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What large-scale restoration success can look like: Seagrass restoration in Virginia's coastal lagoons

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The system of barrier islands, coastal bays, and salt marshes along the Atlantic coast of Virginia's portion of the Delmarva Peninsula represent some of the most natural, unspoiled coastal habitat along the US East Coast. Historically, finfish and shellfish resources in this region supported large fisheries. However, during the 1930s, this region underwent a dramatic ecological shift.

Seagrasses, primarily eelgrass *Zostera marina*, were once very abundant in these coastal bays, covering most of the subaqueous bottom. In the 1930s, eelgrass underwent a massive decline attributed to a wasting disease pathogen *Labyrinthula* sp. The decline was pandemic, affecting not only populations in the coastal bays but also populations on both sides of the Atlantic. In August 1933, this region was affected by one of the most destructive hurricanes to influence the area in the twentieth century, contributing to the decimation of seagrasses in the bays. Seagrasses were essentially absent in these bays until the late 1990s.

One of the most notable consequences of the loss of seagrass habitat in the coastal bays was the immediate collapse of a previously productive commercial bay scallop fishery, which is dependent on seagrasses as primary habitat. Almost certainly this loss of seagrass habitat resulted in declines in production of other commercially and ecologically important species.

As a professor at the Virginia Institute of Marine Science (VIMS), I began studying seagrasses in Chesapeake Bay in 1969, just right around the corner from the coastal bays. In 1997, I discovered several small natural seagrass patches in one of the coastal bays, and the following year, I initiated a seagrass restoration program using test plots of adult transplants of eelgrass. The success of those test plots led my staff and I to initiate experiments with eelgrass seeds in 1999 and 2000. The success of using seeds in restoring the seagrass was significant, as using whole plants would have been logistically impossible and very expensive. Harvesting and distributing seeds was a viable alternative since eelgrass seeds could be collected easily and in large numbers based on our research in Chesapeake Bay. Because of the initial success using seeds, in 2001 we initiated an annual large-scale seed-based restoration effort that continues today. The restoration efforts using seeds have resulted in one of the most successful seagrass restoration projects in the world today. Since 2001, in collaboration with The Nature Conservancy (TNC) staff and many volunteers working with TNC at the Virginia Coast Reserve, we have collected over 72 million seeds and distributed them into 536 individual plots that ranged from one-half to one acre in size. The plants in these plots have grown, flowered, and produced seeds that have spread naturally to new areas, such that by 2018 these coastal bays now have almost 9,000 acres of seagrass where 20 years ago there were none.

Eelgrass seed harvester. Photo credit: Robert J. Orth, Virginia Institute of Marine Science.

Aerial photographs from 2001, 2004, 2006, and 2010 showing the rapid spread of eelgrass in South Bay, Virginia (US). Dark squares within the white line in the 2004 and 2006 frames are one-acre plots that were seeded with eelgrass in 2001 and 2002. The dark areas within the white line in the 2010 frame shows the natural spread of eelgrass from reseeded areas. Photo credit: Robert J. Orth, Virginia Institute of Marine Science.

With the return of seagrasses to these bays, many of the important ecosystem services these beds once provided have also returned. Fish and invertebrates are now once again abundant in the meadows. Water is clearer inside the beds as the plants filter out particles and sequester carbon. And more recently, efforts by VIMS scientists are now underway to bring back the bay scallop.

The seaside work here in the coastal lagoons of Virginia's Eastern Shore is unique in the world because of the scale of its success, but also how quickly it happened. Today, my lab and colleagues at VIMS and TNC continue to lead the effort in the restoration of this unique and beautiful underwater habitat, and the iconic bay scallop that once inhabited these meadows. It is becoming a poster child for seagrass restoration efforts around the world.

Bay scallops. Photo credit: Robert J. Orth, Virginia Institute of Marine Science.

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