Anyone who has visited the New Hampshire shore will know what a salt marsh looks like. Vast expanses of lush meadow threadered with meandering creeks. But salt marshes are more than beautiful. They are unique ecosystems that, when healthy, provide a number of beneficial functions to humans and wildlife.

Colonists early on recognized the value of these productive lands, relying on them as sources of hay to feed their cattle. But as agriculture declined, many people began to see salt marshes as little more than breeding grounds for mosquitoes and "greenhead" flies. Many thought the best use of a salt marsh was to drain it, fill it in and build on it.

Of an estimated 10,000 acres of salt marsh that existed in New Hampshire in colonial times, about 6,200 acres survive. Only a dozen years ago, much of what was left was not functioning properly and was being taken over by invasive plant species, like phragmites and purple loosestrife. The lifeblood of these salt marshes – the flow of tides twice a day – had been restricted by coastal roads, culverts or buried by dumped dredging spoils.

Today, however, healthy salt marshes are recognized as vital fish habitat, an important element of flood control and a quintessential New England landscape. New Hampshire is leading the way in salt marsh restoration, benefiting wildlife, residents and visitors alike.

A Cooperative Effort

The Granite State, with its compact 18-mile coastline, has restored more acres of wetland than any other coastal state in the Gulf of Maine, including Maine, Massachusetts and the Canadian provinces of Nova Scotia and New Brunswick.

"There was a real effort here – it wasn’t by accident. We really did that and it’s something the state can be proud of," said Alan Ammann, Ph.D., a wildlife biologist with USDA’s Natural Resources Conservation Service in Durham. "In 1994, we looked at over 100 restrictions to tidal flows in the state. We identified dozens that could be corrected, which would help restore those salt marshes."

In the past 12 years, the NRCS, in a cooperative effort with nearly a dozen local, state, federal agencies as well as...
**A Complex Ecosystem**

New Hampshire's salt marshes are found along the state's 18-mile coastline, along the Piscataqua and Cocheco rivers, and around the Great Bay and Little Bay estuaries and tributaries. These seemingly featureless meadows are complex ecosystems, delicately balanced between marine and terrestrial environments, and are one of the Northeast's primary grasslands.

Normal, healthy salt marshes are usually laced with tidal creeks that drain fresh water from the marshes and allow tidal water to be distributed throughout the wetlands. Their meadow-like appearance is dominated by salt-tolerant grasses, such as cordgrass.

New Hampshire has two basic kinds of salt marshes: low marshes and high marshes. Low marshes are usually the fringes along tidal creeks and estuaries that are flooded twice a day. A good example of a low marsh is Johnson Creek, upstream of Route 4 in Durham.

High marshes are usually inundated a few times every other week during spring tides or storm surges. Areas around Rye Harbor and most of the Seabrook estuary are good examples of high marshes.

Throughout the high marsh are little areas called pannes, or intertidal pools, which hold water between the infrequent flooding tides and sometimes get very salty because of evaporation. Plants here include glasswort and widgeon grass, both eaten by waterfowl. Pannes hold thousands of small bait fish and macroinvertebrates that birds eat.

**Important Functions**

A healthy salt marsh is one of the most productive ecosystems in the world, meaning it is very efficient at turning the sun's energy into plant life. As bacteria and small insects break down the vegetation, that energy becomes available to larger insects and small fish, like Atlantic silversides and mussels. These form the food supply for larger fish such as cod and flounder, which arrive with the tide.

Nationally, more than two-thirds of commercially harvested fish are dependant at some point in their lives in salt marshes. So, restoring salt marshes is expected to help boost New England's depleted fish stocks.

Healthy salt marshes also help control mosquitoes, an increasing concern with the arrival in New Hampshire of the potentially deadly West Nile virus. Seacoast towns spend more than $100,000 annually controlling mosquitoes. Ironically,

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private, nonprofit groups has restored tidal flow to more than 35 salt marshes, totaling nearly 700 acres. New Hampshire has been so successful that Ammann and others have been asked to give workshops throughout the Northeast.

The involvement of local conservation commissions has been the key, according to Ammann. “These guys went out and contacted people and they got the local support,” he said. “You can’t go somewhere with big federal boots on and say ‘This is going to happen.’ You have to have local support.”

Getting local support means convincing locals it is to their benefit to restore the salt marshes and making sure they understand how this unique ecosystem works.

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*A healthy salt marsh is an important habitat for egrets (above, left), great blue herons, sharp-tail sparrows, and many fish, including commercial species. Bringing salt marshes back to healthy, working condition usually involves restoring tidal flow. At Awosting Marsh in Rye (above), tidal streams are being restored after being filled by dredge material in the 1940s and 1960s.*
past attempts to quash mosquito populations by draining salt marshes increased their numbers. The remaining pools of stagnant water could not support insect-eating fish like the mummichog minnow, but were perfect breeding habitat for the pesky biting bugs.

Healthy salt marshes also prevent shoreline erosion, protect uplands from storm surges, protect water quality, and offer a place for recreation and education.

But Ted Diers offers other good things about salt marshes. Diers is a planner with the N.H. Coastal Program. “The real reason we care about salt marshes is because they’re integrally tied to the history and culture of the coast,” Diers said. “If you go to Hampton, you see two things. You see the beach and that broad expanse of salt marsh and that marsh is beautiful.”

**Unclogging the Drains**

Things go wrong in salt marshes when they’re filled in— that was the case at Awcomin Marsh in Rye in the 1940s and 1960s. Others stop functioning properly when road culverts or other restrictions cut off their connections with the tides.

The presence of invasive plants can indicate if a salt marsh is deteriorating. These include common reed (Phragmites australis), purple loosestrife or narrow leaf cattail. These plants have little value to wildlife and can crowd out the plants that are valuable.

Leading efforts to unplug the drains and fix the marshes are the Natural Resources Conservation Service, Office of State Planning Coastal Program, U.N.H. Jackson Lab and a myriad of other partners, including state and federal agencies and nonprofit organizations and local communities.

Two good examples of restoration efforts include Little River salt marsh in North Hampton and Awcomin Marsh in Rye.

Until last year, the 170-acre Little River salt marsh was drained by a single 48-inch diameter pipe. During heavy rains water would flood the marsh—and nearby homes.

In October 1996, Chuck Gordon had only been in his North Hampton home on Little River Marsh about a year, having moved from Manhattan. In a period of 36 hours that month it rained more than 11 inches, causing flooding of a magnitude expected only once every 500 years, on average. Six feet of water covered the marsh. The N.H. Department of Transportation had to prevent part of Route 1A from washing away.

“When a 500-year flood occurs in my lifetime, I don’t consider it a 500-year flood,” said Gordon. “The guest house had almost 4 feet of water in the basement and in the main house I had about a foot of water in the basement.”

**Broad Support**

Gordon joined the town’s conservation commission the following year and became involved in restoration.
efforts. To restore tidal flow to the Little River Marsh, the 48-inch culvert was replaced with two 6 by 12-foot concrete box culverts. The work involved digging a 250-foot trench through Route 1A for the new culverts.

To illustrate the levels of support for salt marsh restoration, this $1.2 million project was made possible by federal grants and contributions by the town of North Hampton, Ducks Unlimited, N.H. Department of Environmental Services, and N.H. Department of Transportation. Town residents contributed more than $70,000. New Hampshire Fish and Game monitored the marsh to determine how successful the project was for fisheries and wildlife.

Impacts on wildlife were considered at every step. “When they did the dredging, they incorporated a few shallow pools to be nurseries for the fish,” Gordon said.

**Un-spoiling the Ecosystem**

At the Awcomin Marsh in Rye ongoing work focuses on removing spoils dredged from Rye Harbor in the 1940s and 1960s. The spoils — 8 feet thick in places — cover about 24 acres and prevent the tidal flow of salt water into the marsh.

In the early 1990s contractors partially restored about 12 acres of Awcomin Marsh by breaching dikes and digging ditches to replace the original tidal creeks filled by spoils.

Once adequate tidal flow is restored to a salt marsh, plugging the system of drainage ditches raises the water table, allowing twice daily flushing of these shallow pools. Over time, the man-made ditches will fill with sediment.

Without enough tidal flow, the salinity of salt marsh water decreases, allowing phragmites, purple loosestrife and other invasive plants to choke out native salt marsh species like cordgrass, salt meadow hay and glasswort.

The Little River Marsh is already conquering the exotic invaders. “The changeover is happening quite rapidly,” Gordon said. “The loosestrife went very quickly. The (phragmites) will take a little longer.”

Sometimes extra work is needed to root out phragmites. In projects between Barrington and Dover, the top layer of the marsh was shaved off to remove phragmites colonies, roots and all. Also, ditches were excavated to flood the area.

By gradually building up the soil, salt marshes also keep pace with rising sea levels. Over the last 6,000 years, the Atlantic has risen several yards. Healthy marshes are expected to match a predicted one-foot increase in the next 100 years. By absorbing the brunt of pounding waves, salt marshes mitigate storm surges too. Winter storms are more damaging in places where salt marshes have been destroyed.

Future salt marsh restoration projects are planned for the Brown’s River Salt Marsh in Seabrook, the Bass Beach Salt Marsh in Rye and the Philbrick’s Pond Salt Marsh in North Hampton.