

# Effects of the Removal of Invasive Giant Cane on Aerial Macroinvertebrates

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## Introduction



Figure 1: The presence of *A. donax* at one of the sampling sites. *A. donax* can be seen growing at the water edge covering the Salinas River banks.

- The banks of the Salinas River are covered in many places by large dense stands of the invasive grass *Arundo donax*. *A. donax* is an invasive species that crowds out native plants and modifies the river hydrology by channelizing flow, altering riparian habitats, and potentially increasing evapotranspiration<sup>1,5</sup>.
- Native plants are not the only species that are affected by *A. donax*. Many aquatic invertebrates such as mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera) (EPT) require healthy bodies of water to complete their life cycle. EPT, which spend most of their life cycle in the aquatic stage, are intolerant to changes in their habitat unlike the more tolerant Diptera and Coleoptera<sup>3</sup>.
- Aerial adult stages of the aquatic macroinvertebrates reproduce and disperse near and around water. *A. donax* can both act as a barrier to migration and degrade habitat<sup>1</sup>.
- The purpose of this study is to address if the removal of *A. donax* improves dispersal of riparian insects in the Salinas River.

## Methods

- We collected invertebrates during the summer of 2019 at two locations with and without *A. donax* along the Salinas River.
- We deployed 20 adhesive traps<sup>4</sup> for eight days, at five sites.
- Traps each faced one of four directions, away/toward the river channel, and up/down stream.
- We identified aerial invertebrates to family and recorded abundances.
- We compared the proportions of terrestrial and aquatic aerial macroinvertebrates moving up-stream or away from the channel from sites with and without *A. donax*.
- Shannon diversity index was calculated to compare richness and evenness at locations.
- We conducted a chi-square test to determine if dispersal away from channel/upstream and toward channel/downstream were significantly different in aquatics and terrestrials between locations.



Figure 2: Four of 20 adhesive trap deployed at one of five sites at the location with *A. donax*. Each of these adhesive traps faces one of four directions, away/toward the river channel, and up/down stream.

## Results

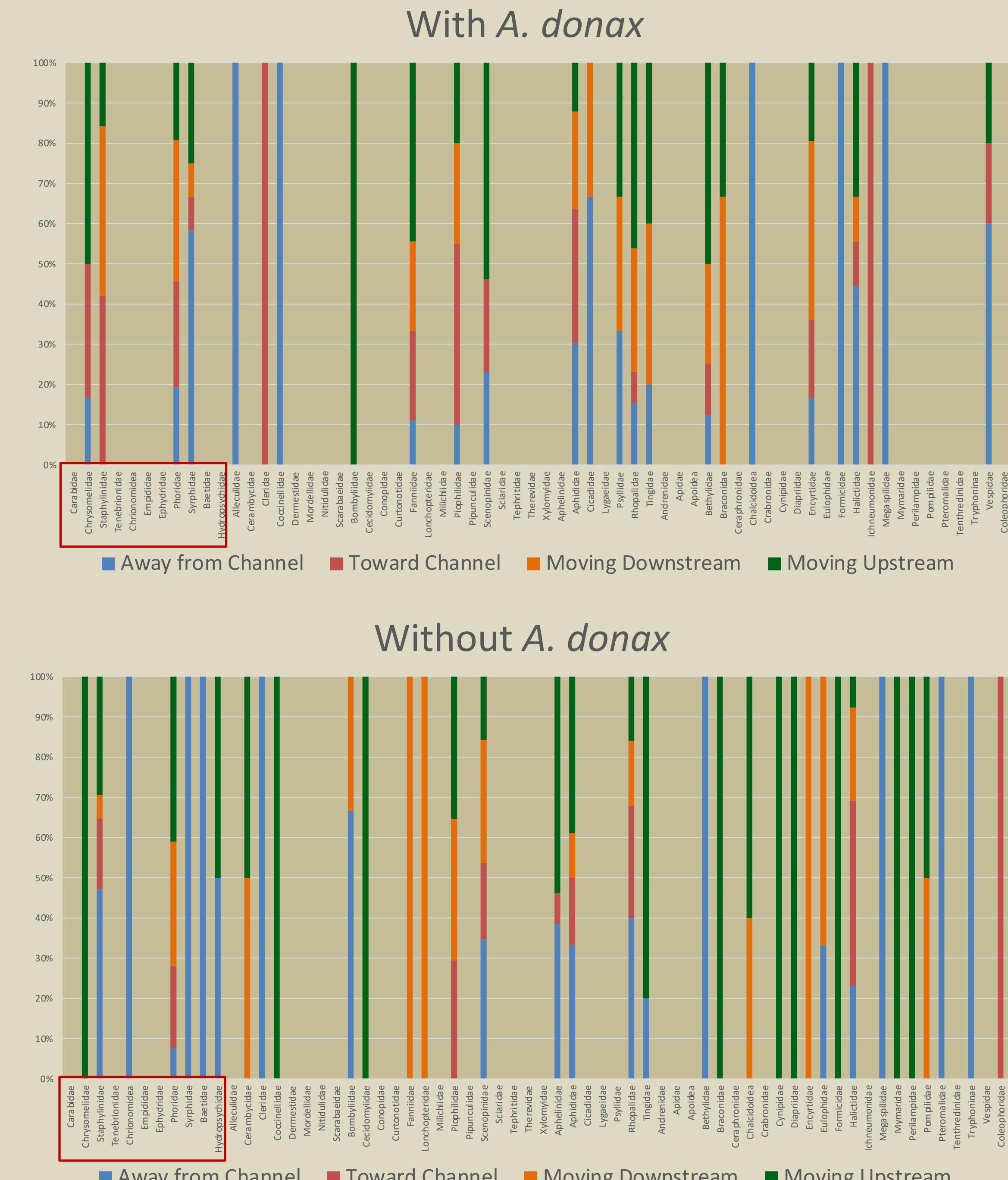


Figure 3: The proportions of dispersal directions among families at locations with *A. donax* and without *A. donax*. Each dispersal direction is represented by a color showing the direction of flight by aerial macroinvertebrates. The red box indicates macroinvertebrates with aquatic lifecycles.

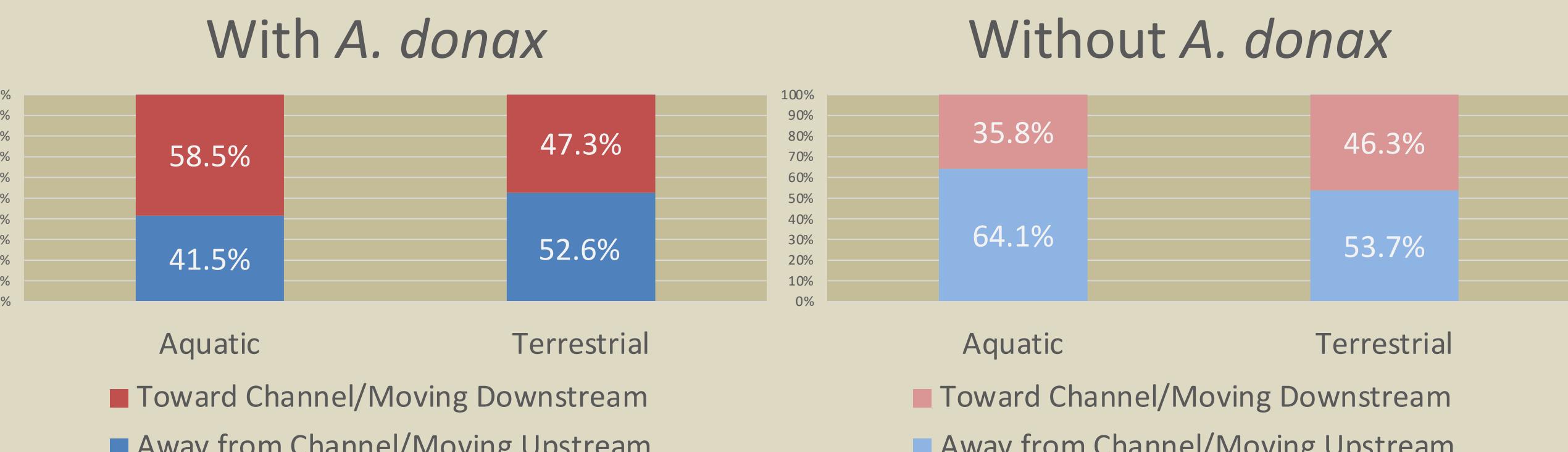


Figure 4: The proportions of aquatic and terrestrial invertebrates moving away from channel/upstream vs. toward channel/downstream with *A. donax* and with no *A. donax*.

- We saw greater family level richness at the location without *A. donax* (36 families without *A. donax*, 25 families with *A. donax*).
- We found a slightly greater Shannon diversity index at the location with *A. donax*. ( $H = 2.63$  with *A. donax*,  $H = 2.43$  at the location without).
- A greater abundance was recorded at location without *A. donax*. (361 individuals without *A. donax*, 282 individuals with *A. donax*).
- Chi-square test indicated that aquatic macroinvertebrates had a significant greater dispersal moving away from the channel and moving upstream where *A. donax* had been removed. Whereas, terrestrial macroinvertebrates saw no significant difference. (aquatic  $p - value = < 0.005$  and terrestrial  $p - value = 0.816$ )

## Discussion

- We expected that *A. donax* would reshape river and riparian habitats, resulting in habitat that will likely support taxa that are more tolerant and have lower diversity than habitat without *A. donax*.
- Our data suggests that removal of *A. donax* from the environment can result in an increase in richness and abundance of macroinvertebrates in the Salinas River.
- Removing *A. donax* may increase dispersal of aquatic macroinvertebrates away from channel and upstream, allowing them to complete their lifecycle.
- Scenopinidae was dominant at the location without *A. donax* causing for a lower Shannon diversity index. High abundance for this taxa may be influenced by local agriculture.
- Although *A. donax* reshapes ecological river habitats, its removal does not immediately restore the ecosystem.

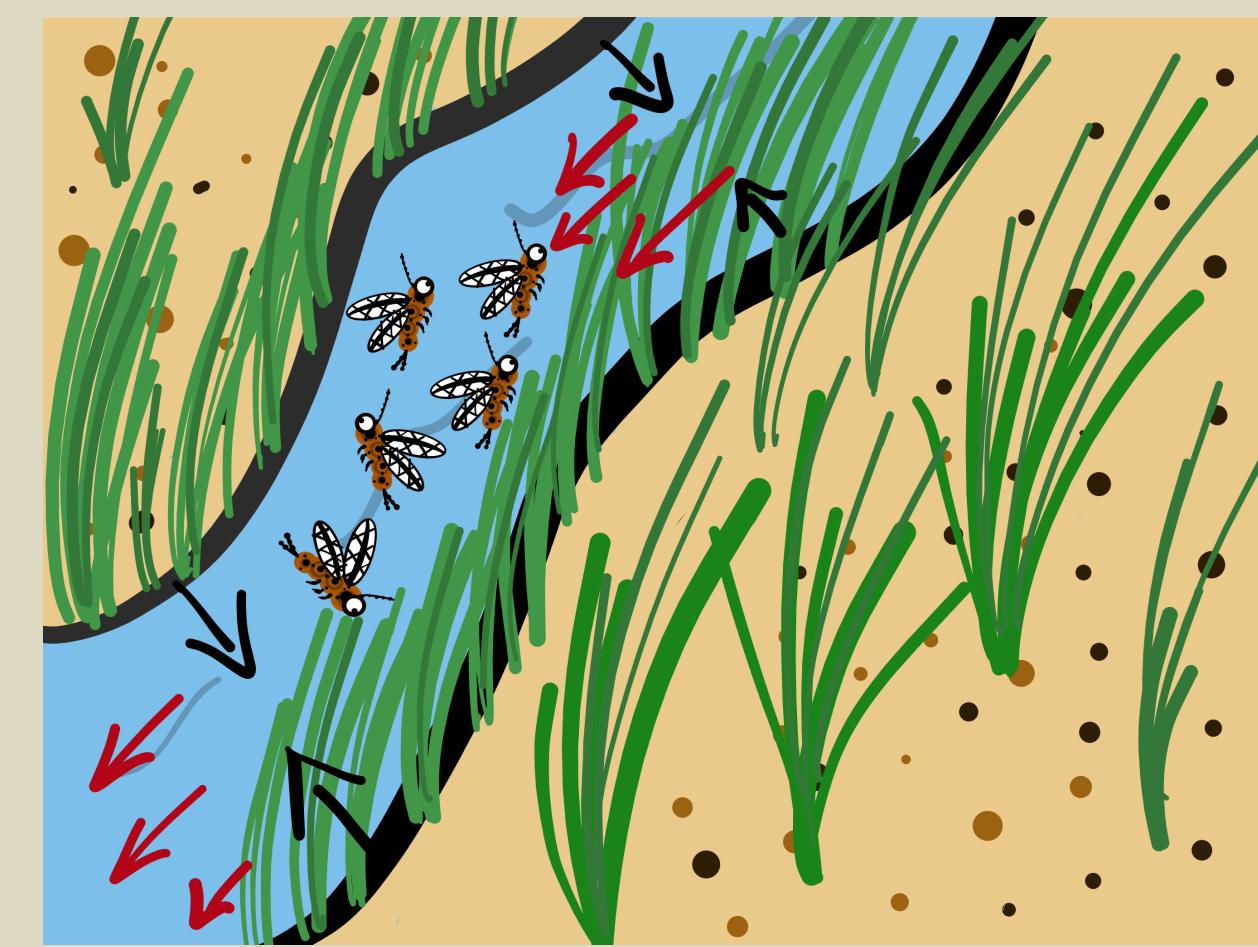


Figure 5: *A. donax* creates dense barriers preventing dispersal away from channel and upstream. *A. donax* can cause channel erosion and out compete native plant species.

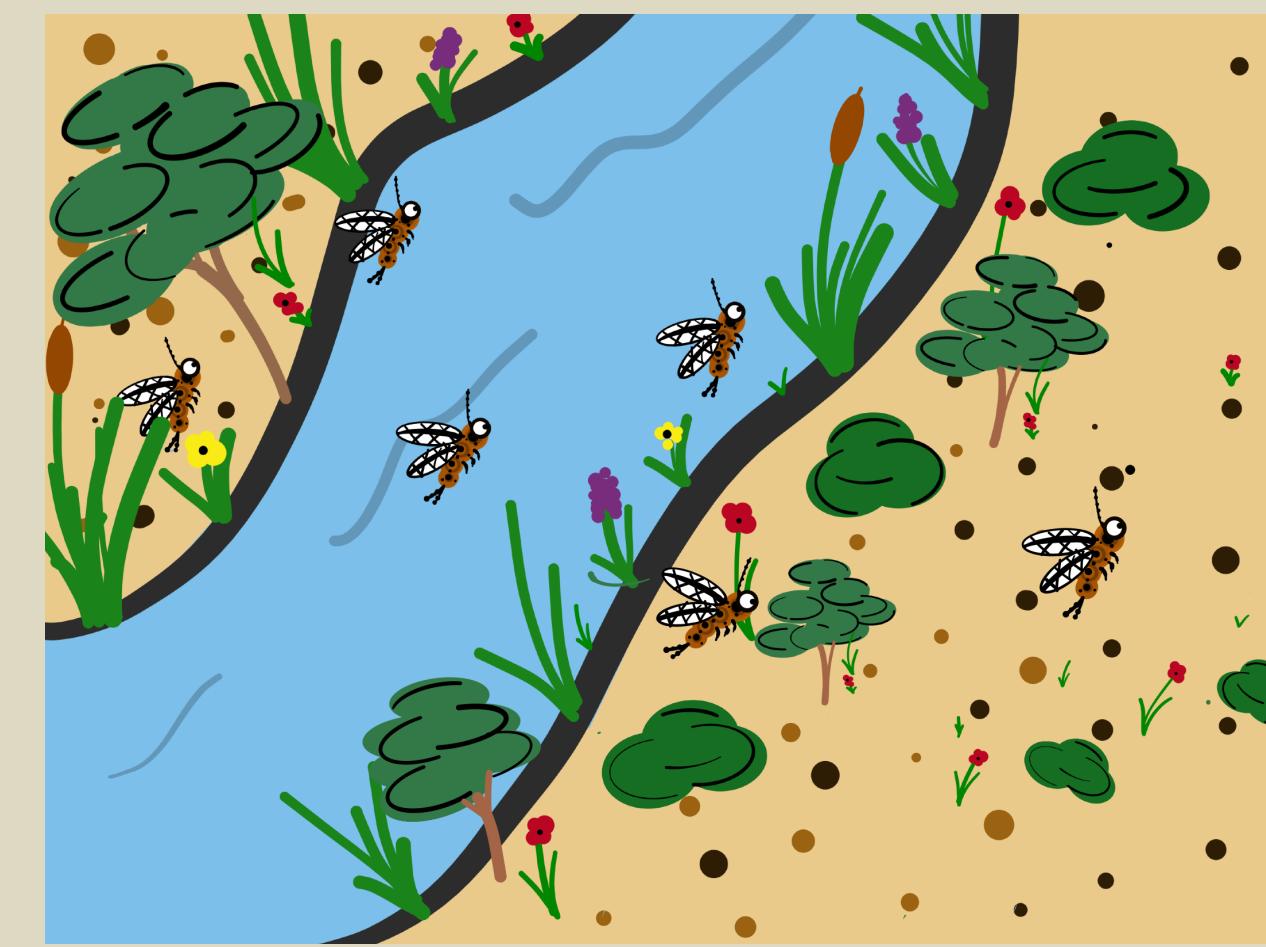


Figure 6: Native vegetation allows for open corridors for dispersal away from channel and upstream. Native vegetation helps to retain natural flow regime and natural habitat structures.

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