

# An Updated Assessment of Trail User Compliance and Trailside Erosion in Wildcat Creek, Tilden Regional Park, Berkeley California

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East Bay Regional Park District Report

## Introduction

It is generally accepted by ecologists and conservationists that anthropogenic disturbance can lead to stressed riparian areas which can negatively impact the habitat and survivorship of sensitive aquatic animals as well as increase the dominance of exotic plant species, the prevalence of disease and lead to reduced biodiversity (Naiman et al. 2005). It is also widely understood that habitat degradation or loss caused by human disturbance and land-use changes are the most important drivers of threatened and endangered species (EPA 2012). In Wildcat Creek, native rainbow trout species (*Oncorhynchus mykiss*) is of particular concern. The once anadromous species thrived in the creek until it was extirpated sometime after WWII (Collins 2000). *O. mykiss* was re-introduced by East Bay Regional Park Districts' (EBRPD) Fisheries Department in 1983 from local Redwood Creek by Peter Alexander and staff (Personal Communication, Alexander 2014). Since that time, *O. mykiss* populations have been annually monitored in Wildcat Creek. From the time of their reintroduction, *O. mykiss* populations fluctuated from 1983-2000 as they were becoming reestablished; however populations have remained relatively stable over the past decade. Wildcat Creek also provides habitat for California Coastal Newts (*Taricha torosa*) which are listed as a California Species of Special Concern by the California Department of Fish and Wildlife and possibly habitat for federally Threatened California Red-legged Frogs (*Rana draytonii*) (Nafis 2014).

In 2001, the district began employing student interns to help discern the cause of fluctuating populations of native rainbow trout. It was hypothesized that fish populations were possibly suffering due to the overuse of Wildcat Gorge Trail adjacent to the creek by hikers and particularly by off-leash dogs entering sensitive summer trout habitat. In California's Mediterranean climate, native trout rely on deep pools along the trail during summer months to endure until the winter rains arrive. Of major concern was possible sedimentation due to increased bank erosion and increased turbidity in deep pools caused by human and dog disturbance.

By observing bank erosion and lack of riparian vegetation along the trail, student intern Jacob Shepard (2001) concluded that Tilden Park and Rifle Range Pool in Wildcat Canyon were the areas most impacted by human disturbance. In 2002, Steve Brumbaugh also measured erosion and lack of vegetation and narrowed down the most impacted areas to the reach between Nook Pool and Brook Pool (located in Tilden Park downstream from Lake Anza) and again Rifle Range Pool. Brumbaugh also found lower trout populations than in previous years which he attributed to drought and the possibility of negative impacts from trail users and their dogs entering the creek.

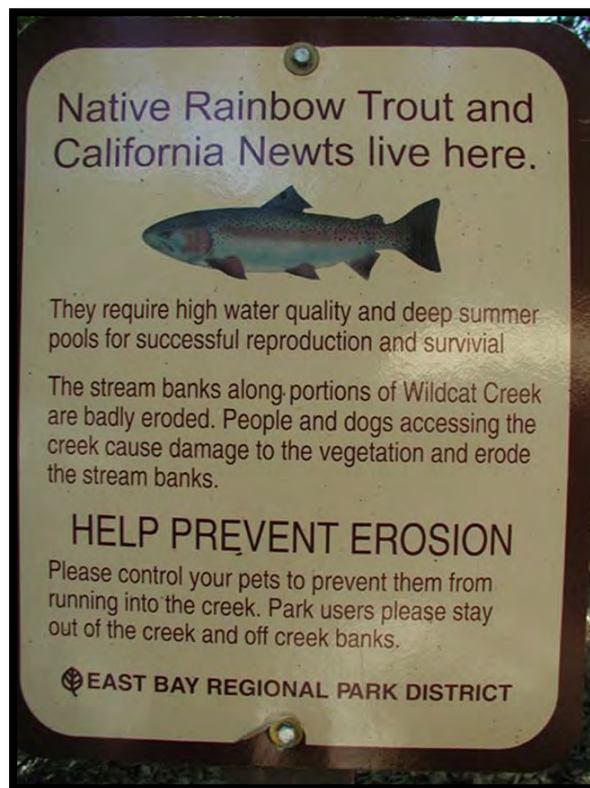
As a result of these findings, EBRPD erected 12 educational signs along Wildcat Gorge Trail informing the public about sensitive trout and newt habitat (fig 1). The district did not change any laws at this time; the hope was that the public would comply with educational signage without having to apply what some might consider heavy-handed tactics such as leash laws or excluding dogs from the trail all together. Brumbaugh (2002) finished his summer internship by observing park visitors and their dogs to evaluate the effectiveness of the new signs. He concluded that the signs were somewhat effective in curtailing people and dogs from entering Wildcat Creek.

In 2003, EBRPD went a step further and erected two-rail split-rail fencing along areas of the creek deemed to be the most sensitive by past studies in Tilden Park. Student intern Scott Wise (2003) observed Nook Pool in Tilden Park to discover if fencing further discouraged visitors and dogs from entering the pool. He found that the fencing was effective, bringing non-compliance down from 46% in the previous summer to 33%. Wise also concluded that the activities of people and dogs may not be directly influencing trout populations but were most likely indirectly affecting habitat. He went on to recommend that an effort be made by the district to restore trout habitat (i.e. riparian vegetation) if populations were to thrive beyond their current carrying capacity at that time.

A final study was completed in 2004 by student intern Matthew Graul. His observational study of Nook Pool revealed an 11% increase in dogs entering the pool since 2003. He concluded that visitors seemed to have grown accustomed to the new signage and fencing. The total number of non-compliant dogs was 44% (very close to Brumbaugh's 2002 study numbers of 46% which were observed before signage and fencing were erected). Graul also completed a trailside erosion study and found 537.5 m<sup>2</sup> of bare ground adjacent to Wildcat Gorge Trail proper from Brook Pool to Nook Pool.

## Objectives

The objective of this study is to repeat the observational and erosional studies from over a decade ago in order to discern if the public has become more compliant with educational signage and fencing. Furthermore this study seeks to discover if these efforts have decreased erosion and lack of riparian vegetation along the Wildcat Gorge Trail in Tilden Park from Brook Pool to Nook Pool. Current status of the creek trail will be compared with past studies and recommendations will be made to help the District to continue educating the public about the possible impacts of humans and their dogs on sensitive trout and newt habitat adjacent to Wildcat Creek.



**Figure 1: Educational signs erected along Wildcat Creek in Tilden Park informing visitors of sensitive creek habitat.**

## Methods

### Site Description:

From its headwaters at Grizzly Peak to its outlet at San Pablo Bay, Wildcat creek is approximately ten miles long and its watershed encompasses approximately 4,500 acres (Hassler 2002). On its way from the Berkeley Hills, the creek passes through a golf course, a nature preserve, a working farm and a residential area. Wildcat Creek also passes through two reservoirs (Jewel and Anza) and two East Bay Regional Park District (EBRPD) parks, Tilden Park, located in Berkeley, California and Wildcat Canyon/Alvarado Park, located in San Pablo/Richmond (Wise 2003). The study sites are adjacent to Wildcat Creek on Wildcat Gorge trail in Tilden Regional Park from Brook Pool to Nook Pool, just downstream from Lake Anza.

### Trail User Compliance Study:

Between June 17 and July 13, 2014, 60 hours of observational data were collected at Nook Pool (N 37.90, W 122.26), which is located along the Wildcat Gorge Trail about 800 meters northwest of Lake Anza in Tilden Regional Park (fig 2). Trail user and dog compliance was monitored for 36 hours during the week and 24 hours on weekends using a modified version of the protocols developed by Wise (2003) and Graul (2004). In order to avoid sampling bias and also to discover if certain times of the day were more problematic, weekdays and weekends were further categorized into equal representations of morning, afternoon and evening hours for a total of 12 hours of each time period on weekdays and 8 hours of each time period on weekends. Observations were made from behind a large California bay laurel tree, uphill on the west bank across from Nook Pool. The pool is perfectly visible from this location while at the same time being completely obscured from visitors making it an ideal location for an unbiased observational study. Categories of data collected are summarized in Table 1 below and the data form used is referenced in Appendix 1.

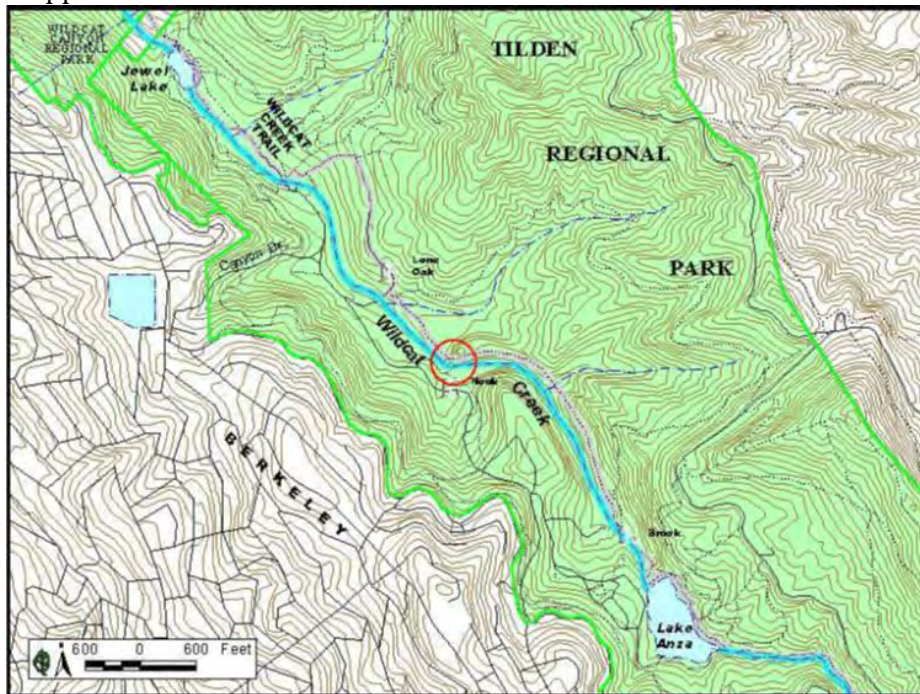


Figure 2: Study area along Wildcat Creek in Tilden Park, Nook pool is circled in Red.

**Table 1: Trail User Compliance Data Collected at Nook Pool**

| Park Visitors   | Dogs               |
|-----------------|--------------------|
| In pool         | Off-leash          |
| Time in pool    | On-leash           |
| On bank         | In pool            |
| Walking 1 dog   | Time in pool (sec) |
| Walking 2 dogs  | On bank            |
| Walking 3+ dogs | Owner encouraged   |
| Riding bicycles | Owner discouraged  |

### Erosion Study

A qualitative assessment of Wildcat Gorge Trail from Brook Pool to Nook Pool was made by walking its length, recording field notes and photo documenting areas of concern. We recorded 1) areas that appeared trampled (compacted) and lacked vegetation adjacent to the trail (i.e. bootleg trails) 2) areas showing obvious signs of erosion (U-shaped or cut trails) adjacent to the official trail 3) past study locations that were either in recovery or still showed signs of trampling or erosion 4) fencing in need of repair or alteration to deter visitors from crossing as well as 5) areas that were likely experiencing erosion due to natural occurrences such as water runoff (Appendix 2). The focus of these observations was concentrated on the side of the trail directly adjacent to the creek; we did not make any notes concerning the opposite side of the trail. Every attempt was made to compare current observations with past site locations in the last study conducted by Graul (2004) whenever possible while also observing any other areas of concern that were not observed in past studies. Each location was described, assigned a number and photographed for future reference (Appendix 3).

At areas along the trail where trampling or erosion were observed, a quantitative measurement was made (excluding those areas that were deemed to be naturally caused). Trampled areas were characterized as areas where the ground was completely bare (lacking a litter layer) and erosion depth was less than 2.54 cm (1 in.). These areas were measured by breaking “trampled” areas into polygon shapes, calculating the area of each polygon and summing these measurements together to achieve an area in m<sup>2</sup> (Brumbaugh 2002). Areas where erosion depth of the soil layer exceeded 2.54 cm were characterized as “eroded”; length and width were recorded again using polygon shapes and depths were also recorded at every 2 feet along the length of the observed erosion area and averaged to calculate the approximate amount of erosion that had occurred in m<sup>3</sup> (NRCS 2001; Personal Communication, Falzone 2014).

## Results

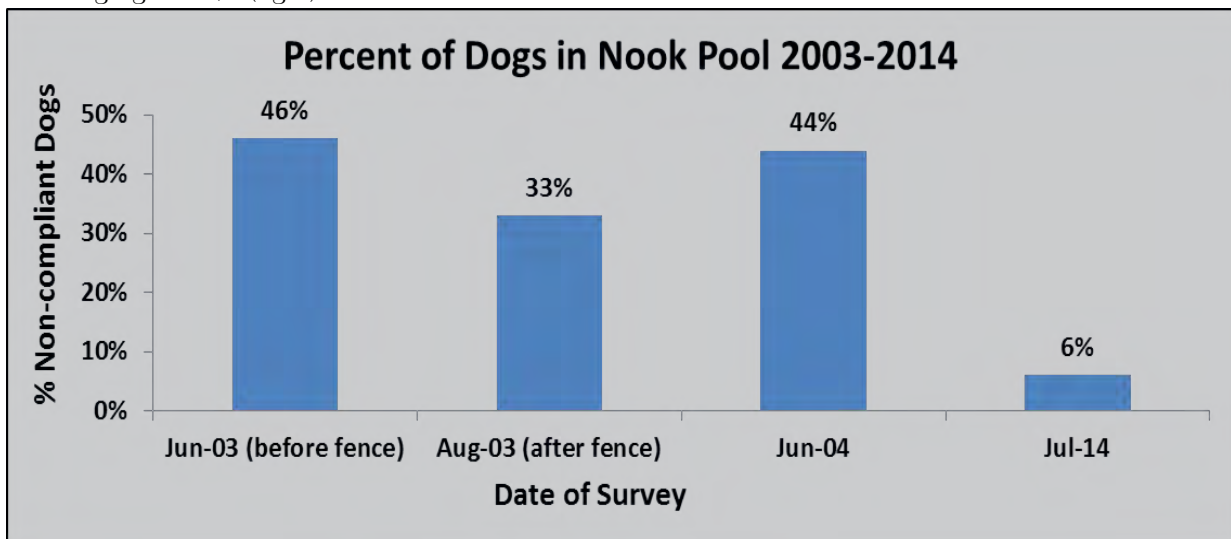
### Compliance Study:

Over the course of approximately one month and 60 hours, 2,416 park visitors were recorded as well as 796 dogs. 81.7% of dogs were observed as being off-leash and 19.3% were noted as being on-leash. This was an increase of 8.7% overall of leashed dogs from 2004 when 10.6% of dogs were recorded as being on-leash by Graul (2004). However, it should be noted that *there was not one instance where a leashed dog entered either Nook Pool or Nook Bank*. Of all dogs visiting Nook Pool (leashed and unleashed), 6.3% were recorded as being in Nook Pool and 6.4% were noted as being on the bank; past studies did not report the number of dogs on Nook Bank. This is a dramatic reduction of dogs entering Nook Pool when compared to past studies (fig 3).

Results for behavior observed by visitors walking 1 dog, 2 dogs and 3+ dogs revealed an increase in non-compliance overall correlated with the number of dogs the person was walking. In other words, the more dogs an owner was in charge of, the more likely a dog would become non-compliant. We determined non-compliance as there being at least one dog either on Nook Bank or in Nook Pool. When owners were walking just one dog, the percentage of non-compliance was 10%, when walking 2 dogs the percentage rose to 20% and when a visitor was walking 3 or more dogs, the percentage of non-compliance rose to 48% (fig 4).

No humans were observed entering Nook Pool. One exception was a frustrated bike rider who threw a large rock into the pool after becoming stuck trying to climb the hill at that section of the trail. Out of 2,416 visitors only 30 were seen on the bank of the creek; that equals approximately 1% of visitors. Of those 30 visitors, 5 were speaking a language other than English (3 Japanese and 2 Spanish).

From the group of non-compliant dogs, we also analyzed the number of owners who either encouraged or discouraged their dogs' non-compliant behavior. Of the dogs entering Nook Pool, 61% of owners encouraged them to enter while 39% did not (fig 5). An almost complete reversal was seen in the percentages of owners encouraging their dogs to enter the bank at 35% and discouraging at 65% (fig 6).



**Figure 3: The percentage of dogs entering Nook Pool has decreased dramatically since 2004. No leashed dogs were observed entering Nook Pool.**

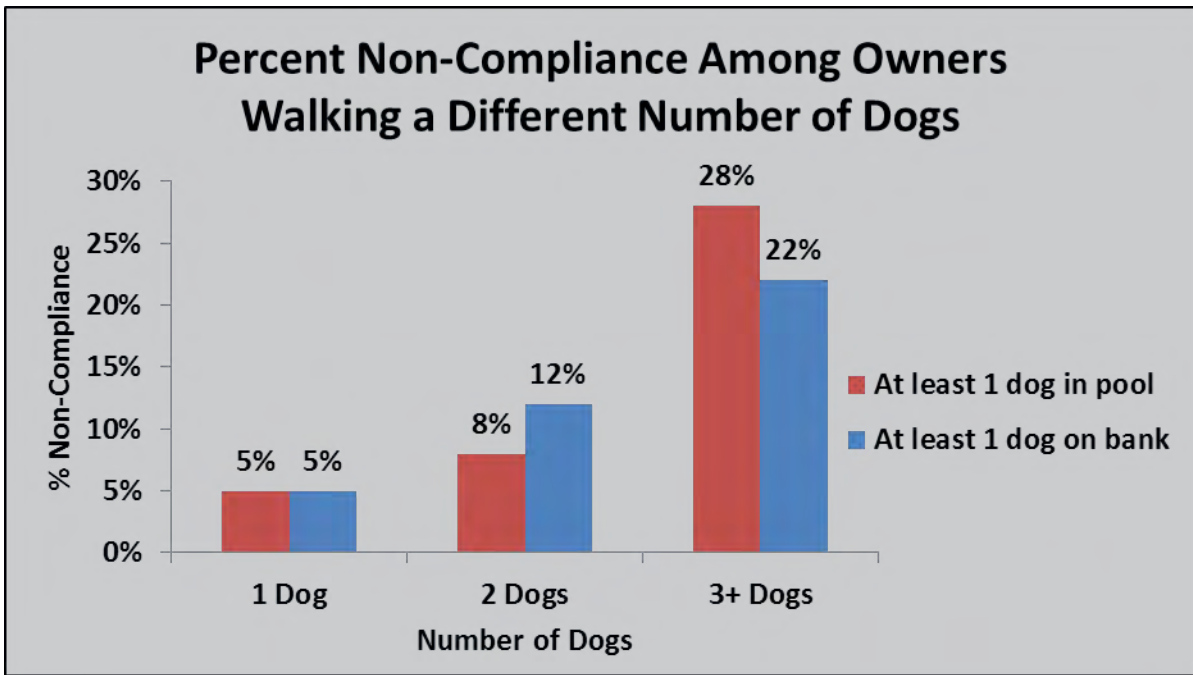


Figure 4: Non-compliance (either a dog on the creek bed or in Nook Pool) increased depending on the number of dogs a visitor was walking. Of those walking 3 or more dogs, 48% were non-compliant with EBRPD signage.

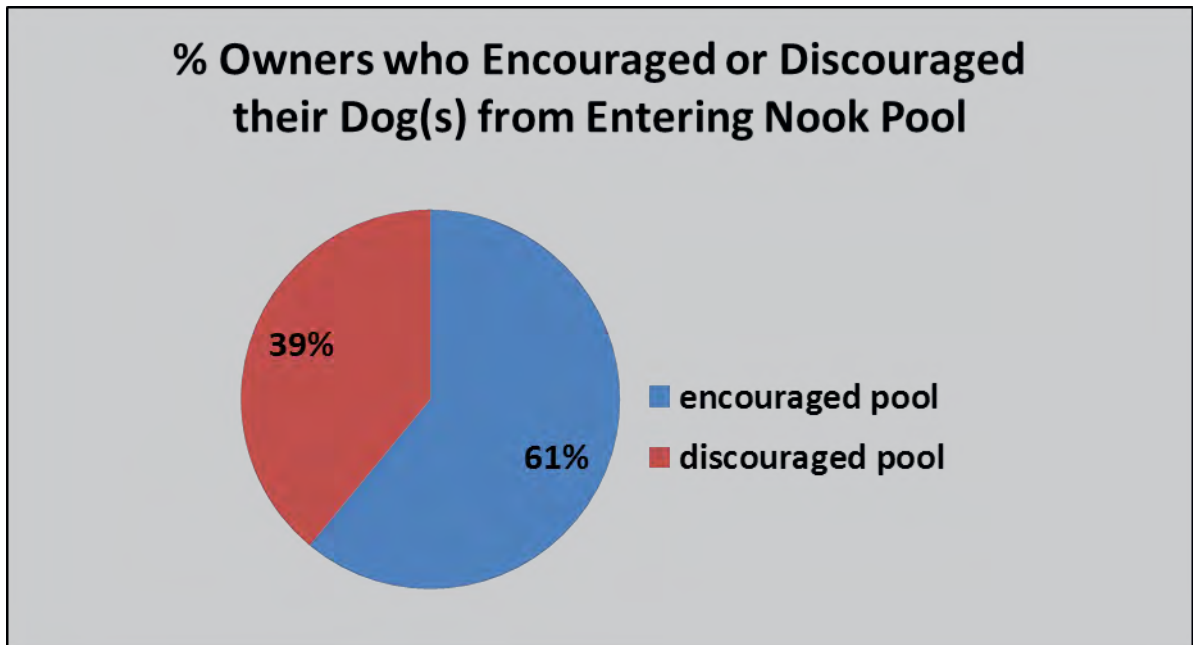
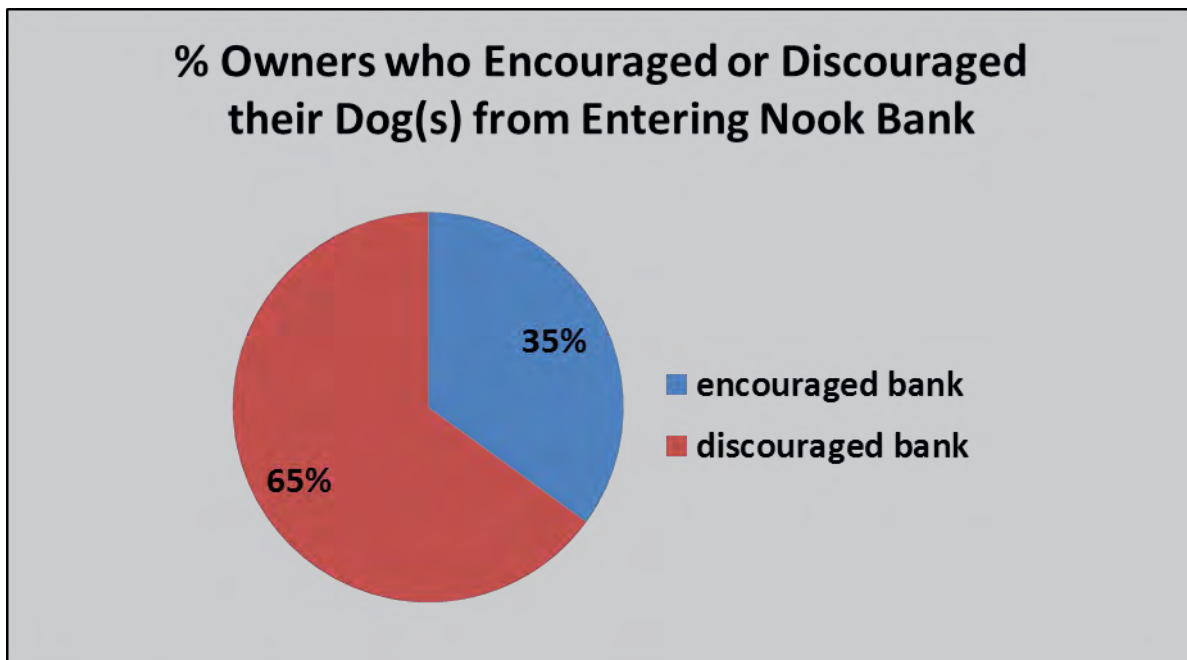


Figure 5: Of those dogs entering Nook Pool, 61% were encouraged by their owners to do so.



**Figure 6: Of those dogs entering Nook Bank, 35% of owners encouraged them to do so.**

#### Erosion Study:

Our initial qualitative assessment of the trail was conducted on July 29, 2014. We observed that along many areas of the trail, fencing was in need of repair or alteration to deter visitors and animals from leaving the trail and entering the bank and stream (see appendix 2 and 3). We found some difficulty in matching sites from previous studies with current sites of erosion and or trampling; we did manage to match a total of eleven sites from Graul's (2004) study (appendix 2). We also observed areas along the trail that showed signs of naturally induced erosion (i.e. from water or wildlife) which was also recorded in appendix 2 and photo-documented in appendix 3.

Quantitative measurements were taken on August 19, 2014 in areas recorded as either "trampled" or "eroded". A total approximate area of 89.2 m<sup>2</sup> was found to be trampled and a total approximate area of 32.2 m<sup>2</sup> was found to be eroded. This is a total area of 121.4 m<sup>2</sup> most likely affected by park visitors and their pets leaving the appointed trail. Total erosion is estimated to be 1.5 m<sup>3</sup> from areas deemed to be eroded (not including areas caused naturally which were not measured). Of the eleven areas matched with the 2004 study, six were deemed to be caused by human or dog disturbance and re-measured. Of the sites compared, 141.3 m<sup>2</sup> was impacted in 2004 while that number decreased to 70.1 m<sup>2</sup> in 2014 (Table 2).

**Table 2: A comparison of 2004 and 2014 sites measured for bare ground, trampling or erosion.**

| 2004 Site #  | Impacted Area m <sup>2</sup> | 2014 Site # | Impacted Area m <sup>2</sup> |
|--------------|------------------------------|-------------|------------------------------|
| 1            | 59.3                         | 1           | 27.9                         |
| 2            | 7.4                          | 2           | 17.9                         |
| 13           | 4.5                          | 9           | 1.6                          |
| 16           | 24.4                         | 14          | 7.7                          |
| 17           | 10.0                         | 15          | 6.4                          |
| 20           | 35.7                         | 19          | 8.6                          |
| <b>TOTAL</b> | <b>141.3 m<sup>2</sup></b>   |             | <b>70.1 m<sup>2</sup></b>    |



Although sites were not able to be matched with Brumbaugh's (2002) study, he recorded a total of 159 m<sup>2</sup> of bootleg trails while this current study found slightly less at 121.4 m<sup>2</sup>.

## **Discussion**

Overall, we have found that the percentage of dogs in Nook Pool has decreased dramatically over the last decade. However, dogs are still entering the pool on a daily basis and affecting sensitive habitat. The data also showed some other interesting trends. We found that of the dogs observed in the creek, a majority of their owners encouraged them (either actively or passively) to enter; this points to the difficulty of educating the public about these issues even when educational signs are placed directly in front of them. It is obvious—at least for these owners that the educational signs are not effective and other techniques are needed to convince them. Another interesting trend was that the more dogs that an owner was responsible for, the more likely it was that their dog(s) would either be in the creek or on the bank of Nook Pool; this shows that non-compliance likely increases as owners or handlers lose control of their dogs when handling too many. It was often observed that dogs running ahead of their handlers would dive into Nook Pool before their handlers had a chance to discourage them. This is a perfect example of a dog not being under the voice control of their owner which was observed repeatedly. And then many handlers upon noticing their dog in the creek would simply wait for the dog to finish without asking them to leave—we considered this as encouragement. Finally, while the results show a dramatic improvement it should be stressed that at no time did we observe a dog on leash entering either the bank or Nook Pool. It is still uncertain how fish and newts are affected by dog disturbance; although this study is averaged over 60 hours, some days were busier than others. It warrants further study to discern how this disturbance is affecting fish and newt habitat.

The erosion study proved to be quite difficult to repeat as descriptions made by Brumbaugh (2002) and Graul (2004) were not always easy to find. This could be because the sites had recovered or were no longer recognizable. To avoid that problem for future researchers, we have included photo documents of all the sites tested and observed to make matching up sites easier for a comparison of conditions in the future (appendix 3). Because of these difficulties, we were not able to make many comparisons except to six of the eleven sites we were able to definitively match with Graul's sites. Graul (2004) found a total 537.5 m<sup>2</sup> area of both trampled ground and bare ground. However Graul included areas that were eroding naturally while we did not measure these. Therefore, four of these sites could not be compared and another site from the 2004 study has since become over grown with brambles (mostly Himalayan Raspberry). Yet, of the six sites we could match, impacted areas did decrease by about half in ten years. However, we are not confident in drawing too large of a conclusion about the improvement of off trail impacts since the sample size was very low.

## **Conclusions**

Over the course of this study, we have observed how water levels have decreased drastically from June to August in Wildcat Creek; exacerbating this decrease is one of the most severe droughts California has seen in decades if not centuries. For species that depend on this habitat for survival it is crucial that the small amount of water available to them in dry months be free from pollution. It is our opinion that establishing a leash law—at least during summer dry months before winter rains arrive—may be the best course of action until it can be determined definitively if the disturbances that are continuing to happen are negatively affecting trout and newt habitat. While the public seems to have mostly embraced the concept of saving habitat for fish and newts as evidenced in the great reduction of dogs in Nook Pool, those handlers that are not compliant seem rather stubborn in their refusal to comply as evidenced by the majority encouraging their dogs to enter the pool.

The erosion witnessed by natural causes along the trail should be addressed to decrease further erosion into the creek. Concerning erosion and compaction caused by humans and dogs,

we believe much can be averted by simply adding mesh to the bottom of fences in strategic places, tapering and extending fencing where needed and establishing a leash law. Finally a bridge should be built over Brook Pool as we observed many times that dogs and people could not help but enter the water at this location (see appendix 2 and 3).

### Recommendations

- Establish a leash law at least during dry months of the year (June-Sept).
- Conduct further studies on the effect of dog disturbance on fish and newt habitat.
- Continue to find ways to educate the public about sensitive riparian habitat.
- Find ways to reduce naturally and unnaturally occurring erosion along the creek (i.e. planting vegetation, building terraces or retaining walls, mulch, etc.)
- To discourage people and pets from leaving the trail, repair, connect, and apply mesh or taper fencing in strategic locations as outlined in appendix 2.
- Build a bridge over Brook Pool.

*This study was conducted by the East Bay Regional Park District fisheries staff: Jennifer Podvin (student intern), Peter Alexander (former Fisheries Program Manager) & Joe Sullivan (current Fisheries Program Manager).*

### Acknowledgements

I would like to thank Peter Alexander and Joe Sullivan for giving me the opportunity to work on this project and for their invaluable advice and support. I would also like to acknowledge Anthony Falzone for taking the time out of his very busy schedule to advise me on methods and protocols for the erosional study. Finally many thanks go out to EBRPD for creating opportunities for students to gain hands-on experience in the field of conservation and for providing a wonderful learning experience.

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## Appendix 2: Erosional Study Site Data Form and Descriptions with Notes and Recommendations

| Location           | Description of site  | Eroded<br>in m <sup>3</sup> | Trampled<br>in m <sup>2</sup> | Graul 2004<br>past site # | Naturally<br>Caused | Slope    | Notes/ Recommendations<br>see appendix 3 for pictures   |
|--------------------|--|-----------------------------|-------------------------------|---------------------------|---------------------|----------|---|
| 1                  | Nook Pool  | YES                         | YES                           | 1                         | NO                  | MODERATE | Right of sign, fencing in need of netting at the bottom to deter dogs. Fencing in need of repair further upstream (falling over). |
|                    |  | 0.4                         | 14.3                          |                           |                     |          |   |
| 2                  | 1st split rail fence after Nook Pool                                       | YES                         | YES                           | 2                         | NO                  | MODERATE | Fence could be extended to deter hikers and dogs.   |
|                    |  | 0.4                         | 9.9                           |                           |                     |          |   |
| 3                  | 2nd split rail fence after Nook Pool                                       | YES                         | YES                           | 3 & 4                     | YES                 | STEEP    | Fence could be extended. Erosion appears to be caused by water from opposite side of trail (possible deer path to creek).         |
|                    |  |                             |                               |                           |                     |          |   |
| 4                  | Up stream from site 3  | NO                          | NO                            | NA                        | NA                  | GRADUAL  | Fence in need of repair (falling over).   |
|                    |  |                             |                               |                           |                     |          |   |
| 5                  | 3rd split rail fence after Nook Pool (Redwood tree)                        | YES                         | NO                            | 9                         | YES                 | STEEP    | Water erosion from upper trail.   |
|                    |  |                             |                               |                           |                     |          |   |
| 6                  | Redwood grove  | NO                          | YES                           | NA                        | NO                  | GRADUAL  | Extending fence would help with trampling around Redwood trees.   |
|                    |  |                             | 7.9                           |                           |                     |          |   |
| 7                  | Stone culvert  | YES                         | NO                            | NA                        | YES                 | MODERATE | Water erosion from upper trail.   |
|                    |  |                             |                               |                           |                     |          |   |
| 8                  | Upstream from culvert  | NO                          | NO                            | 12                        | NA                  | GRADUAL  | This area was once trampled but is now grown over with brambles.  |
|                    |  |                             |                               |                           |                     |          |   |
| 9                  | Under Bay tree on right before large Bay (with hole) on left side of trail | NO                          | YES                           | 13                        | NO                  | MODERATE | Mostly recovered, still some trampling evident.   |
|                    |  |                             | 1.6                           |                           |                     |          |   |
| 10                 | Upstream from bay trees  | YES                         | NO                            | NA                        | YES                 | MODERATE | Appears to be deer or wildlife trail.   |
|                    |  |                             |                               |                           |                     |          |   |
| 11                 | 1st split rail fence after bay trees and at large bay tree                 | YES                         | NO                            | 14                        | YES                 | STEEP    | Water runoff from upper trail. Still in need of revegetation.   |
|                    |  |                             |                               |                           |                     |          |   |
| 12                 | Just before split rail fence at Redwoods near 3 large bay trees            | NO                          | YES                           | NA                        | NO                  | GRADUAL  | Fence should be extended to discourage bootleg trail.   |
|                    |  |                             | 4                             |                           |                     |          |   |
| 13                 | Beginning of split rail fence at 2 Redwoods                                | NO                          | YES                           | NA                        | NA                  | GRADUAL  | Fence should be extended to discourage bootleg trail. *Very close to creek, easy access. Netting needs repaired.                  |
|                    |  |                             | 6.4                           |                           |                     |          |   |
| 14                 | End of split rail fence near 2 Redwoods and 1 bay                          | YES                         | YES                           | 16                        | NO                  | GRADUAL  | Fence needs repaired, *very close to close to creek with easy access. Witnessed a dog entering while measuring.                   |
|                    |  | 0.04                        | 7.3                           |                           |                     |          |   |
| 15                 | Upstream of redwood fence  | YES                         | NO                            | 17                        | UNCERTAIN           | STEEP    | Fence needed.   |
|                    |  | 6.4                         |                               |                           |                     |          |   |
| 16                 | Fence upstream of site 15 near 3 Redwoods                                  | NO                          | YES                           | NA                        | NO                  | GRADUAL  | Very easy access to creek; a tapered fence could deter visitors.  |
|                    |  |                             | 26.3                          |                           |                     |          |   |
| 17                 | Upstream from site 16  | YES                         | YES                           | NA                        | YES                 | STEEP    | Water erosion evident; easy access to creek. Connect fences.  |
|                    |  |                             |                               |                           |                     |          |   |
| 18                 | Beginning of 2nd fence upstream from site 17, before Brook pool            | YES                         | YES                           | NA                        | NO                  | GRADUAL  | Trampling along fence, seems to be still in the process of recovery; not recently used. Mesh at fence bottom recommended.         |
|                    |  | 0.3                         | 2.8                           |                           |                     |          |   |
| 19                 | Just before Brook Pool   | NO                          | YES                           | 20                        | NO                  | GRADUAL  | Bank in recovery but still much bare ground. A bridge is recommended over the creek at Brook Pool.                                |
|                    |  |                             | 8.6                           |                           |                     |          |   |
| <b>TOTAL</b>       |  |                             |                               |                           |                     |          |   |
| <b>trampled</b>    | <b>89.2 m<sup>2</sup></b>  |                             |                               |                           |                     |          |   |
| <b>eroded area</b> | <b>39.2 m<sup>2</sup></b>  |                             |                               |                           |                     |          |   |
| <b>erosion</b>     | <b>1.5 m<sup>3</sup></b>   |                             |                               |                           |                     |          |   |

Appendix 3: Photos of Sites as outlined in Appendix 2



Location 1: Nook Pool. Netting should be applied here at the bottom of the fence. This was the most popular access point for dogs entering Nook bank and pool.



Location 1: Nook Pool. Further up the trail, this fence is falling over and in need of repair. Also netting should be placed at the bottom of the fence. This was the second most popular entry location for dogs entering Nook bank and pool.



**Location 2: 1st split-rail fence after Nook Pool (upstream). Here you see an obvious bootleg path leading to the creek. Fencing should be extended here to deter hikers and dogs.**



**Location 3: 2nd split-rail fence upstream from Nook Pool. This steep trail appears to be caused by water erosion. Fencing should be extended to discourage animals or people from entering. A retaining wall could prevent further erosion.**



Location 3: Alternate view of steep, water eroded path leading directly to Wildcat Creek.



Location 4: Upstream from site 3. Fence in need of repair.



**Location 5: 3rd split-rail fence upstream from Nook Pool (at large Redwood tree). Here water erosion from the opposite of the trail is evident. A retaining wall could be effective for reducing the amount of erosion entering Wildcat Creek.**



**Location 6: Redwood grove. Fencing is falling over and in need of repair. Bootleg trail is very close to creek—a very easy access point for people and dogs.**





**Location 6: Redwood grove. Trampling around Redwood trees could be prevented by repairing and extending fencing (to the left) of the tree.**



**Location 7: Stone culvert. This site is also experiencing erosion from water runoff which is draining directly into a tributary. A retaining wall is recommended.**



**Location 8: Upstream from stone culvert. This site was identified as location #12 from Graul's 2004 study, a once trampled area is now overgrown with Himalayan Blackberry.**



**Location 9: Under large bay tree on right side of trail (on opposite side of trail from large bay tree with hole in trunk). Site #13 from Graul's 2004 study appears to be recovering but is still showing signs of trampling. A fence could be erected here to discourage people and animals from entering.**



**Location 10:** Upstream from bay trees. These trails appear to be caused by wildlife, likely deer. The creek is about 5 meters from the trail here.



**Location 11:** 1st split-rail fence upstream from bay trees at large bay tree. Water erosion is again evident from opposite side of trail. Re-vegetation or a retaining wall is recommended.



**Location 12: Just before split rail fence at Redwoods near three large bay trees. Fencing should be extended to cut off bootleg trail.**



**Location 12: Alternate view showing where fence ends and should be extended to bay trees.**



**Location 13: Beginning of split-rail fence at 2 large Redwoods. Fencing should be extended here and netting added/repaired. This location is very flat and close to the creek providing very easy access for hikers and dogs.**



**Location 13: Alternate view showing where fencing should be extended to the right.**



**Location 14: End of split-rail fence near 2 large Redwoods. Fencing is in need of repair and netting installed. This area is extremely close to the creek and is very easy to access.**



**Location 14: Alternate view showing trampling and close proximity of Wildcat Creek.**



**Location 15:** Upstream from redwood fence. Erosion is evident but it is uncertain how it was caused. A fence should be erected to deter hikers and animals from entering.



**Location 16:** Fence upstream from location 15 near 3 redwoods. Trampling was abundant here and the creek easily accessed; a tapered or extended fence could discourage visitors and dogs from entering.



Location 17: Upstream from location 16. Water erosion is evident but the creek is also easily accessed from here, there is a fence both before and after this location—the fence should be connected and a retaining wall erected to discourage further erosion.



Location 18: Beginning of 2<sup>nd</sup> fence upstream from site 17, just before Brook Pool. Trampling is still evident along the inside of the fence although there appears to be some recovery in the form of vegetation growing (note the abundance of the invasive grass *Erharta erecta* which was observed along the length of the trail near fences). Mesh at the bottom of fence is recommended.





**Location 18: Alternate view showing the need for mesh on bottom of fence.**



**Location 19: Brook Pool. Banks appear to be recovering but dogs and people cannot avoid walking in the stream here and this location is sensitive as Brook Pool (which is habitat for trout and newts) is directly underneath this location. A bridge is highly recommended.**