain for many of the Gulf of Maine's most valued commercial and recreational marine species. Small salt marsh fish, like mummichogs, silversides and sticklebacks, are a favorite food source for predators like striped bass, blue fish, sea run brook trout and Atlantic salmon. They and crustaceans that feed in salt marshes and then move into offshore areas to become food for larger creatures are also essentially transferring salt marsh derived nutrients into marine food webs. Fresh water spawning species like alewives and smelt that use the marsh channels to reach their spawning grounds upstream are also important forage fish for cod, haddock and pollock.

Ted Ames, a commercial fisherman and Chairman of the Penobscot East Resource Center, has researched historic cod and haddock spawning areas in the Gulf of Maine. He has concluded that closing off rivers and tributaries has materially damaged the inshore cod fishery as well as populations of anadramous fish like alewives, sea run brook trout and smelt. He is quoted as saying that "Reopening coastal rivers and streams is critical to rebuilding anadramous and estuarine stocks", an opinion shared by many marine biologists.

<u>Gulf of Maine Fish that are Dependent on Salt Marsh</u>

A. Small fish that live in the marsh and are key forage species:

<u>Mummichogs</u>: important forage fish, would be a major biomass component of a restored West Branch marsh.

<u>Atlantic Silversides</u>: abundance and significance of this species in the Pleasant Bay region is unknown; may be a significant component of the forage base in certain high temperature years – particularly in brackish water areas of the marsh.

Stickleback (3 species): important forage fish.

B. Anadromous fish that migrate from salt water through the marsh to reach spawning beds in fresh water:

Rainbow Smelt: commercial and recreational uses. Anecdotal evidence exists to suggest significant use of the West Branch sub-watershed by this highly productive species before 1940. Smelts are near the base of the food web and serve as an important forage base for many gamefish including bluefish, striped bass, sea-run brook trout and Atlantic salmon.

Sea-run Brook Trout: often reach 12 - 18" and can be a very important gamefish where locally abundant. Anecdotal evidence exists to suggest significant use of the West Branch sub-watershed by this species before 1940.

Blueback Herring: riffle spawning species, related to alewives, shad and ocean herring. Often mistaken for alewives. Generally thought this species was plentiful throughout the Gulf of Maine. Historic use of this sub-watershed by this highly productive species is very likely. Herring are plankton feeders and as such make up an important component in the food web. Bluebacks are near the base of the food web and likely serve as an important forage base for many gamefish including bluefish, striped bass. Also important as a source of lobster bait.

C. Other fish that are likely to use the marsh:

Tomcod: spawn in estuaries. Recreational and home consumption uses (commercial markets existed up until 1940's); anecdotal evidence exists to suggest significant use of this sub-watershed by this highly productive species. Tomcod are likely to serve as an important forage base for many gamefish including bluefish, striped bass, sea-run brook trout and Atlantic salmon.

Striped Bass: unlikely to spawn in this region but the species does range into the Pleasant River watershed during summer months feeding on marine worms and various forage fish.

American Eel: spawns at sea; returns to marshes as an adult. Important food source for striped bass.

D. Predator fish of the estuary that prey on smaller marsh associated fish:

Atlantic Salmon
Sea-run Brook Trout
Cod
Halibut
Pollock
Striped Bass
Haddock

E. Other predators that feed on marsh associated fish:

Black Duck	**Hooded Merganser**
Blue Heron	**Kingfisher**
Bufflehead	**Osprey**
Cormorant	**Red-Breasted Merganser**
Eagle	**Snowy Egret**
Golden Eye	**Tern**

The health and abundance of salt marshes at the heads of estuaries is also of supreme importance to shellfish like clams, mussels and scallops and to marine worms. As dead marsh grasses break down and decompose much of the resulting detritus along with its associated bacteria and fungi is released into the waters of the estuary. Every ebb tide carries this flush of nutrients from the marsh into offshore areas where it is eaten by a variety of consumers, notably marine worms, clams, mussels and scallops. Along with plankton and algae marsh derived detritus is essential sustenance to these creatures which filter such microscopic food from the water. According to Dr. Michele Dionne of the Wells National Estuarine Research Reserve "salt marshes feed the clam beds and mussel bars" as their nutrients are transferred into nearby estuaries and consumed by the filter feeders.

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Salt marshes perform two additional functions that are vitally important to commercial shell fishing. First, salt marshes filter many of the toxic pollutants from run-off that can cause beds of clams and snails to be closed. Such pollutants are often carried on sediment particles that settle in the marsh and stay buried there limiting their impact on the downstream ecosystem.

Salt marshes have a second important cleansing function. They absorb excess nutrients such as phosphorus and nitrogen that come from fertilizers, detergents, animal waste and sewage, and that would otherwise trigger algal blooms in the estuary. Such "red tide" blooms can also result in closed fisheries because the shellfish concentrate toxins from these algae that are harmful to humans.

Appendix 3: Community Concerns and WBSC Recommendations

As part of its study the West Branch Study Committee members have had informal discussions with interested residents and selectmen of Columbia and Addison and been asked to address a number of questions about a potential project to remove the West Branch tide gates.

Getting reliable answers to these questions is a "work in progress" since research is continuing. With that in mind, the following is a preliminary review of some key concerns of local citizens along with the Committee's recommendations to the selectmen of Columbia and Addison based on that research.

I. Who Will Pay for the Restoration of the West Branch?

This is perhaps the biggest question of all because the scope of the project is clearly very large – *ie* a new bridge of 100 - 150' span to replace the existing but deteriorating tide gates, three other road crossings to be rebuilt, several thousand feet of road to be raised and rebuilt, individual land owner issues to be solved (buildings, wells, septic systems and dikes, for example) and a town water line to be modified. The town landing also needs to be stabilized and upgraded, a substantial task.

The US Army Corps of Engineers "Preliminary Restoration Plan", prepared at the request of the Town of Addison, calls for a four year project to address all of these issues and costing over $2.6 million. The Army's proposal includes a commitment to cover 65% ($1.7 million) themselves. The remaining $900,000 must be raised from non-federal sources.

Although the two towns cannot afford a project of this scope, the towns and landowners along the Branch are in an excellent position to request support from other partners both governmental and among local and regional conservation organizations. Since Maine Department of Transportation (ME DOT) has direct responsibility for the Ridge Road bridge and any state highways that are involved DOT would be a likely partner for this project.

We can also request support from agencies like the NOAA Fisheries Division, the US Fish & Wildlife Service and major Maine based conservation organizations including The Nature Conservancy, Conservation Law Foundation and Maine Coast Heritage Trust. Local organizations like Great Auk Land Trust, Pleasant River Wildlife Foundation, Downeast Rivers Land Trust and Pleasant River Watershed Council will be able to help with smaller but highly targeted and strategic financial support and many hours of volunteer work which will count as "matches" to leverage the federal funding.

It is the opinion of the Committee, based on meetings with senior representatives of many of the above organizations, that if we act promptly this project can be accomplished with little or no cash cost to the towns.

However, before a fully detailed funding plan can be developed and reliable commitments secured the towns of Addison and Columbia need to progress through several steps.

Step 1 – The towns need to agree they want the project to happen. This could be accomplished by a simple warrant item at the March town meetings expressing the desire of the towns to remove the gates, restore the marshes and improve the local roads and town landing. **As a first step the WBSC recommends presenting the question at the March town meetings in Addison and Columbia. –** *"To see whether the Town wishes to restore tidal flow to the West Branch of the Pleasant River, subject to the provisions that the Town bear no financial costs in excess of $5,000.00, that the Town landing be protected and upgraded, that private homes, wells and septic systems are protected and/or upgraded, and that the final plan be approved by the Selectmen of the Town of Addison.*

Step 2 – So far we have developed a rough design of the project and identified who would be involved as major partners (USACE, ME DOT, NRCS/USDA, for example). We can now work with these lead organizations to develop a more detailed project description and a budget <u>consistent with the towns' requirements and objectives.</u> *If the towns wish to continue with the USACE this step would be to request a detailed Feasibility Study from the Corps.*

Step 3 – Next, we would identify and enlist our other major financial partners – *ie* sources of funding +/or financial guarantors – based on plan and budget.

Step 4 – Finally we would seek final approval for any town funds, if they were required, at town meetings in Addison and Columbia.

II. <u>The Use of the West Branch Restoration as a Mitigation Project</u>

Will the restoration of the West Branch be used as a "trade" to offset or mitigate the destruction of wetlands in another part of the State? Will we be required by state or federal authorities to participate in a mitigation project?

Whether or not the Branch is used as a mitigation project is a decision for us to make. <u>There is no requirement</u> to be involved in such a "trade". One possible source of funding is indeed a company that has a project of theirs that will adversely effect wetlands and that is required by the authorities to "make amends" by restoring or creating an offsetting wetland area. However, while this money may seem attractive there is an important negative associated with it – namely that other <u>even more important</u> sources of funding would probably be lost if Addison and Columbia accepted mitigation dollars.

Lois Winter of the US Fish and Wildlife Service's Gulf of Maine Coastal Project is on record that the USF&W <u>would not participate</u> in any project that attempts to use the West Branch project to offset environmental damage elsewhere. The service's reasoning is that their mission is to <u>improve</u> the overall Gulf of Maine environment and move towards a <u>net gain</u> in its fisheries and recreational value. Any "break even" deal is thus a bad deal.

NRCS would also be unable to participate for the same reasons. Other state or federal partners, potential non-governmental conservation partners and private contributors may also be averse to helping make a wrong seem right. In short, fund raising for the West Branch will be easier if there are no mitigation dollars involved.

The WBSC recommends that the Towns refuse to participate in a mitigation scheme and instead seek untainted funding from partners that are interested in genuinely improving the overall health of our fisheries and marine environment.

III. Maintaining Local Control

Some of Maine's most dramatic and beautiful waters, shorelines, marshes and uplands are in Addison and Columbia. They are of exceptional value to all of us and they are vital habitat to many local and migratory species of wildlife. The livelihoods of our citizens, whether they dig clams, drag for mussels, fish for lobsters or grow hay depend on the health of our environment, especially the health of our waters and wetlands. The quality of our remarkable local environment is also of great recreational value to our townspeople for fishing, hunting, snowmobiling and other outdoor pursuits and to tourists who come here to sail, kayak, canoe or birdwatch and who contribute to our local economy.

The initiative to restore our marshes on the West Branch is coming entirely from local people, and the continuing leadership will be from within our own communities. We feel this is as it should be.

The Committee strongly endorses continued private local ownership and local control of the Branch marsh properties to protect these important values for the benefit of the community as a whole and to guarantee the protection of the rights of individual property owners.

The Committee would oppose the inclusion of the Branch marshes in any State or Federal park or other project by which control would shift away from our local communities.

IV. Height of the Tides and Impact on Roads and Private Property

What will be the impact on local roads and property if the tide gates were ever to fail and not be repaired or are removed and replaced with an open bridge?

The NRCS hydraulic engineer's report of December 2003 indicates that in these scenarios a total of about 291 acres, 196 acres in Addison and 95 acres in Columbia, would lie within the historic tidal flood plain and would be restored to their natural salt marsh hydrology. Except as noted all hydrologic data in this report are drawn from the NRCS.

Most of the old marsh area appears to be essentially level. Data from NRCS and limited surveying by Sheldon Trundy and one of the Committee members in the spring of 2003 and January 2004 suggests that the old flood plain has subsided over the years since the tides were shut off through oxidation of the organic-rich peat soil. Much of the old marsh surface now lies at an elevation about 2.1' lower than the elevation of the salt marshes on the main branch of the Pleasant River that are open to natural tidal flow.

With natural flow restored most of the West Branch marsh should cover for about an hour on each side of the daily high tides. Water depths of about 1' over the marsh surface would be expected at mean high tide and a foot more at spring tides. According to Dr. Burdick of UNH, the West Branch marshes can be expected to recover and revegetate naturally so long as subsidence does not reach the 3 - 4' range. If subsidence is allowed to continue and reaches the 3 - 4' range natural recovery is unlikely.

According to the NRCS report, roughly each 10 years tides up to 3.7' higher than a normal spring tide would be expected to occur, most likely in conjunction with a major NE storm or hurricane. Roughly each 100 years tides 4.9' higher than spring tides would be expected.

Table #1 lists relevant levels of normal and storm tides in the Pleasant River estuary along with road flood levels for the four places the Branch and its related brooks cross local roads.

TABLE I – Relevant Elevations from 2003 NRCS survey, datum is NGVD 1929

Channel bottom West Branch at Ridge Road	-4.7'
West Branch – floor of majority of historic flood plain estimated from limited surveys by Sheldon Trundy)	4.7'
Mean high water – Pleasant River upper estuary	5.9'
Point Street (Columbia Falls road) road overflow elevation at culvert	6.1'
Mean spring high water	6.8'
Pleasant River marshes free to tidal flow (Addison Point and marshes opposite town landing south of main channel – survey by Sheldon Trundy)	6.9'
Well #1 from NRCS report	6.9'
Addison Road overflow elevation at Bell's Brook culverts (2nd Abatore)	7.9
1 year tidal event	8.4'
Water Street overflow elevation at culvert (1st Abatore)	8.4'
Residence #1 garage and septic from NRCS report	9.7'
10 year tidal event	10.5'
Ridge Road overflow elevation at tide gates	11.1'
100 year tidal event	11.7'

All four of the road crossings, including the present Ridge Road dike (elevation 11.1') are vulnerable to flooding in a 100 year tidal event; to avoid flooding at this level (11.7') at any of the four crossings about 4,700' of roadways would need to be raised. The NRCS report also concludes that: "the US Route 1 crossings were determined to be minimally impacted by any change in the Ridge Road crossing."

The NRCS report indicates that one home's well and another home's garage and septic system are at levels below the 10 year event elevation. The dikes on Lloyd Jordan's property have a number of breaches and low spots. In general they are only at about the height of mean spring high water (6.8'). Community members have also pointed out that the Addison Point water line may need to be modified.

With these data from the NRCS report in mind it is clear that in addition to a new bridge and roadwork on Ridge Road over the Branch and stabilization of the town landing the restoration will need to provide a plan and budget for:

- *Removal and replacement of the culverts at three other crossings (Addison Road in Columbia, Point Street and Water Streets in Addison), but not necessarily for the culverts under Route 1*
- *Raising the level of the Addison Road, Point Street and Water Street for some distance on each side of the crossings to meet state DOT standards*
- *Flood protection or other solution for any town water lines or private wells, septic systems or homes and buildings that would be affected*
- *A specific diking or other flood protection satisfactory to Lloyd Jordan's haying operation*

The Army Corps of Engineers has stated that restoration projects of this nature normally do include plans and budget to cover these sorts of situations and that their preliminary cost estimate includes them (see Appendix IV). The WBSC has taken the position in this report that all impacts on current use must be addressed to the landowners' satisfaction.

V. Impact on Property Values Along the Branch Marshes

What impact will the restoration have on the market value of property along the Branch?

The Committee believes, based on a review of property tax policy in Addison (see Section VI) and of real estate price trends in other parts of coastal Maine, that as a result of the restoration owners may be in the fortunate position to have property values go up while taxes don't.

Since not every property is the same several factors should be considered in projecting future market value:

- Properties in Maine with frontage on a salt marsh or views over one are increasingly in demand. Real estate professionals report that market values of tidal waterfront and water view properties have been going up steadily. The primary factor driving this trend is the scarcity and high cost of deep water frontage which forces buyers interested in waterfront to consider the very limited amount of salt marsh frontage still available in Maine. Because there is a relatively large amount of land in Maine with views over meadows and fresh water lowlands, as is presently the case for land bordering the Branch, prices for these properties are typically lower while salt marsh frontage prices are getting steadily higher.

- The present stand alone market value of the land lying specifically on the original marsh plain is hard to assess. As it is now most of the plain would probably be classified by the Maine DEP as a fresh water wetland. Therefore using this land for house lots or other building sites or actively modifying it for agriculture would require permits from the Maine DEP and possibly other regulatory agencies. Experience suggests such permits would be difficult to obtain. From that perspective one would expect the old marsh plain land to have a fairly low present value as stand alone property. Aside from cutting hay it appears that not much can legally be done with this land now; the situation wouldn't change much with the restoration from fresh water wetland back to saltwater wetland.

VI. Impact on Property Taxes

Landowners are very much concerned to know what the impact on taxes would be.

The Committee has reviewed a number of current Addison tax assessments on properties on the Branch and comparable properties along the upper Pleasant River and its marshes to try to get a handle on this issue. We have not yet met with Kathleen Proulx, the Tax Assessor, so the following conclusions are very preliminary. In all comparison cases the Committee has used an estimate of the upland and wetland (salt marsh or original marsh plain) acreage components of each property in order to separate out the component values going into the assessment. Generally the town of Addison does this as well.

The comparison shows several things:

- Properties fronting on the West Branch channel are not presently taxed for "frontage".
- Land parcels with a component of salt marsh fronting the main Pleasant River estuary are usually not taxed for "frontage" as long as the only frontage on the main river is salt marsh and the high land does not come directly down to the river shoreline. (If there is true river frontage it is taxed.)

Accordingly we would not expect any increase in taxes on West Branch properties for "frontage".

- If an undeveloped parcel has an upland component as well as a salt marsh component the upland component is normally assessed as a (potential) house lot of 1 acre plus the remainder as "rear" acreage. The first parcel of rear acreage is normally assessed at $500/acre.
- The salt marsh acreage falls under Class 40 "waste land". It is assessed at $50/acre, 1/10 the value of the "rear" acreage rate.
- Addison does not currently increase assessments for "water views" for properties fronting the upper Pleasant River estuary.

- Some of the fresh water wetlands that are part of the old tidal flood plain of the West Branch are presently assessed as Class 40 "waste land". However, it appears that quite a lot of the original flood plain does not presently enjoy Class 40 tax status, but would appear to qualify for it (and a tax reduction) after the marsh was restored.

The conclusion of the Committee is that taxes for properties fronting on the restored West Branch marshes might decrease in some cases and not change in others if the town applies the same valuation standards that are presently used for land with frontage on the main Pleasant River marshes.

VII. Individual Property Rights

If the Town moves ahead with this project how will the Town protect individual property rights?

First, the Committee sees no need for any "taking" of property. Virtually all the land on the Branch is in private hands and we recommend that it remain that way. We recommend against any town, state or federal taking or purchase of lands on or fronting the Branch marsh.

As discussed above **we believe most abutting landowners will see an increase in the market value of their property, without an increase in property taxes, as a result of the restoration**. However, if any owners do wish to sell their land they should be aware that in addition to the open real estate market there would be several strong local conservation organizations that are potential purchasers for such environmentally and scenically valuable property.

Certain other property rights issues need to be addressed. The Committee recommends the following:

- *There must be specific provision in the project plan and plan budget to protect any homes, structures, septic systems or wells which might be affected at no cost to their owners.*
- *There must also be specific provision to protect legitimate, ongoing agriculture on the marsh plain. The Committee feels the restoration plan should not require such agriculture to be abandoned.*
- *The Towns should take no action to infringe on any existing historic right to harvest hay on the West Branch marshes.*
- *The right to fish and hunt on the Branch marshes must be preserved.*

VIII. Outflow conditions at the mouth of the West Branch

Will restoration of natural flow in the West Branch create whirlpools or unusually strong currents at the Addison Point town landing? A related question is whether natural flow will cause additional erosion or damage to the town landing or excessive siltation in the main river channel.

History tells us that there were no whirlpools or serious currents before the tide gates were installed. In fact, during the mid to late 1800's schooners berthed alongside the wharves on both sides of the West Branch channel to load and unload (research by Marilee Lovit). The old pilings can still be seen along the east face of the present town landing and on the west facing side of Addison Point.

The reason there appears to be no record of problems before the gates were put in, but that whirlpools were observed when the tide gates were opened in 1997, appears to be that the cross sectional area of the gates themselves is only a fraction of the full West Branch channel. In 1997 when the tide gates were opened the full tidal flow of the Branch exited through a relatively narrow opening creating a high velocity fire-hose effect which caused whirlpools and would probably also cause erosion and damage to the town landing over a period of time.

Specifically, according to the NRCS report, there are six box culverts, each 5' x 5' in cross section, in the present structure giving a total cross sectional area of 150 ft^2. The West Branch channel itself is 110' wide and about 9.4' deep to the surface elevation of the marsh. Its natural cross sectional area is roughly 1,000 ft^2, over 6 times as great as the present structure. With natural flow velocities in the Branch there would be little turbulence at the outflow and also there would likely be quantitatively insignificant transportation of silt into the main river channel.

With the 1997 experience in mind the WBSC recommends that when the tide gates are removed the full original channel of the Branch be restored. The Branch should be spanned by an appropriate bridge that does not obstruct the natural flow. Tidal flows through the channel would then be reasonable, as they were known to be before the gates were installed.

The Study Committee also recommends that the project plan and budget include rebuilding or restoration of the Addison Point town landing to stabilize it and minimize any future erosion and deterioration. The landing was a commercial landing before the tide gates were installed. In the future the Town of Addison may wish to be able to upgrade the facility to commercial status.

IX. Debris

Will brush, trees or other debris flow downstream and possibly cause damage at the town landing or become tangled in moorings or lobster traps?

Considering that the total area that would need to be cleaned up is estimated at about 300 acres and that most of that is not heavily overgrown, doing a responsible job of clearing the area and cleaning up the slash will not be a major budget item.

The Committee feels these are valid concerns and recommends that the restoration plan needs to include provision for clearing and removal (by chipping or burning) of alders, brush, and trees from the affected area so that nothing drifts down into the main channel when natural tidal flow is restored to the Branch.

X. Cultural Resources Concerns

Would the restoration project damage or destroy prehistoric or historic cultural resources?

The NRCS report states "there are no known prehistoric archaeological sites in the area of potential effects." However, the report concludes that it is likely that native Americans had camps along the Branch and such sites might be found.

Similarly, there are no historic-period buildings or structures within the area that are listed in or eligible for the National Register of Historic Places and no inventoried historical archaeological sites within the area. However, NRCS notes that the system of dikes and associated water control structure themselves might be of archaeological interest.

NRCS concludes that both road work on the project and higher than normal tides could lead to damage to such sites.

In general the approach outlined above complies with the requirements under Section 106 of the

The WBSC recommends that consistent with the National Historic Preservation Act (NHPA) the project plan and budget should provide for identification and evaluation of cultural resources. The plan and budget should also provide that if such resources would be adversely effected those effects should be minimized through plan modification, protection of resources or detailed recordation of the resources in agreement with the State Preservation Officer.

NHPA (36CFR 800) which would have to be met by federal agencies like NRCS or the Army Corps if they are involved. Such cultural resources protection is now a normal part of federally funded projects.

XI. Impact on Wildlife

If the Branch is returned to its historical state will wildlife such as deer, rabbits and redwing black birds that presently use the bottom lands of the old marsh plain be displaced?

As the present fresh water meadow reverts to salt marsh its wildlife will change as will its vegetative cover. The marsh will generally come to resemble the existing marshes on both sides of the main Pleasant River channel although it will cover more frequently and about two feet deeper at high tides. Consequently areas of lower elevation can be expected to support extensive areas of smooth cord grass, *Spartina alterniflora,* while the higher elevations will support marsh hay, *Spartina patens*.

Because the marsh will only be under water for a few hours at the top of the tides deer will continue to use the area getting both nutrition and necessary salt as they graze on the marsh grasses. Many other animals will also continue to use the marsh while some may not. Quality salt marsh habitat is relatively rare but freshwater based habitat is common enough that these upland species will still have plenty of nearby habitat. Species, like black ducks and green wing teal, that need salt marsh will benefit substantially.

The biological section of the report prepared for the town by the Natural Resources Conservation Service confirms that "deer, teal and other wildlife that visit the impoundment now will also use the restored salt marsh". In fact, the report, which has been reviewed by wildlife biologist Ron Joseph of USF&WS, predicts much greater bio-diversity once tidal flow is restored. Black duck, teal, sea run brook trout, striped bass, marsh hawks, eagles, herons and several species of sandpipers can be expected to frequent the restored marsh.

The report cites the successful restoration of the Weskeag marsh in South Thomaston: "As a result (of the restoration) Weskeag marsh now attracts thousands of migratory sandpipers each fall. A total of 22 species of shorebirds have been documented..... birders.... observe teal, egrets, peregrines, eagles, sandpipers and rare sparrows....."

The NRCS report's conclusion is that: "The ecological benefits of removing the Addison tide gates far outweigh the benefits of maintaining a mostly fresh water impoundment created by the gates."

XII. Effect on Clamming and Worming

When the tide gates are removed will there be an increase in fresh water runoff into the Pleasant River that might adversely affect clamming and worming? More broadly, what effect will restoring the Branch have on the shellfish industry?

In order to address these questions members of the WBSC have reviewed the extensive scientific literature on salt marsh biology and met with several leading scientists specializing in salt marsh ecology, notably David Burdick of UNH, Erno Bonebakker and Ray Konisky of the Wells National Estuarine Research Reserve, Grace Bottitta of Ducks Unlimited, Ron Joseph of USF&WS, Eric Hutchins of the NOAA/National Marine Fisheries Service Restoration Center in Gloucester, MA, Jon Kachmar at the Maine State Planning Office and Lois Winter of the USF&WS Gulf of Maine Program. We have found that biologists with hands-on salt marsh experience in the Gulf of Maine are remarkably consistent and Appendix II presents their conclusions in more detail.

First, as to fresh water runoff, the simple answer they give is that there would be no appreciable change from the present situation. All the fresh water that goes into the Branch (roughly an 11 square mile drainage) already flows out through the tide gates and into the Pleasant River just as it would if the gates were removed.

However, the biologists point out that the real danger to the shellfisheries of the estuary is actually the present situation. The freshwater that runs into the Branch and from there into the Pleasant River includes a great deal of run off from Four Corners and Route 1. If an unusually heavy storm overwhelmed septic systems upstream or there were a toxic spill in the Four Corners area the run-off might well pollute the shellfish beds in Pleasant Bay requiring them to be closed.

Similarly detergents and fertilizers, laden with nutrients like nitrogen and phosphorus, could be washed down the West Branch and trigger "red tide" algal blooms in Pleasant Bay. An important function of salt marshes is to act as a filter removing pollution from the water and absorbing excess chemical nutrients. Thus the restoration of the West Branch marshes would give the shellfish beds additional protection from upstream pollution.

Perhaps more importantly the scientific evidence is clear that a restored West Branch marsh would become a major new source of food at the base of the food chain for all filter feeders – including marine worms, clams, scallops and mussels. This is a major topic and discussed in more detail in a separate part of the Committee's report (see Appendix II).

The WBSC believes that restoring the marsh would be a significant long term step forward for the health of the shellfish and worming industries in Pleasant Bay.