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Comparing the Effects of Invasive and Native Marsh Grasses on Estuarine Invertebrates

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The Question: *What happens to the small creatures that live in a salt marsh when it's invaded by a non-native species, hybrid cordgrass (*Spartina alterniflora x foliosa*)?*

Invasive species are organisms that have been introduced into an ecosystem either intentionally or accidentally by human action and disrupt the ecosystem by changing physical processes or reducing the habitat available for native species. Marshes within San Francisco Bay have been invaded by an east coast plant, smooth cordgrass (*Spartina alterniflora*), ironically introduced to stabilize the shoreline. Smooth cordgrass crossbreeds with native California cordgrass, producing "super hybrids" that grow much taller and with denser stems than the native species, and that can survive both lower and higher in the intertidal zone. If hybrid cordgrass became established within the estuaries of Point Reyes, it could fill many of the mudflats used by shorebirds, drastically reducing the birds' foraging areas. The small invertebrates that live within the sediment of salt marshes and mudflats are the food for migrating shorebirds and form the base of the food web.

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A typical California cordgrass marsh in Tomales Bay.

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Hybrid cordgrass, shown here in San Francisco Bay, forms islands that turn mudflats into meadows.

The Project: *Compare the invertebrates in California cordgrass marshes to those in hybrid Spartina marshes.*

To study its effects, two main methods were used: core samples and food web analysis (California cordgrass samples were collected at Point Reyes National Seashore). Taking core samples simply involves using a pipe to collect a specified volume of sediment, which is taken back the lab to be preserved in formalin and washed through a fine sieve to separate out the organisms. Food web analysis is a more complex process. The rationale behind it is "you are what you eat." By comparing animals to the potential food sources (plants and algae) at a site, the researcher can determine whether cordgrass might be one of the plants supporting the food web.

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The California horn snail (*Cerithidea californica*) is one of many invertebrates forming the base of the food web in California cordgrass (*Spartina foliosa*) marshes.

Preliminary Results: *Hybrid and California cordgrass differ in the way they affect organisms living within the marsh.*

Previous studies in other marshes show that the sediment around plants often contain more invertebrates than nearby mudflats, probably because stems and roots slow the water movement, prevent erosion of sediment, and reduce soil temperatures by shading. If the simple presence of vegetation helped invertebrates, more invertebrates would be expected to be seen within the

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Boccardia proboscidea **(a polychaete worm shown upper left corner) and** ***Corophium*** **(a small crustacean shown immediately above) are other examples of invertebrates living in West Coast coastal marshes and mudflats whose population numbers could decline due to increasing hybrid** ***Spartina*** **populations.**

hybrid. However, California cordgrass contained more invertebrates in vegetation than mudflats, but hybrid contained about the same number or fewer organisms than unvegetated areas. This result is significant, because it indicates that hybrid Spartina may be so dense that even the smallest organisms cannot find space to live within it. In addition, most invertebrates do not seem to use the tough stems of hybrid Spartina as a food source, while several species, especially crabs, use California cordgrass. The implications of this work for park management is that hybrid Spartina would severely alter both marsh habitat structure and shorebird food resources if it were to become established at Point Reyes or in nearby bays.

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