

--PRELIMINARY DRAFT--

# Draft 2012 Year End Monitoring Report for the Peregrine Point Disc Golf Course

Upper Bidwell Park, Chico, California

June 10, 2013



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## City of Chico

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Appendix E – Foothill Associates. 2012. Upper Bidwell Park Peregrine Point Disc Golf Course Baseline (Year 1) Oak Tree Monitoring and Assessment Report. March 15, 2012. Chico, CA.

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### Suggested citation:

City of Chico. 2012. 2011 Year End Monitoring Report for the Peregrine Point Disc Golf Course. Chico, California. June 14, 2012. General Services Department, Parks Division. Chico, California.

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### I. INTRODUCTION

Note: This document is a preliminary draft and is provided to allow initial comments that will be addressed in the Revised version that will be submitted as part of the September 30, 2013 Bidwell Park and Playground Commission meeting. The contents and conclusions of the document should be viewed with caution as much of the data have not been verified and many tables and appendices are incomplete. Therefore the document will change as corrections are made. Please submit comments to [parkinfo@ci.chico.ca.us](mailto:parkinfo@ci.chico.ca.us) by 9/10/13.

The Bidwell Park and Playground Commission (BPPC) and Chico City Council have directed Staff to work with Outdoor Recreation Advocacy, Inc. (ORAI) toward the construction of a disc golf long course and installation of mitigation measures at the Peregrine Point Trailhead Area. The course is located in Upper Bidwell Park off of Highway 32.

ORAI began course development on September 1, 2010. Pursuant to the adaptive management model integrated into the mitigation concept adopted for the project, additional work and course changes will be required over time. The cornerstone of a successful adaptive management approach is a comprehensive monitoring program.

An operating agreement developed between the City of Chico and ORAI helps implement the disc golf course development, operation, and mitigation measures. Approximately 79 mitigation measures (Exhibit B in the Operating Agreement) were identified as part of the environmental review for the Bidwell Park Master Management Plan (BPMMP) (EDAW, 2009). As part of the project, the City of Chico developed a monitoring plan for the site (City of Chico, 2011).

The goal of the monitoring plan is to provide a framework from which ORAI and the City can begin monitoring the project. The framework will help define the extent and nature of monitoring. ORAI will pay up to \$5,000 annually toward completion of monitoring costs, and will complete maintenance and repairs to the course as needed. ORAI will also communicate issues regarding course repairs or resource impacts to the City. The City or a consultant hired by the City will collect data and provide annual reports on the project. The City or outside consultant will invoice ORAI for monitoring work. Annual reports will be submitted to the BPPC and made available to the public.

This monitoring plan articulates the adaptive management approach, and outlines the monitoring approach and framework to evaluate the ongoing operation of the Peregrine Point Disc Golf Course. Monitoring provides the basis for assessing impacts associated with implementation and operation of the project. Several corrective actions are outlined in the agreement, if they become necessary. Additional corrective actions could be developed if monitoring suggests they are necessary. This document lays out

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the plan and process for monitoring, the results, findings, and status of the mitigation measures will be documented as part of future monitoring reports.

This monitoring plan provides an adaptive management framework for data collection at the site. The focus of the document is on the monitoring identified in the mitigation measures developed for the site, but it also provides guidance as to communication and the process for considering changes on the implementation or monitoring of the project.

Key functions of the end of season report are to:

- Communicate implementation activities,
- Review monitoring results and project activities,
- Document the completion of project milestones,
- Point out salient monitoring results,
- Evaluate the effectiveness of monitoring activities and identify data gaps that require additional action or consideration.
- Identify potential challenges or objectives for the upcoming year, and
- Recommend specific actions (adaptive management recommendations) on any aspect of the program for the following year.

This step completes the general adaptive management model noted in the Monitoring Plan (City of Chico, 2011), and helps place the various monitoring efforts into a larger context. Based on the findings of the monitoring, modification to this program or the need to continue it should be considered after the 5<sup>th</sup> year.

As part of the adaptive management approach, we anticipate that this document will evolve over time as understanding of the site becomes more refined. Data collection frequencies, intensity, and protocols may change and future updates will reflect those changes.

### **A. Monitoring Requirements**

This program proposes a series of monitoring efforts to match the requirements of the mitigation measures for the site according to the BPMMP and to also aid in the general management of the project.

The current status of all proposed mitigation measures (as of 4/11/12) is provided in Appendix A, and a summary in Table 1. While 77 mitigation measures were devised, 14 are the focus of this Monitoring Report (Table 2). Other measures, such as those marked as completed or “completed, on-going monitoring required,” were subject to observations during site inspections.

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**Table 1. Tally of the Status of Mitigation And Monitoring Measures for the Peregrine Point Disc Golf Course (4/11/12).**

<b>Mitigation</b>	<b>Total</b>	<b>Not Applicable</b>	<b>Completed</b>	<b>In Progress</b>	<b>To Be Determined</b>	<b>Not Completed</b>
Air Quality	11	4	7	-	-	-
Biological Resources	52	13	17 <sup>a</sup>	16	6	-
Cultural Resources	9	4	5	-	-	-
Hydrology	1	1	-	-	-	-
Noise	3	-	3	-	-	-
Traffic	1	-	-	-	1	-
<b>Total</b>	<b>77</b>	<b>22</b>	<b>23</b>	<b>16</b>	<b>7</b>	<b>-</b>

<sup>a</sup> Tasks noted as completed may be split into ones that were required during construction and no further action is needed and ones that must have on-going monitoring to make sure that they are completed (for example, signs are completed on site, but must be monitored to make sure that they are replaced if they are removed. Nine items are completed but require on-going compliance monitoring.

**B. Sampling Area**

The sampling area is within the Peregrine Point Disc Golf course (Figure 1). Monitoring efforts are connected to the installation and maintenance of the long course. Monitoring of other areas of the site are beyond the scope of this effort. Fairway areas were developed geometrically using GIS techniques, with assumptions made about the range of disc throws and angles. The shape was modified based on the position of trees (open sites tend to have wide fairways and ones with a lot of trees, narrow). This approach provides a reasonable approximation of fairway locations and where most of the play may occur.

**C. Adaptive Management Framework**

The Monitoring Plan (City of Chico, 2011) outlines an adaptive management framework that guides this project and should be referred to for details. Alterations to the monitoring protocol or changes are captured in later sections.

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**Table 1. Summary of Mitigation Measures Related to Long-Term Monitoring.**

<b>Topic</b>	<b>Mitigation #</b>	<b>Description/Goal</b>	<b>Trigger</b>	<b>Remedy</b>
Butte County Checkbloom	BIO-1b-f	Adopt an Adaptive Management program to document changes over time.	Start of project.	Role and adaptive management program developed in this document.
	BIO-1b-g	Long term maintenance of the same number and approximate extent of Butte County Checkerbloom as the 2005 survey.	Data indicates a decline in existing populations after implementation.	Relocation of trails or disc golf structures.
Bidwell's knotweed	BIO-1d-a	Use a habitat approach to minimize impacts on wildflower fields.	High fluctuation in annual population makes tracking difficult.	Minimize impacts to wildflower fields.
	BIO-1d-e BIO-1d-f (remedy)	Document and monitor changes in existing population.	Monitor annually.  Decline in number or extent of existing populations.	Implement Plant Objective O.P-7 and Plant implementation strategies and guidelines I.P-3 and I.P-4 of the BPMMP. Relocation of trails or disc golf structures in vicinity of populations or other management strategies to benefit the plant.
Oak Woodland	BIO-3c-b	Decommission trails in oak woodlands that are part of a site-specific Park Improvement project.	Monitor annually	Reclaim using barriers. Decommission unused trails, identify needs annually.
	BIO-3c-i	Protect tree trunks without damage to the root zone and preserves visual character of the site.	Monitor annually	Consider protection measures, such as shielding poles.
	BIO-3c-j	Minimize soil compaction around tee pads and on trails under oak driplines.	Monitor annually	Apply 6 inch layer of woodchip mulch to a 20' radius around the tees and on the trails.
	BIO-3c-k	Determine if any unavoidable impacts are occurring as a result of site use.	Twice annually	Replant oak woodland habitat in suitable areas (l) according to conditions outlined in BIO-3c: l, m, n, o, p for a period of 5 years.
Wildflower Fields	BIO-3d-f	Reclaim existing trails not retained as part of site-specific Park Improvement Projects.	Monitor annually	Reclaim using barriers to discourage use. Reseeding may be considered over time.
Signage	BIO-1b-d BIO-1d-b BIO-3c-h BIO-3d-g	Maintain permanent signage to inform users of the presence and sensitivity of 1) Butte County Checkerbloom, 2) Bidwell's knotweed and wildflower field, 3) value of native oak trees and woodland, and 4) presence and sensitivity of the wildflower field community, discourage off trail use.	Monitor annually	Repair or replace signs.

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Figure 1. Peregrine Point Disc Golf Course (Long Course) (City of Chico, 2011).



## II. SUMMARY OF RESULTS

This monitoring report is based on the following reports related to monitoring at the site:

- Wildflower and survey (NSR 2012),
- Blue oak monitoring (NSR 2012),
- Site evaluation and ranger observations (by City of Chico staff), and
- Annual report (ORAI 2012).

### A. ORAI Annual Report

ORAI provided a brief report (Appendix B) summarizing activities at the course including volunteer efforts and costs associated with payment for site studies. ORAI reported the following participant numbers for tournaments (they estimated a small number of observers (0-3) at each event, but did not track those numbers).

**Table 2. 2012 ORAI Tournament Participation. [will be added to final]**

Date	# Participants
<b>Total</b>	

### B. Site Evaluation and Photo Point Monitoring

The intent of the Site Evaluation is for Staff to assess the compliance with mitigations and observe any improvements or areas of concern (Chico 2011). Throughout the year some observations were shared and remedies developed with ORAI. A catalogue of photos are presented in Appendix C.

### C. Butte County Checkerbloom and Bidwell's Knotweed, and Wildflower Field Surveys

In Spring 2012, North State Resources, Inc. conducted surveys to document the extent and distribution of Butte County Checkerbloom and Bidwell's Knotweed (NSR 2012). Table 3 presents the data from past years: 2010 (preconstruction), 2011, and 2012. While it is tempting to compare data, at this point only the 2011 and 2012 data were collected with consistent methods. We should note that while observers marked the boundaries (lines) of wildflower fields with a GPS in 2011, these will have to be converted from lines into polygons to arrive at an area estimate. If available, this will be compared in future reports.

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**Table 3. Preliminary Comparison of Key Data from Botanical Monitoring.**

Resource	Variable	Sub-variable	2010	2011	2012	Trend
Bidwell's Knotweed						
	# Patches		10	10	18	
	Area (acres)		3.16	4.62	1.6	
Wildflower Fields						
	# Patches		-	-	17	
	Area (acres)		-	-	4.6	
Butte County Checkerbloom						
	# Occurances		62	132	114	
		# units reproductive	-	64	59	
		# units vegetative	-	68	55	
	# Racemes			145	247	
		# racemes in flower/fruit racemes	-	50	27	
		# racemes in bud	-	39	132	
		# racemes nipped	-	56	88	

Notes: Starting in 2011, more detailed information was collected and is comparable to data collected in later years. Wildflower field boundaries marked in 2011, but not as polygons. Staff will explore digitizing them to obtain areas.

## D. Blue Oak Woodlands

### 1. Transect Sampling

An interrupted belt transect (4 permanent 25 m x 4m quadrats) was established on site (Foothill 2012) which includes data on 9 trees. The data provide a long term view of changes on the site (including density). We did not compare data between years.

### 2. Examination of GIS Analysis of Blue Oak Woodland

The monitoring plan (2011) notes that this method is related to long-term monitoring and utilized after 5-10 years. A base map based on 2009 aerial photography is available. No comparisons are possible until the next set of aerial photographs become available.

### 3. Assessment of Blue Oaks within Course Boundaries

In 2012, North State Resources (2012) collected data related to Priority 1 trees and reference trees. Comparison of Priority 1 trees provide a year to year comparison; while comparison between Priority trees and reference trees provide a more immediate comparison that could help define year to year variation.

NSR (2012) provides summary data (distribution in classes) and the data for individual trees.

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Table 4 provides some basic statistical analyses using ANOVA techniques (Appendix F). For categorical data, we converted the data into numerical values to complete the analysis. These are summarized in Table 4.

**Table 4. Comparison of Priority 1 and Reference Trees Using ANOVA Based on 2012 Observations.**

Variable	Reference Tree (n = 52)		Tree Priority 1 Tree (n = 39)		Statistically Different (p-value)
	Ave	Std Dev	Ave	Std Dev	
Diameter at Breast Height (DBH) (ft)	9.96	5.01	10.87	5.81	No (p=0.43)
Tree Height (ft)	19.98	6.32	20.49	6.49	No (p=0.71)
Crown Width (ft)	21.35	12.22	17.67	9.40	No (p=0.12)
Trunk Quad Impacts (#)	0.42	0.72	2.44	0.99	<b>Yes (p&lt;0.0001)</b>
Damaged Bark Patches (#)	0.41	1.35	0.61	0.67	No (p = 0.37)
Broken Branches (#)	3.33	3.48	4.85	2.62	<b>Yes (p &lt; 0.025)</b>
Dead Canopy (%)	17.81	11.11	18.77	17.64	No (p = 0.75)
Tree Condition (#)	3.12	0.62	3.15	0.75	No (p= 0.79)

Note: Treated multiple stems as individual entries. Data from NSR 20xx, statistical analysis printout in Appendix XX.

In 2011, we observed differences in Tree Height (ft), Trunk Quad Impacts, and Damaged Bark Patches (Using ANOVA). In 2012, we observed:

- Priority 1 trees exhibited with 1) Trunk Quad Impacts and 2) broken branches. Next year's data will all for a better comparison, but as a follow-up, we combined data sets and explored some potential differences between 2011 and 2012.
- Priority 1 trees showed an statistically significant (p < 0.005) increase in the number of broken branches versus reference trees (mean difference of 1.49 branches).
- We did not observe a statistically significant difference in condition ( p = 0.1).

We should note that the variation on these values was large and that time and further monitoring will indicate whether these impacts have long term detrimental effects.

**E. Data Handling and Storage**

The City will receive electronic and hard copies of all reports and field data sheets and will serve as the repository for monitoring reports. The reports will contain summary information and findings. Final monitoring or annual reports will be forwarded to BPPC members as part of reports on the project, and will be available to the public. The reports will also be made available through the City of Chico website (<http://www.chico.ca.us/>). Project derived GIS layers will be submitted to the City's GIS department (and stored at CSU Chico's Geographical Information Center). Any copies of data sheets will also be submitted to the City.

### III. DISCUSSION AND EVALUATION OF DATA

#### A. Identification of Data Gaps

- Damage from impacts was evident on many of the priority 1 trees across the course. In general, impacts to bark and cambium cause additional stress on the trees (to repair), potentially provide a portal for pathogens or insects, and make the trees more susceptible to mortality from other events (i.e drought stress mortality). What the effect of such impacts and blue oak mortality on site is uncertain, but the challenges for blue oak growth on site strongly suggest the need for protective strategies or measures.
- The data for the reference oaks were collected in fall, meaning that this year's plant vigor estimates may not be comparable (since it relies considerably on leaf health). However, we did not observe any statistical differences between dates ( $p = 0.382$ ).
- Many of the measurement variables were set up for year to year or trends over time and the limited data collected so far do not provide much in the way of trend analysis.

### IV. FOLLOW-UP RECOMMENDATIONS

#### A. Findings and Course Improvements

A number of course improvements will be explored with ORAI in 2012, these include:

- Based on last year's recommendation, the City will install a sign that outlines basic rules, etiquette, park rules, and stewardship, and a bollard with a closed sign on the entrance to Hole 1 that would be used when the course is closed.
- Compliance with wet weather (conditions) closures continues to be of concern. We anticipate enhanced education and enforcement efforts for all of Upper Park during the next winter 2012-2013.
- Last year's report noted that "Although many plants struggle with the challenging soil conditions on the site, the photo monitoring (Photo point PP 2.9 indicates a grey pine sapling that appears to have grown more than 6 inches between photos), suggests that under the right conditions, these plants can grow quickly. We would like to explore the potential of planting grey pine and buckbrush as screens to protect either wildflower areas (to the left of the pad on Hole 14) or to protect blue oaks from disc impacts (on southside of the target for hole 10)." Last winter's drought precluded any plantings.
- Install markers on the top of targets to identify the hole number. This may minimize confusion for first time users (for example at the targets for Holes 1 and 18. ORAI will get City approval of the design before fabrication and installation.
- Although many of the trails between holes and the next tee pad appear to be defined, some of the pathways on fairways will need to be examined and refined.
  - Disc golfers were not using the trail connection between Holes 8 and 9, it has been rerouted and staff will evaluate with ORAI in 2012.
  - Another exception is the trail between Hole 16 and 17 with many users not using the developed path (Figure 1). Staff will be working with ORAI in

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2012 to look at the alternative trail that has been established. The most likely alternative is to develop the more direct route from 16 to 17 and abandon the section that runs around the back side of 14 to 17. This was suggested by Staff, but the “as built” route was used because of concern that people walking to the next hole would interfere with play.

- Pathways (especially the first third or so on fairways) will be reviewed with ORAI with the goal of reducing the number and width of trails.
- Staff and ORAI will examine options to keep water off of a path that has developed along the hillside on Hole 4.
- The snake rail fencing on the course appears to be functioning well in narrowing trails and keeping users off out of bounds/sensitive areas, and has become less intrusive as it has weathered.
- Identify trees that appear to be the most susceptible to disc impacts and explore alternative trunk protection methods on them with ORAI.
- During the 2011 survey, NSR (NSR 2011) observed a fairly large infestation of barbed goat grass (*Aegilops triuncialis*) in the grassland area southwest of the 9th fairway and north of the large wildflower field containing knotweed (south of 8th and 9th fairways and west of the 10th tee). Given the heavy foot traffic (high dispersal potential) observed in this portion of the study area, it is recommended that control efforts of this CDFA List B noxious weed be undertaken before it spreads further, potentially impacting rare plants within the study area. In addition, NSR observed a single scotch broom (*Cytisus scoparius*) plant (CDFA List C) in the eastern end of the study area. Staff recommends aggressive control actions. Options include: mechanical (hand pulling, hoeing, weed eating in the early flowering stage, or cut, bag, and remove). Burns are very effective, but could be challenging at that location. Herbicides are also possible with careful glyphosate application in the early season (we require a pesticide applicator’s license). Given the relatively small area, hand pulling the green plants before the seeds mature will likely be the most effective approach.
- Perhaps the biggest challenge is related to the mulch requirement on the course. Mulch on the course will need to be replenished. This mitigation (BIO 3C- j) is to limit the amount of compaction under the dripline of oak trees at tees or trails (it excluded targets). Mulch has been applied to all tees and targets on the course.
  - While mulch (especially straw mulch applied before the winter rains start) is a good idea in areas with bare ground and slope (to minimize erosion), this measure is intended to prevent compaction under oak trees. While the mulch does provide a more finished look, prevents weeds from growing in high use areas, and limits erosion, it is only required under the mitigation measures on a subset of the course (and technically on the tees and trails only). Table 5 lists the tees and targets that are within the dripline of oak trees. The number of tees that require mulch is 8 tees. A minimum of 6 targets are within tree driplines too.

**Table 5. Tees and Targets within Oak Trees Driplines.**

Hole Number	Within Dripline?			
	Tee	Target	Connecting Trail	Project Notes

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Hole Number	Within Dripline?			Project Notes
	Tee	Target	Connecting Trail	
1	N	Y	Y (near target)	
9	Y	Y	Y	
10	N	Y	Y (near target and tee).	
11	Y	N (borderline)	Y	
12	Y	N	Y (near tee)	
13	<b>Y</b>	Y	Y (near target)	
14	N	Y	Y	
15	Y	N	Y (minor)	
16	Y	Y	Y	
17	Y	N	N	
18	Y (minor)	N	N	

Notes: N – No. Y – Yes. Bold indicates more than 3 yards required.

- Narrow functional trails (less than 4 -5 ft wide) do not warrant mulch placement. Many of the connecting trails only require mulch near tee pad or target and would really be handled as extensions of mulch in tee or target areas.
- Staff and ORAI will discuss options of importing mulch onto the site. Several holes are relatively accessible from the gate to staging areas (1, 14, 15, 16, 17, and 18) where wheelbarrows could be used. The other areas on the course are more challenging (9, 10, 11, 12, and 13). A temporary haul road that was decommissioned was used during construction. Other options, such as chipping on-site downed wood or other vegetative material, the installation of fabric, pervious cement, or graveled areas, are possible but pose negative tradeoffs.
- The imported wood chips were a commercially available product. The Urban Forester suggested that clean chips from an oak tree may provide a better mix of wood, leaves, and twigs which may better “lock” in the mulch.
- Trails not related to disc golf travel across the site, we plan to address route options on these with the forthcoming Trails Plan for the park. \*

**B. Alterations to the Next Monitoring Plan or Report**

The following should be added to the next management plan:

- Use an abbreviated list of mitigations, including only those items that are in progress or completed items that need on-going compliance monitoring. Items that have been completed or are not applicable, for example mitigations related to the construction phase no longer apply and have been amply documented. However, some items will remain as they provide overall guidance for the site.
- Document photo point locations and Priority 1 and reference tree locations.
- Reference trees were added to the data collection to provide a comparison between trees within disc golf fairways and in the same general area (on the course) but likely minimally impacted by disc golf play.
- Multi-stemmed trees will be given a letter designation and DBH recorded and treated as an individual tree. The other variables measured for that tree will be the same, introducing some potential “double counting” in average estimates. Given that the numbers are small (and no reason to think that reference trees

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and Priority 1 trees are different, we do not expect significant issues, but the data analysis should proceed with this in mind.

- Consider documenting observations on effects of “pruning” back of branches on tree structure.
- In addition to the “damaged cambium” or “number of damaged quads” count the number of impacts.
- Add protocol to collect area data on the size of the wildflower fields.
- Complete area comparison between data collected in 2005 and current data (Table 3).

### V. SUMMARY

This represents the first monitoring report for the Peregrine Point Disc Golf Course. As part of the adaptive management approach, we will update the Monitoring Report based on recommendations in this report and complete course improvements.

### VI. REFERENCES

- Chico Environmental Science and Planning. 2009. Interim Adaptive Wet Weather Management Plan. Prepared for the General Services Department, City of Chico Parks and Open Space Division. December 2009. Chico, CA.
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**Appendix A –Revised (As Of 4/11/12) Summary Of Mitigation And Monitoring Measures For The Bidwell Park Peregrine Point Disc Golf/Trailhead Area.**

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**Appendix B – ORAI Annual Report**

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**Appendix C – Peregrine Point Photos**

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**Appendix D – [NSR]. North State Resources. 2011. Peregrine Point Disc Golf Course Botanical Monitoring. NSR No. 51325. Chico, CA.**

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**Appendix E – Foothill Associates. 2012. Upper Bidwell Park Peregrine Point Disc  
Golf Course Baseline (Year 1) Oak Tree Monitoring and Assessment Report.  
March 15, 2012. Chico, CA.**

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**Appendix F – Statistical Analysis**

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Welcome to Minitab, press F1 for help.  
 Retrieving project from file:  
 'H:\PARK\PROGRAMS\MONITORING\PEREGRINE\_DISC\_GOLF\_COURSE\DATA\2011\_PPDG\_TREE\_12\_0403.MPJ'  
 Retrieving worksheet from  
 file:  
 'H:\Park\Programs\Monitoring\Peregrine\_Disc\_Golf\_Course\Data\PPDG\_2012\_Combined\_Tree\_Data\_13\_0610.xls'  
 Worksheet was saved on Wed Jul 17 2013

NOTE: Results are separated out for Priority 1 trees ("y" for yes to the question "on the course" or "1") and Reference Trees ("n" for no or "0").

**Results for: 2012\_Priority\_Reference\_Trees**

**Descriptive Statistics: DBH\_(inches), Tree\_Ht\_(ft), Crown\_Width\_, ...**

Variable	In_course(y/n)	N	N*	Mean	SE Mean	StDev	Minimum
DBH_(inches)	N	52	0	9.962	0.695	5.014	0.000000000
	Y	39	0	10.872	0.929	5.805	5.000
Tree_Ht_(ft)	N	52	0	19.981	0.876	6.320	6.000
	Y	39	0	20.49	1.04	6.49	10.00
Crown_Width_(ft)	N	52	0	21.35	1.69	12.22	6.00
	Y	39	0	17.67	1.51	9.40	0.000000000
Trunk_quad_impts	N	52	0	0.423	0.100	0.723	0.000000000
	Y	39	0	2.436	0.159	0.995	1.000
Damaged_bark_ptc	N	52	0	0.404	0.187	1.347	0.000000000
	Y	39	0	0.615	0.108	0.673	0.000000000
Broken_branches_	N	52	0	3.327	0.483	3.479	0.000000000
	Y	39	0	4.846	0.420	2.621	0.000000000
Dead_canopy_(%)	N	52	0	17.81	1.54	11.11	13.00
	Y	39	0	18.77	2.82	17.64	13.00

Variable	In_course(y/n)	Q1	Median	Q3
DBH_(inches)	N	7.000	9.000	12.000
	Y	7.000	9.000	12.000
Tree_Ht_(ft)	N	15.000	18.000	25.000
	Y	16.00	20.00	24.00
Crown_Width_(ft)	N	14.00	19.00	24.00
	Y	10.00	17.00	24.00
Trunk_quad_impts	N	0.000000000	0.000000000	1.000
	Y	2.000	2.000	3.000
Damaged_bark_ptc	N	0.000000000	0.000000000	0.000000000
	Y	0.000000000	1.000	1.000

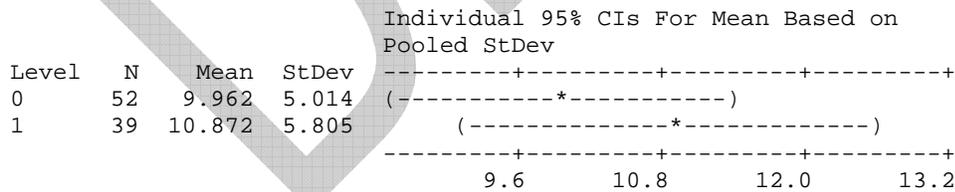
**- PRELIMINARY DRAFT-**

Broken_branches_	N	0.00000000	2.000	5.000
	Y	2.000	5.000	8.000
Dead_canopy_(%)	N	13.00	13.00	13.00
	Y	13.00	13.00	13.00
Variable	In_course(y/n)	Maximum		
DBH_(inches)	N	24.000		
	Y	30.000		
Tree_Ht_(ft)	N	32.000		
	Y	32.00		
Crown_Width_(ft)	N	55.00		
	Y	40.00		
Trunk_quad_impts	N	3.000		
	Y	4.000		
Damaged_bark_ptc	N	6.000		
	Y	2.000		
Broken_branches_	N	11.000		
	Y	9.000		
Dead_canopy_(%)	N	63.00		
	Y	88.00		

**One-way ANOVA: DBH\_(inches) versus Ind\_Course**

Source	DF	SS	MS	F	P
Ind_Course	1	18.5	18.5	0.64	0.425
Error	89	2562.3	28.8		
Total	90	2580.7			

S = 5.366    R-Sq = 0.72%    R-Sq(adj) = 0.00%



Pooled StDev = 5.366

**One-way ANOVA: Tree\_Ht\_(ft) versus Ind\_Course**

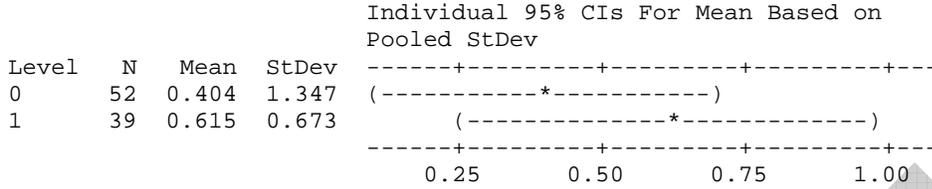
Source	DF	SS	MS	F	P
Ind_Course	1	5.7	5.7	0.14	0.709
Error	89	3636.7	40.9		
Total	90	3642.4			

S = 6.392    R-Sq = 0.16%    R-Sq(adj) = 0.00%



**- PRELIMINARY DRAFT -**

S = 1.110    R-Sq = 0.90%    R-Sq(adj) = 0.00%

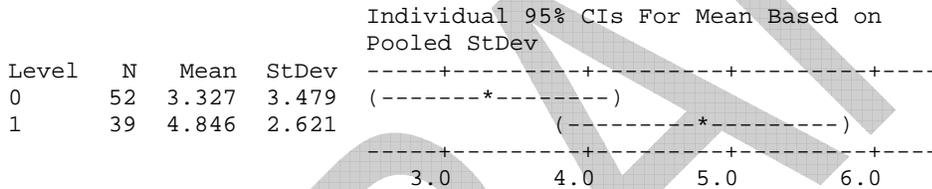


Pooled StDev = 1.110

**One-way ANOVA: Broken\_branches\_(0->10) versus Ind\_Course**

Source	DF	SS	MS	F	P
Ind_Course	1	51.44	51.44	5.21	0.025
Error	89	878.52	9.87		
Total	90	929.96			

S = 3.142    R-Sq = 5.53%    R-Sq(adj) = 4.47%

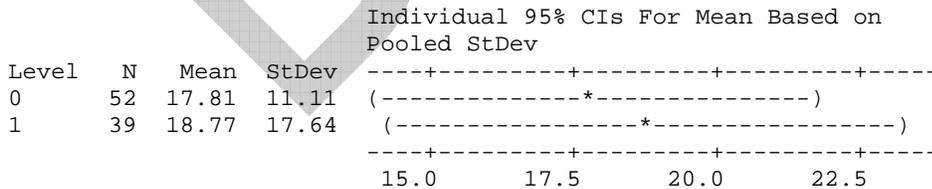


Pooled StDev = 3.142

**One-way ANOVA: Dead\_canopy\_(%) versus Ind\_Course**

Source	DF	SS	MS	F	P
Ind_Course	1	21	21	0.10	0.751
Error	89	18125	204		
Total	90	18146			

S = 14.27    R-Sq = 0.11%    R-Sq(adj) = 0.00%



Pooled StDev = 14.27

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Retrieving project from file:

**- PRELIMINARY DRAFT-**

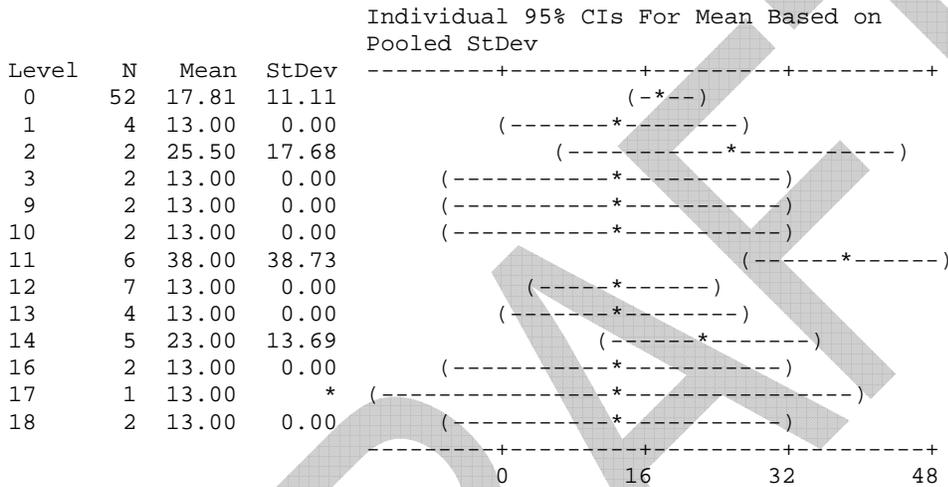
'H:\PARK\PROGRAMS\MONITORING\PEREGRINE\_DISC\_GOLF\_COURSE\DATA\2011\_PPDG\_TREE\_12\_0403.MPJ'

**Results for: 2012\_Priority\_Reference\_Trees**

**One-way ANOVA: Dead\_canopy\_(%) versus Hole**

Source	DF	SS	MS	F	P
Hole	12	3285	274	1.44	0.167
Error	78	14861	191		
Total	90	18146			

S = 13.80    R-Sq = 18.10%    R-Sq(adj) = 5.50%

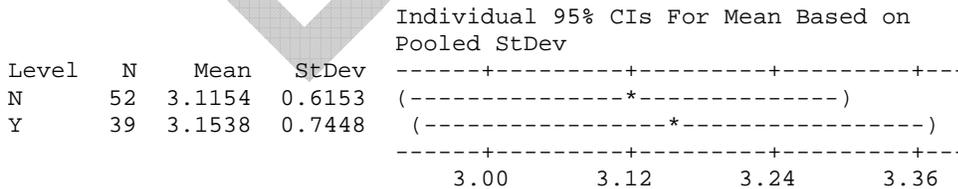


Pooled StDev = 13.80

**One-way ANOVA: Condition\_no versus In\_course(y/n)**

Source	DF	SS	MS	F	P
In_course(y/n)	1	0.033	0.033	0.07	0.788
Error	89	40.385	0.454		
Total	90	40.418			

S = 0.6736    R-Sq = 0.08%    R-Sq(adj) = 0.00%



Pooled StDev = 0.6736

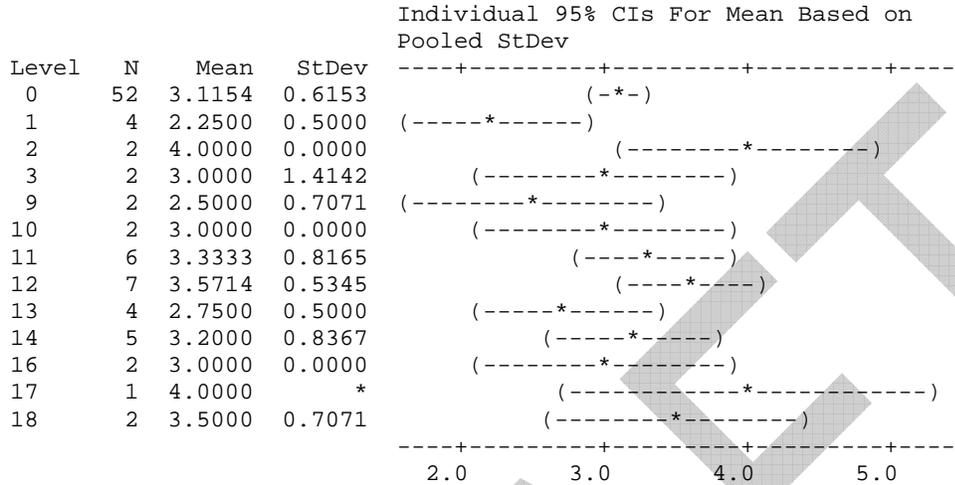
**One-way ANOVA: Condition\_no versus Hole**

Source	DF	SS	MS	F	P
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**- PRELIMINARY DRAFT-**

Hole 12 8.762 0.730 1.80 0.063  
 Error 78 31.655 0.406  
 Total 90 40.418

S = 0.6371 R-Sq = 21.68% R-Sq(adj) = 9.63%



Pooled StDev = 0.6371

**Results for: Worksheet 5**

**Paired T-Test and CI: 2011\_DBH\_(inches), DBH\_(inches)**

Paired T for 2011\_DBH\_(inches) - DBH\_(inches)

	N	Mean	StDev	SE Mean
2011_DBH_(inches)	90	10.2000	4.8903	0.5155
DBH_(inches)	90	10.1333	4.9610	0.5229
Difference	90	0.066667	1.234340	0.130111

95% CI for mean difference: (-0.191861, 0.325194)  
 T-Test of mean difference = 0 (vs not = 0): T-Value = 0.51 P-Value = 0.610

**Paired T-Test and CI: 2011\_Crown\_Width\_(ft), 2012\_Crown\_Width\_(ft)**

Paired T for 2011\_Crown\_Width\_(ft) - 2012\_Crown\_Width\_(ft)

	N	Mean	StDev	SE Mean
2011_Crown_Width	90	20.3667	10.4875	1.1055
2012_Crown_Width	90	19.6556	11.2041	1.1810
Difference	90	0.711111	2.896121	0.305278

95% CI for mean difference: (0.104530, 1.317692)  
 T-Test of mean difference = 0 (vs not = 0): T-Value = 2.33 P-Value = 0.022

**Paired T-Test and CI: 2011\_Trunk\_quad\_impts\_(No), 2012\_Trunk\_quad\_impts\_(No)**

**- PRELIMINARY DRAFT-**

Paired T for 2011\_Trunk\_quad\_impts\_(No) - 2012\_Trunk\_quad\_impts\_(No)

	N	Mean	StDev	SE Mean
2011_Trunk_quad	90	0.87778	0.96951	0.10220
2012_Trunk_quad	90	1.28889	1.31751	0.13888
Difference	90	-0.411111	0.805800	0.084939

95% CI for mean difference: (-0.579883, -0.242340)  
T-Test of mean difference = 0 (vs not = 0): T-Value = -4.84 P-Value = 0.000

**Paired T-Test and CI: 2011\_Damaged\_bar, 2012\_Damaged\_bar**

Paired T for 2011\_Damaged\_bark\_ptchs\_(0->10) - 2012\_Damaged\_bark\_ptchs\_(0->10)

	N	Mean	StDev	SE Mean
2011_Damaged_bar	90	0.311111	0.592925	0.062500
2012_Damaged_bar	90	0.500000	1.114259	0.117453
Difference	90	-0.188889	1.037439	0.109356

95% CI for mean difference: (-0.406176, 0.028399)  
T-Test of mean difference = 0 (vs not = 0): T-Value = -1.73 P-Value = 0.088

**Paired T-Test and CI: 2011\_Broken\_bran, 2012\_Broken\_bran**

Paired T for 2011\_Broken\_branches\_(0->10) - 2012\_Broken\_branches\_(0->10)

	N	Mean	StDev	SE Mean
2011_Broken_bran	90	2.60000	2.48953	0.26242
2012_Broken_bran	90	4.00000	3.22560	0.34001
Difference	90	-1.40000	2.53869	0.26760

95% CI for mean difference: (-1.93172, -0.86828)  
T-Test of mean difference = 0 (vs not = 0): T-Value = -5.23 P-Value = 0.000

**Paired T-Test and CI: 2011\_Dead\_canopy\_corrected\_(%), 2012\_Dead\_canopy\_(%)**

Paired T for 2011\_Dead\_canopy\_corrected\_(%) - 2012\_Dead\_canopy\_(%)

	N	Mean	StDev	SE Mean
2011_Dead_canopy	90	16.4556	10.2947	1.0852
2012_Dead_canopy	90	18.2778	14.2679	1.5040
Difference	90	-1.82222	8.09574	0.85337

95% CI for mean difference: (-3.51784, -0.12660)  
T-Test of mean difference = 0 (vs not = 0): T-Value = -2.14 P-Value = 0.035

**Paired T-Test and CI: 2011\_Cond\_no, 2012\_Condition\_no**

Paired T for 2011\_Cond\_no - 2012\_Condition\_no

	N	Mean	StDev	SE Mean
2011_Cond_no	91	3.19780	0.58156	0.06096
2012_Condition_n	91	3.13187	0.67014	0.07025

**- PRELIMINARY DRAFT-**

Difference            91   0.065934   0.388793   0.040757

95% CI for mean difference: (-0.015036, 0.146904)

T-Test of mean difference = 0 (vs not = 0): T-Value = 1.62   P-Value = 0.109

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