species turnover. While this situation cannot be fully resolved, the compartmentalization into 96 subunits (Figure 1b) enables the study of spatial and metapopulation dynamics by using different spatial arrangements of and varying the connectivity between the four subunits within a given EcoUnit. Moreover, alterations of biotic interactions (Figure 1c) can be related to changes in invertebrate activity patterns and behavior that can be observed through the video camera system. Fully programmable multi-color (wavelength) LED lamps, irrigation systems, and temperature gradients along the soil profile enable the spatial and temporal control of environmental factors as well as the simulation of environmental gradients within and across EcoUnits.

Analogous to the successive establishment of the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science–Policy Platform on Biodiversity and Ecosystem Services (IPBES), biodiversity researchers – by building the first biodiversity chambers – are catching up with climate scientists. Such novel equipment will help to better integrate community ecology and ecosystem ecology to reconcile the complexity and functioning of biodiversity (Thompson *et al*. 2012; Hines *et al*. 2015) and to generate a more holistic and mechanistic understanding of BEF relationships. Although laboratory-based experiments represent an abstraction of natural complexity, the biodiversity chambers at the iDiv Ecotron can be used to test multitrophic mechanisms of BEF and develop novel hypotheses, which can then be explored at different ecological scales.

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Border wall: bad for biodiversity

Although most public discussion of "the wall" has focused on its cost and human impacts, expanding the physical barriers ("building the wall") along the southern border of the US will have substantial negative effects on wild species and natural ecosystems. We concentrate on Texas, with which we are most familiar, but similar impacts can be expected elsewhere along the US border and in Mexico. With the shortest length of existing border barriers (~160 km) and the longest border with Mexico (~2000 km), Texas will be the US state most affected by this proposed structure. The Rio Grande/Río Bravo forms the border between Texas and Mexico, with the biological division between South Texas and West Texas falling approximately in Val Verde County.

Substantial amounts of habitat would be degraded or destroyed by construction of barriers and the roads alongside them. Together the barriers and roads would have a total width of 12–20 m (40–60 ft [ie 4–5 highway lanes]) (USDHS 2008). This is equivalent to a minimum of 12–20 ha destroyed per kilometer of barrier (4.8–7.3 acre destroyed per mile of barrier), not including construction sites, new roads to reach the barriers, or the resultant edge effects on adjacent land. Much of the remaining natural habitat – in both South Texas and West Texas – is federally owned and therefore does not require complex legal actions for acquisition. As a result, natural areas are particularly at risk of having border barriers built across them.

One of the impacted ecosystems of most concern is Tamaulipan thornscrub, remnants of which occur in South Texas on higher ground along the river. This diverse and formerly widespread ecosystem is now rare, having been replaced by agricultural and urban land uses (Leslie 2016). Many plant and animal species dependent on this ecosystem would lose some of their last remaining US habitat (USDHS 2008; Leslie 2016; Greenwald *et al*. 2017). For example, the endangered wildflower *Physaria thamnophila* grows only in a few sites in South Texas; these sites are exactly where barriers would be built (Fowler *et al*. 2011). Another at-risk species in South Texas is the endangered ocelot (*Leopardus pardalis*), which would also lose habitat as a result of barrier construction (Janečka *et al*. 2011; Tewes 2017). Similar habitat loss would occur in West Texas. For instance, a population of a threatened cactus species (*Coryphantha ramillosa*) near the Rio Grande in Big Bend National Park in West Texas would likely be in the direct path of a physical border barrier. Vertebrates and vascular plants have been the best studied, but other taxa (eg arthropods) are very likely to be harmed as well.

Habitat fragmentation is also a major concern. Animal species that cannot or will not cross the barriers and their associated roads would be affected (Koblinsky 2017). Larger mammal species would likely be the most vulnerable, but smaller mammal, reptile, and amphibian species may be blocked even if 10-cm (4-in) gaps are provided for animal passage (McCorkle 2011). There would also be indirect negative effects on plant species whose pollinators or seed dispersers do not cross the barriers. Species cut off from the Mexican portions of their populations would have smaller effective population sizes, which would in turn further increase the probability of extirpation or extinction (Lasky *et al.* 2011). Animal movement among habitat fragments within Texas would also be inhibited (Jahrsdoerfer and Leslie 1988). In South Texas, the two remaining ocelot populations are already isolated from Mexico and from each other by other types of habitat fragmentation, and are experiencing a loss of genetic variability as a result (Janečka *et al.* 2011; Tewes 2017). Likewise, in West Texas, impacts due to habitat fragmentation also would occur. For example, a border barrier would separate the black bears (*Ursus americanus*) in Big Bend National Park from the population in Mexico, making the Park population too small to persist (Hellgren *et al.* 2005). Similar, negative impacts of habitat fragmentation have also been predicted in Arizona for the threatened ferruginous pygmy-owl (*Glaucidium brasilianum*) and desert bighorn sheep (*Ovis canadensis mexicana*) (Flesch *et al.* 2010), and there is concern regarding similar impacts on several other Arizona species, including jaguars (*Panthera onca*), Sonoran pronghorn (*Antilocapra americana sonoriensis*), and javelinas (*Tayassu tajacu*) (Cohn 2007; Greenwald *et al.* 2017).

South Texas riparian habitat (an ecosystem distinct from Tamaulipan thornscrub) would be separated from the rest of the US, sometimes by several kilometers, because permanent barriers cannot safely be built in the river's floodplain and delta. For instance, Sabal Palm Sanctuary in Brownsville, Texas, is located between the river and an existing section of barrier 2 km (1.2 mi) away from its banks. Riparian vegetation in South Texas is a hotspot for bird diversity and ecotourism (eg birdwatching; www.theworldbirdingcenter.com). It is unclear how deleterious the effects of additional barriers would be on the management of riparian preserves stranded between the river and the new barriers, or on their visitation rates and financial stability (McCorkle 2011). If ecotourism declines substantially because access to preserves has been impeded, there may be negative economic impacts on the region. On the other hand, if the barriers are not far enough from the river, they may trap wildlife escaping from floods and may even act as levees, which tend to increase downstream flooding.

This project is unusual in being exempt from environmental reviews (US Public Law 109-13, Section 102c; see also Bear 2009), but we strongly suggest that environmental reviews be conducted for each proposed barrier section. Negative impacts could be lessened by limiting the extent of physical barriers and associated roads, designing barriers to permit animal passage, and substituting less biologically harmful methods, such as electronic sensors, for physical barriers.

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