

Jensen designed property as a case study of the long-term efficacy of ecological restoration

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Abstract

In recent years, investment in the restoration of the environment has increased substantially. But, because restoration ecology is a new science and most environmental restoration projects are relatively recent and often go unmonitored, little is known about the long-term efficacy of environmental restoration. The EcoLab on the campus of Marian College in Indianapolis, Indiana, USA provides an interesting case study of a restoration project that was initiated over 90 years ago. In 1911 and 1912, Jens Jensen designed and implemented a 40 acre planting in what was formerly an agricultural field. One characteristic of a Jensen design is the use of native plants in ecologically sensible locations and groupings, much like a present day environmental restoration project. In this study, I examine the efficacy of Jensen's restoration by comparing his original planting plan with remaining first and subsequent generation growth from that planting and also assess quality of the resultant landscape as a natural area. Few of Jensen's original plantings remain, however, successional growth and natural reestablishment of natives has resulted in an area of particularly high floristic quality. Breeding bird and mammal diversity are high; however, amphibian diversity is surprisingly low considering the wetland character of the site. The current high quality of the site provides hope that careful planning of initial conditions and 90 years can result in successful restoration.

Introduction

Because restoration ecology is a new science and most restoration projects are relatively recent and go unmonitored, there is a need for case studies documenting the long term success of restoration work (Zedler 2000). Landscape architecture has a long history and if done using native plants in ecologically sensible locations and groupings, can imitate environmental restoration. The early twentieth century landscape architect, Jens Jensen for example, was well known for his knowledge and use of natives (Grese 1992). Commenting on the evolution of his design from exotics to natives he wrote "...we were trying to force plants to grow where they don't want to grow. And then I took less and less pleasure in looking at these formal designs. They were always the same. There was no swaying of leaves in the wind, no mysterious play of light and shade. I was becoming more and more appreciative of the beauty and decorative quality of the native flora of this country" (Jensen 1939).

Jensen often would have a more formal planting near an estate that would include some non-indigenous varieties. Separate from this formal planting would be a naturalistic portion of the design where native species would be planted in massive quantities in small areas to simulate a more natural look and allow for selection and randomness to determine which would thrive or die. For example, in the naturalistic portion of one estate design he designated that 560 Butternut Hickory (*Juglans*

cinerea) and 560 Black Walnut (*Juglans nigra*) be planted in a 1300 m² area.

Unfortunately, there are few Jensen landscapes that have been left intact or unchanged. One of the better preserved Jensen landscapes, planted in 1912, is now on the campus of Marian College in Indianapolis, IN, USA. About 30 acres of the estate designed by Jensen for James Allison, founder of the Indianapolis 500 and Allison Transmission, has been left mostly untouched for the last 90 years. In this study, I examine the success of Jensen's restoration by comparing his original planting plan with remaining first and subsequent generation growth from that planting and also assess quality of the resultant landscape as a natural area.

Methods

Study Area

The estate of James Allison, once known as Riverdale, forms the north end of the Marian College campus in Marion County, Indianapolis, IN, USA. The landscape was designed by Jens Jensen and planted in 1912. Much of the area received no maintenance or additional plantings from 1929 when Allison died until 2000 when a contemporary restoration project began on the property. The landscape has not remained completely untouched, however. Along the south end of what is now known as the EcoLab, fill has been pushed over a bluff. Fill was also dumped into one of the wetlands and the main pond was dredged and changed in size. Further, the area Jensen designed as a "clover meadow" is now turf grass

including a softball field and practice soccer field (Figure 1).

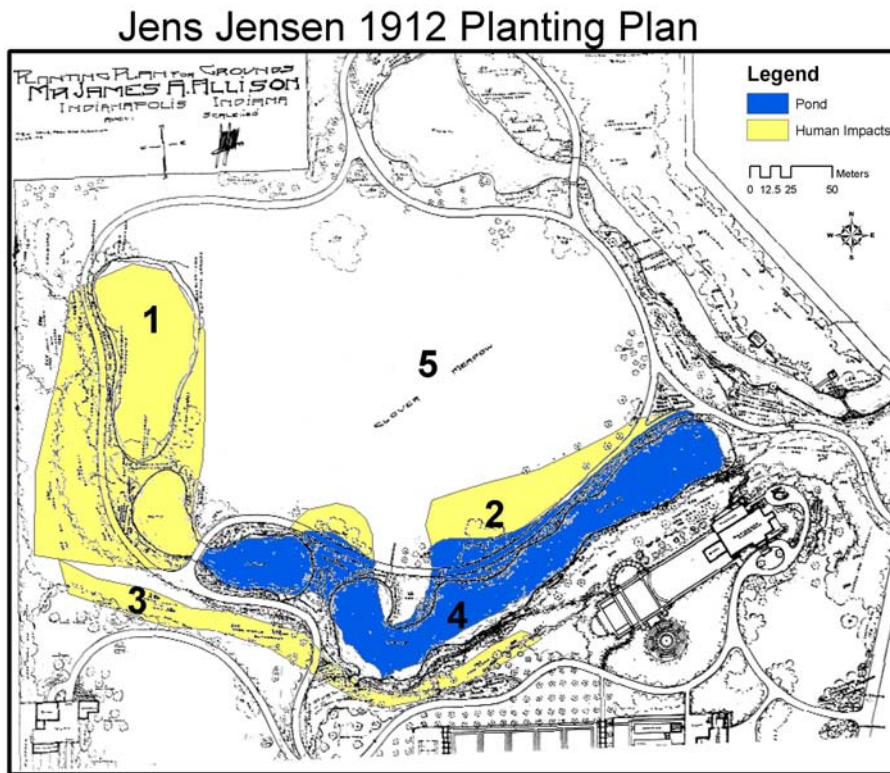


Figure 1: Jensen’s planting plan overlaid on current Marian College EcoLab with human impacts: (1) wetlands where fill has been dumped, (2 & 4) main pond that has been dredged and re-shaped, (3) bluff where fill has been dumped over the edge, and (5) clover meadow that is currently a softball field and mown turf grass.

Assessment of original plantings

Marian College students and I performed a walking survey of the property and took GPS locations and measured circumferences of those trees that are in the approximate locations listed in the original planting plan. We then used common growth factors to estimate age of the trees based on circumference to determine which current trees remain from the original Jensen plantings. The rest were considered 2nd and third generation growth as were all the shrubs. Any recent plantings were omitted from this analysis.

Assessment of current quality as a natural area

A floristic quality index and mean coefficient of conservatism (C) (Swink and Wilhelm 1979, 1994) was calculated based on a floristic inventory done in 2001 (Tungesvick 2003) not including any recent plantings and

using coefficient of conservatism values from Swink and Wilhelm (1994).

Weekly bird surveys were conducted from February 2002 to June 2004 and breeding bird point counts were done in the area from 2001-2004. Monthly frog and toad call surveys were conducted from 2002-2004.

Results

Of the many thousands of trees called for in the Jensen planting plan of 1912, only 117 trees were found that are the correct species and in the correct approximate location (Figure 2). Twenty-three shrubs were found of the correct species in the correct approximate location. Most of these 1st and subsequent generation trees and shrubs are found in areas that have not been highly impacted by human activity (Figure 2).

Jensen 1911 Superimposed

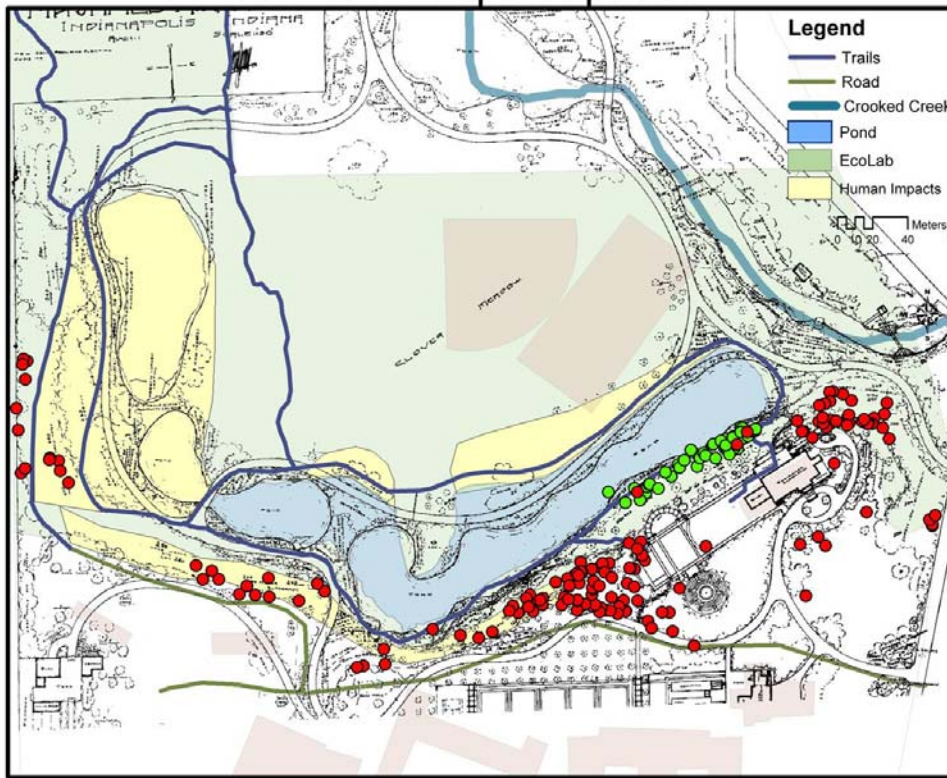


Figure 2: Jensen 1912 planting plan with trees (red) and shrubs (green) in approximately the location where planted regardless of age.

Of the trees, only 23 oaks (*Quercus* spp.), 23 hard maple (sugar (*Acer saccharum*) or black (*Acer nigrum*)), 14 red cedar (*Juniperus virginiana*), 12 white pine (*Pinus strobus*), and one butternut hickory are approximately the right age to have been planted by Jensen (Figure 3). Approximately half (36) of the Jensen age trees that remain are in the naturalistic portion of the planting and therefore have not been attended to by a grounds crew.

The floral inventory done in 2001 found 344 species, 267 of which are native to central Indiana (Tungesvick 2003). The native species have a mean coefficient of conservatism of 4.5 and a floristic quality index of 73.

One hundred and forty species of birds were sighted in the area from Feb 2002-June 2004 including 30 species of warbler, 10 sparrows, and breeding great horned owls (*Bubo virginianus*), American woodcock (*Scolopax minor*), Cooper's hawks (*accipiter cooperii*) and others. Frog and toad surveys detected 4 species: American Toad (*Bufo americanus*), Green Frog (*Rana clamitans*), Bullfrog (*Rana catesbeiana*), and Cricket Frog (*Acris crepitans*).

Discussion

Prior to Jensen's planting the estate was agricultural land devoid of almost all woody species. There is no doubt that Jensen was attempting to create a particular aesthetic in his design at Riverdale. But, to do this he chose plant species quite similar to what a restoration ecologist would choose today: groupings of natives as they would be found in nature, fitting the region, particular microclimate, and soils of the area being planted (Grese 1992).

Very few of Jensen's original plantings of 1912 were evident even if 2nd and later generations are included. Much of the loss may be due to human impacts after the purchase of the property by Marian College such as the dumping of fill into one of Jensen's wetlands, the re-contouring of the main pond, and the extra fill pushed over the bluff (Figure 1). These impacts would have smothered sensitive root systems and caused stems to rot. Others were likely lost to disease such as the Canoe Birch (*Betula papyrifera*), which in this part of Indiana tends to succumb to birch borer. Still others were "phased out" by succession like the sumac (*Rhus typhina*) planted alongside sugar maples and subsequently shaded out by their larger neighbors. Other smaller species of shrubs and trees might have been lost

as exotics such as the Norway maple (*Acer platanoides*) moved in.

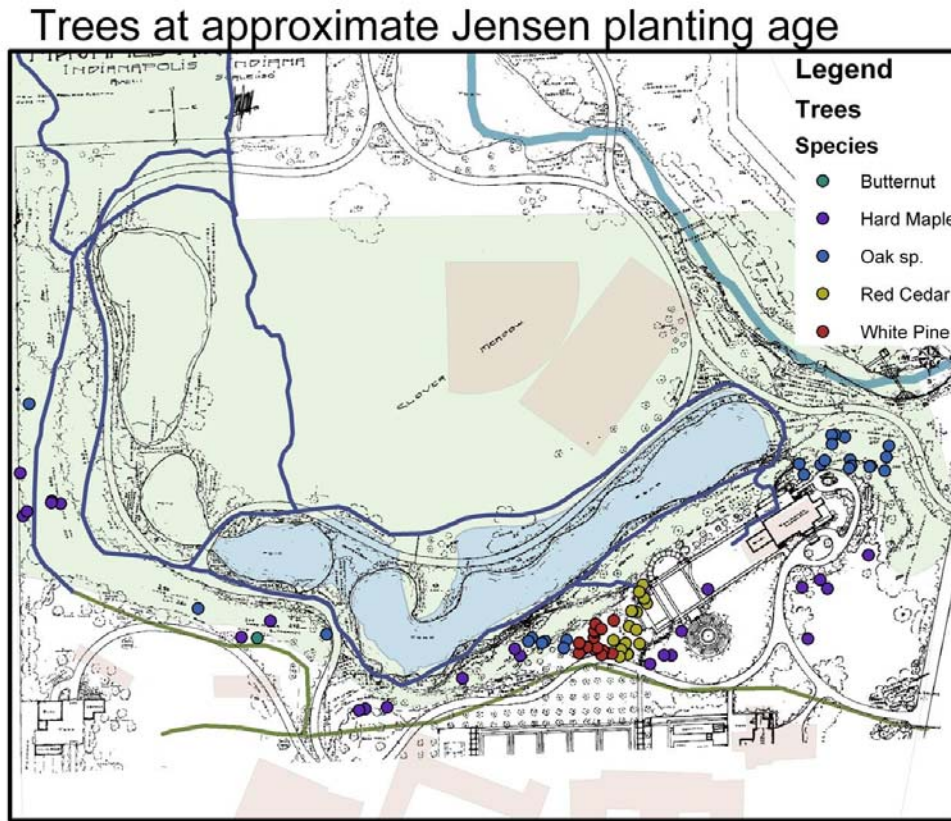


Figure 3: Jensen 1912 planting plan with trees of approximately the right age to have been planted in 1912 and in the location called for on the planting plan. Species are in the Legend.

But, although only a small percentage of Jensen’s original plantings survived, the resulting landscape is in remarkably good shape with high mean coefficient of conservatism, FQI score, and bird and mammal diversity. It has been suggested that FQI is not a fair indicator of quality due to its tendency to be greatly affected by species richness due to habitat diversity – e.g. a 20 acre prairie may have a lower FQI than a 20 acre combination of prairie, wetland and forest even if the prairie alone is very high quality (Rooney and Rogers 2002). In my case, I am interested in both the habitat diversity and species richness within the habitats and therefore FQI of the entire property is a good indication of success of the restoration; especially considering what the FQI must have been prior to the restoration, when the property was in agricultural production. The area is now being used by birders due to its decent diversity and proximity to the city center. For its size, the breeding bird diversity appears to be high.

A large portion of the property is wetland due to groundwater seeps. Prior to Jensen’s “restoration” this

water was removed to a creek with drainage tile. Perhaps the most important bit of restoration that Jensen accomplished was removing the drainage tile and restoring a more natural hydrology to the area. Because the hydrology was restored, a large portion of the “clover meadow” has become a hardwood swamp with breeding woodcock and beaver (*Castor canadensis*). Beaver have taken over the hydromanagement of the property; another indicator and cause of the success of the restoration.

Frog and toad diversity is lower than expected, however, especially considering the quantity of wetland on the property. Spring Peepers and Chorus Frogs were notably absent, perhaps due to distance to the nearest source population. By 2001, non-native plants made up a large percentage of the total diversity on the site, and non-native invasives such as honeysuckle shrub (*Lonicera* spp.), Norway maple, common buckthorn (*Rhamnus cathartica*), and Oriental bittersweet (*Celastrus orbiculatus*) had become pervasive. In both the case of the lack of frog diversity and the abundance of invasives, more active management was needed; landscapes cannot

simply be left alone to restore themselves, especially in urban areas.

Unfortunately, because this is a case study rather than a controlled experiment, it is unclear whether Jensen's design was truly critical in the restoration of the property. It may have been restored to as good or even better condition if simply left alone. This case study does give hope that through either a good restoration plan, 90 years, or both, an urban agricultural landscape can be restored.

Acknowledgements

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