

Re-introduction of Governor Laffan's Fern (*Diplazium laffanianum*) to the wild

Report on plantings for calendar year 2019



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Summary for 2019

As of December 31st 2019, the total number of Governor Laffan's Fern (*Diplazium laffanianum*) plantings surviving in the wild was sixteen immature individuals. This includes one fern from the 2015 plantings at Sear's Cave, eleven planted this year at Sear's Cave, and four planted this year in West Walsingham Sink (WWS). Of the twenty seven Gov. Laffan's Ferns planted between January and March 2019, fifteen (56%) survived the year.

- Sear's Cave - 12 planted in 2019, 11 surviving
- WWS/Bee Pit Cave– 9 planted, 4 surviving
- Deep Blue Cave – 6 planted, 0 surviving

Table 1: Status Table for *Diplazium laffanianum* Planted in 2019

Planting Site	Pot batch	Origin	Date Planted	Currently Surviving
Sear's Cave	14J	14-19 May 2014	18 th January 2019	yes
Sear's Cave	14L	14-19 May 2014	18th January 2019	yes
Sear's Cave	SS Oct 14	14-5 or 14-12 (4yrs old when received) or 14-31 (2.5yrs old) middles cont.	18th January 2019	yes
Sear's Cave	NN Oct 14	oct14-39 (4yrs old when received). middles container	18th January 2019	yes
Sear's Cave	NN Oct 14	oct14-39 (4yrs old when received). middles container	18th January 2019	yes
Sear's Cave	PP Oct 14	oct14-9 or oct14-34 (4yrs old)	18th January 2019	yes
Sear's Cave	NN Oct 14	oct14-39 (4yrs old when received). middles container	18th January 2019	no
Sear's Cave	QQ Oct 14	14-34, 14-9, or 14-5 all were 4 yrs old when received in Bda.	18th January 2019	yes
Sear's Cave	QQ Oct 14	14-34, 14-9, or 14-5 all were 4 yrs old when received in Bda.	18th January 2019	yes
Sear's Cave	12-16AB	12-16	18th January 2019	yes
Sear's Cave	12-13AB	12-13	18th January 2019	yes
Sear's Cave	12-8AB	12-8	18th January 2019	yes
Deep Blue	09-5	09-5	18 th February 2019	no
Deep Blue	14 O	14-35 '+liq DKW 3-12-14' May 2014	18th February 2019	no
Deep Blue	14 O	14-35 '+liq DKW 3-12-14' May 2014	18th February 2019	no
Deep Blue	14 U	14-10 May 2014	18th February 2019	no
Deep Blue	12-13	12-13	18th February 2019	no
Deep Blue	12-14A	12-14	18th February 2019	no

WWS / Bee Pit	12-12BC	12-12	4 th March 2019	no
WWS / Bee Pit	Oct 14-39/14-17	14-39 or 14-17 Oct 2014	4th March 2019	no
WWS / Bee Pit	QQ Oct 14	14-34, 14-9, or 14-5 all were 4 yrs old when received in Bda.	4th March 2019	no
WWS / Bee Pit	QQ Oct 14	14-34, 14-9, or 14-5 all were 4 yrs old when received in Bda.	4th March 2019	no
WWS / Bee Pit	VV Oct 14	14-31(2.5yrs) 14-13 (2.5yrs) 14-40 (3.5yrs)	4th March 2019	no
WWS / Bee Pit	PP Oct 14	oct14-9 or oct14-34 (4yrs old)	4th March 2019	yes
WWS / Bee Pit	BBB Oct 14-33	Oct14-3 (2.5yrs old when received)	4th March 2019	yes
WWS / Bee Pit	RR Oct 14	Oct14-5 or 14-12 (both 4yrs old when received)	4th March 2019	yes
WWS / Bee Pit	WW Oct 14	Oct14-40 (3.5yrs old) and Oct14-23 (15mo.old)	4th March 2019	yes
	27 planted			15 surviving

Site Notes

Sear's Cave

On January 18th 2019, twelve Governor Laffan's Ferns (*Diplazium laffanianum*) and two Bermuda Shield Fern (*Thelypteris bermudiana*) were planted at the Bermuda Audubon Society's nature reserve at Sear's Cave. A sketch map of the relative positions of the plantings is on file at the DENR. Six *D. laffanianum* were placed along the two rock ledges on the lower slope of sinkhole. The Bermuda Cave Ferns grow a bit more sparsely here, so the *D. laffanianum* should not be overwhelmed and shaded by the larger ferns. The rock ledges should provide some stability on what is otherwise a very unstable slope. Two *D. laffanianum* were planted on the upper slope in the SW corner of the sinkhole. A group of three *D. laffanianum* were planted adjacent to the old cedar log on the upper slope of the sinkhole, in a clearing created by the removal of large invasive ferns. The last *D. laffanianum* was placed at the base of the sinkhole wall on the south side of the cave.

One *D. laffanianum* that was planted on January 29th 2015 continues to survive on the lower slope at Sear's Cave as of December 2019. There had been a second fern from the 2015 planting which was still surviving in September 2018, but this died sometime before our January 2019 visit.

The planting material was all sporophytes between three and seven inches tall. Three of them came from the 2012 shipment of *in-vitro* flasks from Omaha Zoo. Two of the ferns arrived in the May 2014 shipment, and the remaining seven came from the October 2014 shipment (Table 1).



The habitat in Sear's Cave. Tags on the lower slope denote 2019 Laffan's plantings, while the large ferns on the upper slope (left of image) are Bermuda Cave Ferns

As of December 2019, eleven of the twelve *D. laffanianum* planted this year survived (Table 1). One of the pair planted on the upper slope in the SW corner has died. Its marker tag is still in place, but the fern is gone. Most of the ferns are still small, but most were showing new fronds and croziers when we visited the site in November 2019. One of the three planted next to the cedar log has grown significantly between January and November. One of its largest fronds measured 56cm in length, including the blade and petiole. This fern, 14L, arrived with the May 2014 shipment and was already a sporophyte (without roots) when it was taken *ex-vitro*.



14L on January 18th 2019



14L on December 2nd 2019 (note orange tag)

West Walsingham Sink and Bee Pit Cave

The habitat in the West Walsingham Sink is fairly open woodland, with a high canopy and relatively little understory. The main canopy trees are naturalized *Coffea arabica*, Southern Hackberry, Olivewood, and Suriname Cherry.

On March 4th 2019, nine potted *D. laffanianum* were planted in West Walsingham Sink. One of the ferns was from the 2012 cohort, while the remaining eight were from the October 2014 shipment. A sketch map of the plantings and a GPS coordinate of the centre are filed at the DENR. Sporophytes between four and six inches tall were used as planting material. They were placed around a cave mouth, at the base of a Southern Hackberry tree, in soil pockets on a mossy rockface and in the soil at the base of a rock outcrop. Bermuda Shield Ferns grow from the soil beneath Olivewood trees and on several rocky surfaces within WWS, and some of the *D. laffanianum* plantings intentionally mimicked these situations.



West Walsingham Sink habitat with Gov. Laffan's Fern at orange tag in lower right

I visited the WWS/Bee Pit planting area on October 21st and it appeared that all of the plantings had died. There was no sign of fronds on any of them, and a number of ferns were gone completely. Upon revisiting the site at the end of December, I found that four of the planted *D. laffanianum* had recovered and put out new fronds (see Table 1). I was further able to relocate the remains of two other planted ferns that were dead. This apparent die back, whether seasonal or hurricane-related, makes it clear that apparently-dead *D. laffanianum* plantings should always be left *in situ* and that recovery following adverse conditions is possible and may take several months.

Deep Blue Cave

On February 18th 2019, six potted *D. laffanianum* were planted at Deep Blue Cave within the Walsingham Trust's property. The planting material was two to four inch sporophytes, selected for genetic diversity. For this reason, one originated from the 2009 shipment, two were from the 2012 shipment and three were from the May 2014 shipment.



12-14A at Deep Blue Cave, Feb. 2019

One *D. laffanianum* was planted in the rocky slope south of the cave mouth, under the sword ferns. There was very little soil among the rocks, so no others were placed here. Four *D. laffanianum* were planted in soil pockets on the rockface or into the soil at the base of the rockface. The sixth fern was planted at the base of the large Bermuda Cedar tree on the slope opposite the cave (photo on report cover).

The largest *D. laffanianum* planted (one of the four planted at the base of the rockface) appeared to have died within weeks of planting, but in May it had recovered and produced a small frond. All of the planted *D. laffanianum* were still surviving on May 15th. After the passage of a hurricane in September, all of the plantings at Deep Blue Cave died. I was able to find the remains of two of the ferns (09-5 and 140 by the water), but not any of the others. The remains will be left *in situ* in case they do recover, but they had not as of the end of 2019.



The habitat at Deep Blue Cave

The habitat at Deep Blue Cave is primarily Walsingham formation limestone rock faces and a muddy slope down to saltwater pool. The slope is sparsely covered by mature Bermuda Cedar, Bermuda Palmetto, Olivewood, *Coffea arabica* and Southern Hackberry. There is little vegetation on the rock faces; mainly scattered Bermuda Maidenhair Fern and Indian Laurel. The slope to the south is cobble-sized limestone rocks densely covered by Sword Fern, with some Bermuda Shield Fern.

General Observations

The survival of this year's plantings was heavily impacted by the passage of Category 3 Hurricane Humberto on September 18th 2019. Humberto delivered salt spray to the island for approximately 48 hours, while only 2-4 inches of rain were associated with this storm. Therefore the salt was not washed off the vegetation as the storm passed, resulting in a lot of the vegetation being burnt island-wide. This is probably what killed the *D. laffanianum* and most of the Bermuda Shield Ferns at Walsingham. A significant amount of Fiddlewood and Suriname Cherry leaf litter accumulated over the planted ferns in the months following Humberto, and although it was continually removed, it may have hampered their recovery. The damage to the forest canopy resulting from Humberto has also opened the woodland (at WWS in particular) which is allowing more light into the understory. This may lead to drying and higher temperatures next summer, which will affect future *D. laffanianum* plantings and recovery of the Bermuda Shield Ferns.