



Kiser Environmental Consulting

Research • Analysis • Results

Litter Crisis in Our



National Parks



**Jonathan V. L. Kiser,
William Rhett Kiser, and
Grant R. E. Kiser**



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On the front cover (clockwise from the top left): Plastic bottle litter in Arches National Park; Soda lid and straw litter in Great Basin National Park; Paper litter in Yosemite National Park; and Paper litter in Redwood National and State Parks.



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Executive Summary

Background/Overview

During July 2013, Kiser Environmental Consulting (KEC) undertook an 18-day expedition to document the environmental health of national parks, state parks, and other protected areas. Our journey started in Colorado at Rocky Mountain National Park and led us west through Arches National Park in Utah, Great Basin National Park in Nevada, Yosemite National Park and Redwood National and State Parks in California, and Crater Lake National Park in Oregon. Along the way we also visited and documented environmental issues at Mono Lake in the Mono Basin National Forest Scenic Area, Battery Spencer in the Golden Gate National Recreation Area, Humboldt Redwoods State Park, and Humboldt Lagoons State Park in California.



Rocky Mountain National Park High, © 2016 W. Rhett Kiser.

KEC's mission was to interview rangers at each of the six national parks we passed through, obtain available National Park Service (NPS) literature, and to complete our own environmental field

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observations, including a comprehensive litter survey. Our goal was accomplished. At the other protected areas, KEC concentrated on obtaining historical and environmental information, and documenting all of the litter we encountered.

Air, land, water, and infrastructure issues, plus an overview of litter encountered at the six national parks visited are documented in the KEC publication, “Solving National Park Issues in the West” (available in the Reports For Sale/News Section of the KEC website at: www.kecgreen.com, and on Amazon Kindle eBooks). By comparison, this litter crisis book provides in-depth waste management, recycling, and litter insights resulting from our field surveys at all of the parks and protected areas visited.



Grant and Rhett RMNP Silhouette, © 2016 J. V. L. Kiser.

The ultimate purpose of this work is to help generate awareness of the many environmental challenges faced by our protected lands, and to define ways that the park managers, the general public, industry, environmental organizations, and other stakeholders can do their part to make conditions better. In the case of litter, problems resulting from this thoughtless human behavior include not only a physical eyesore in the natural environment but also the potential threats it poses to wildlife (e.g., disrupting their natural diet, how they find food, etc.).

Our national parks, state parks, and other protected areas are United States treasures and it is up to all of us to respect, honor, and preserve them so they will endure for future generations.

Investigation Methodology

At each of the national and state parks, scenic and recreation areas visited, KEC completed a comprehensive litter survey, counting each piece of litter encountered, and noting the type of material and location where it was found. A One to Four litter severity ranking scale was used, with a One indicating a Clean Site (i.e., No Litter), Two indicating Some Litter, Three indicating a Littered Site, and Four indicating an Extremely Littered Site. This scale was adapted from the Keep America Beautiful template and used by KEC to consistently compare litter amounts in the various parks and protected areas visited.



Arches National Park Lunar Landscape, © 2016 W. Rhett Kiser.

In addition, KEC documented the widespread litter problem by taking strategic photographs, many of which are included in this book. Also included are KEC improvement recommendations for each location.

Key Findings

Litter severity rankings documented for each location the KEC research team visited are provided in ES Exhibit 1.

ES Exhibit 1
Litter Severity Rankings for Parks and Areas Visited

| | Rocky Mountain | Arches | Great Basin | Mono Lake | Yosemite | Battery Spencer | Humboldt Redwoods | Humboldt Lagoons | Redwood National | Crater Lake |
|----------------|-----------------------|---------------|--------------------|------------------|-----------------|------------------------|--------------------------|-------------------------|-------------------------|--------------------|
| Litter Ranking | 2 | 2.5 | 2 | 2 | 3.5 | 4 | 1.5 | 3.5 | 3 | 3 |

Visual Scale: 1 = No Litter; 2 = Some Litter; 3 = Littered Site(s); 4 = Extremely Littered Site(s).

Source: Kiser Environmental Consulting, 2016

Battery Spencer (overlooking the Golden Gate Bridge) was the most littered single location the KEC team visited and consequently received a 4 ranking. Yosemite National Park and Humboldt Lagoons State Park both received the second highest ranking of 3.5. Bear in mind that, in the case of Yosemite, we stopped at about 26 locations, hiked 12 miles, and traveled around 190 miles along park roads (i.e., compared to the single Battery Spencer location). That means the 3.5 reflects an average ranking. Yosemite, with its more than four million annual visitors and limited waste management budget, was very littered. Humboldt Lagoons earned its ranking by having a high concentration of litter along the seven mile stretch of Highway 101 we traveled.



The Peaks of Great Basin National Park, © 2016 Grant R. E. Kiser.

By comparison, both Redwood State and National Parks and Crater Lake National Park followed with a 3.0 severity ranking. This reflects that fact that we unfortunately found littered sites throughout these parks. Arches National Park received a 2.5 ranking and a 2.0 (some litter found) was achieved by Rocky Mountain and Great Basin National Parks and Mono Lake. Humboldt Redwoods State Park received the best rating of 1.5 since we only documented one piece of litter there.



The Peculiar Mono Lake Panorama, © 2016 Grant R. E. Kiser.

ES Exhibit 2 summarizes the actual litter count for each location KEC visited. In total, 1,602 individual pieces of litter and trash were counted. More specifically, 781 pieces of paper litter were documented at the ten parks and other protected areas visited by the KEC team. This represented the highest total number and percentage (49%) of all types of litter counted. Cigarette butts ranked second with 439 individual butts counted (27% of the total), followed by plastic (229 pieces – 14%), non-ferrous metal (45 pieces – 3%), and food (20 pieces – 1%).

ES Exhibit 2 also summarizes the comparative percentage of litter found at each location visited. 35% of the total litter counted (556 pieces) was in Yosemite National Park. This is nearly double the amount counted at Crater Lake National Park (i.e., 18%) and more than twice the amount counted at Redwood National and State Parks (16%) and Battery Spencer (13%).

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ES Exhibit 2
KEC Litter Count in Parks and Protected Areas Visited

| Litter Type | Rocky Mountain | Arches | Great Basin | Mono Lake | Yosemite | Battery Spencer | Humboldt Redwoods | Humboldt Lagoons | Redwood | Crater Lake | Totals | Percent of Total |
|-----------------------|----------------|------------|-------------|------------|------------|-----------------|-------------------|------------------|------------|-------------|-------------|------------------|
| Paper | 25 | 20 | 2 | 8 | 200 | 133 | 1 | 96 | 184 | 104 | 781 | 49 |
| Plastic | 9 | 7 | 3 | 7 | 44 | 24 | - | 64 | 63 | 8 | 229 | 14 |
| Rubber | - | - | 1 | - | 2 | - | - | - | 1 | 2 | 6 | 0.4 |
| Cigarette Butts | 6 | 17 | 1 | 3 | 207 | 54 | - | - | 5 | 146 | 439 | 27 |
| Ferrous Metal | - | 2 | 1 | - | 2 | - | - | - | 1 | - | 6 | 0.4 |
| Non-Ferrous Metal | 5 | 1 | - | - | 17 | - | - | - | 1 | 22 | 46 | 3 |
| Food | - | 3 | 1 | - | 15 | - | - | - | - | 1 | 20 | 1 |
| Cardboard | - | - | - | - | 1 | 4 | - | - | - | - | 5 | 0.3 |
| Other (a) | - | - | - | - | 60 | - | - | - | - | 10 | 70 | 4 |
| Totals | 45 | 50 | 9 | 18 | 556 | 215 | 1 | 160 | 255 | 293 | 1602 | 100 |
| % of Total | 3 | 3 | 0.6 | 1 | 35 | 13 | 0.1 | 10 | 16 | 18 | 100 | - |
| Litter Ranking | 7th | 6th | 9th | 8th | 1st | 4th | 10th | 5th | 3rd | 2nd | - | - |

(a) Includes a feather, candy box chip board, Q tip, cloth, corks, road kill, wood, a sock, glass, composite plastic and foil packaging, and a trash can full of recyclable plastic bottles due to the absence of a recycling container in the Yosemite Mariposa Grove parking lot.

Source: Kiser Environmental Consulting, 2016.








Litter documented in Humboldt Lagoons State Park represented 10% of the total (160 pieces), while Rocky Mountain and Arches National Parks each had 3% of the total litter counted. The litter found at Mono Lake was 1% of the total (18 pieces), Great Basin National Park had less than 1% of the total (9 pieces), and

Humboldt Redwoods State Park, with again only one piece of paper litter, represented 0.1% of the total.

With specific regard to plastic litter, the exhibits found in this book reflect the combination of all types of plastics into one category. This is primarily done to be consistent with the broader litter categories used for the other materials (e.g., paper, food, etc.).

During the course of this field investigation, the KEC research team encountered the full range of plastic types in the form of litter. Details about the specific types of plastic litter we documented are provided in the chapter narratives and exhibit footnotes. ES Exhibit 3 summarizes examples of plastic types and associated items we encountered.

ES Exhibit 3
Examples of Documented Plastic Litter

| Plastic Type | Recycling Symbol | Examples of Materials KEC Encountered |
|-----------------------------------|---|---------------------------------------|
| Polyethylene terephthalate (PETE) |  | Water bottle; Cup lids |
| High-density polyethylene (HDPE) |  | Food storage bags |
| Polyvinyl chloride (PVC or V) |  | Flip-flop |
| Low-density polyethylene (LDPE) |  | Shopping bags; Six pack rings |
| Polypropylene (PP) |  | Straws; Bottle caps; Utensils |
| Polystyrene (PS) |  | Styrofoam, Colored cups |
| Other |  | Miscellaneous hard pieces |

Sources: Public domain and Kiser Environmental Consulting, 2016.

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KEC Improvement Recommendations

For each of the national parks and the protected areas visited, the research team generated a number of improvement recommendations based on our discussions with park officials, literature reviews, and field observations. Note that some of the recommendations offered by KEC may already be in place to varying degrees at the parks. In such cases, an expanded effort will typically be helpful. The scope of this investigation did not allow for an exhaustive assessment of all park and protected area programs.



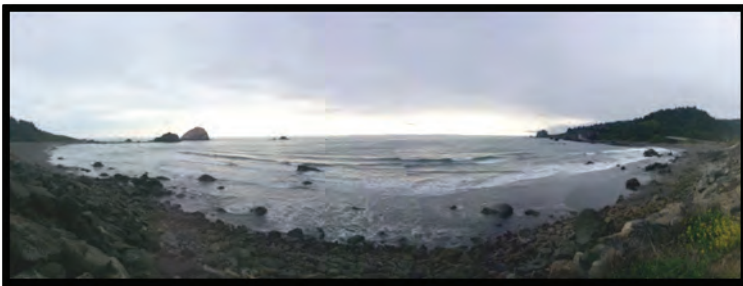
**Looking Into Yosemite National Park from the Tioga Road,
© 2016 W. Rhett Kiser.**

Also, note that many of the recommendations provided for one park are also applicable to the other parks. In other words, report recommendations listed for one park should not be viewed as mutually exclusive with the other parks (even if a particular recommendation is not specifically listed in the other park chapters). For example, additional funding for waste management, recycling, and litter control/prevention staffing and infrastructure (e.g., the placement of more trash cans and recycling bins, and subsequent collection by staff) is something all of the parks can use. Strategically placed anti-litter signage is another need that applies to all of the parks and protected areas. Also, there is a definite lack of recycling bins for plastic bottles and paper in most locations we visited. As a result, these materials were not being effectively recycled.

Establishing a cooperative effort to curb litter between the parks and the tourism industry is another essential strategy. Cigarette butt and paper litter in parking lots and elsewhere from bus tourists and others was an obvious problem. One solution would be to strategically place cigarette receptacles at major tourist stops. This should be bolstered by the bus lines and other tourist agencies bearing some of the responsibility to educate their patrons not to litter and to use the designated receptacles to dispose of their butts.

In addition, pamphlets explaining the importance of recycling and not littering should be passed out on the bus to patrons, and also be made available on the web and at all visitors centers. Anti-litter and trash management signs should be installed in the parking areas and trailheads as well. More stringent littering fine programs may ultimately have to be implemented in some locations to get the situation under control.

From our observations, the voluntary Junior Ranger program in the national parks visited (i.e., a “defensive” program aimed at picking up litter after the fact) was not working very well. This program needs to be energized and additional volunteer groups need to be mobilized to accomplish any real litter cleanup results. Efforts should be documented to better determine program effectiveness.



**Redwood National and State Parks Coastal Area,
© 2016 Grant R. E. Kiser.**

In terms of curbing toilet paper and other litter along the trails, there should be an education outreach effort explaining to visitors

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how to “properly pee and poop” in the woods. It appears that park officials do not want to upset the tourist apple cart in this regard (i.e., they don’t want to discourage folks from coming to the parks and spending their tourist dollars). As a result, the parks that are clearly suffering.

There is an extreme level of laziness and indifference ingrained in the mentality of those who litter and education is a key first step to start reversing the attitudes of the throw-away society. It is better to address this reality head-on, instead of not taking the needed action against those who are willing to desecrate the very paradise they seek.

In summary, the President, U.S. Congress, the National Park Service (NPS), and the states must take a stand, make litter and proper waste management a priority, and provide sufficient funds to reverse the horrible circumstance. It’s clear how important the parks are from an economic stimulus perspective, as witnessed during the federal government 2013 shut down when a number of states took the initiative, at their own expense, to reopen park facilities. Now is the time to dedicate the needed creative resources to elevate the collective conservation consciousness and behavior of all those who benefit and/or seek refuge in the tranquility of park sanctuaries.



Crater Lake Swim, © 2016 J. V. L. Kiser.



Chapter 1

Rocky Mountain National Park



**Rhett and Grant at the RMNP Eastern Entrance,
© 2016 Jonathan V. L. Kiser.**

Overview

Rocky Mountain National Park (RMNP) was established as a national park in 1915, one year before the creation of the NPS. According to the NPS, the park contains more than 110 mountain peaks above 10,000 feet in elevation, and holds 72 named peaks above 12,000 feet, including Longs Peak, the tallest in the park at 14,259 feet. In addition, there are over 150 alpine lakes.

95 percent of the park is protected under the 1964 Wilderness Act, and it is managed in a manner to preserve its wilderness character and natural conditions. In total, RMNP contains 415 square miles

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which amounts to 265,000 total acres. During 2015, NPS reported that a record high 4.16 million visitors came here.

KEC Field Observations: July 13, 2013

RMNP Entrance

Departing from our hotel in Estes Park, the KEC research team followed Route 36 to the RMNP entrance. At the park entrance sign, we counted five pieces of paper litter (including a lollipop stick) and a cigarette butt.



**Rhett Pointing Out Paper Litter at RMNP Entrance,
© 2016 Jonathan V. L. Kiser.**



Paper Litter at RMNP Entrance, © 2016 Jonathan V. L. Kiser.

Beaver Meadows Visitor Center

Our next stop was the Beaver Meadows Visitor Center (Park Headquarters at 7,840 feet elevation) just inside the park entrance. This is a National Historic Landmark that was designed by the Frank Lloyd Wright School of Architecture at Taliesin West.



Beaver Meadows Visitor Center, Public Domain.

In spite of there being well-placed, separate bins for mixed recyclables and trash outside the visitor center, nine pieces of litter were documented nearby. The litter included three pieces of paper, a piece of hard plastic, a plastic bag, bottle, a straw, and two cigarette butts.



Recycling and Trash Receptacles, Beaver Meadows Visitor Center Parking Lot, © 2016 Jonathan V. L. Kiser.

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Plastic and Paper Litter, Beaver Meadows Visitor Center Parking Lot, © 2016 Jonathan V. L. Kiser.

We next followed the Trail Ridge Road (Route 34) west toward Grand Lake. Along the way the team encountered a trash management bin with an animal-proof lid. The backdrop was stunning with Longs Peak, the highest mountain in the park (elevation 14,259 feet), looming in the background.



Animal-Proof Trash Container along Trail Ridge Road, © 2016 Jonathan V. L. Kiser.

Many Parks Curve Overlook

Continuing along Trail Ridge Road, we arrived at the Many Parks Curve Overlook. Along with the spectacular panoramas, there were a lot of tourists and 17 pieces of litter (2+ out of 4 on the litter severity scale).



RMNP Many Parks Curve Vista, © 2016 Grant R. E. Kiser.

Litter was documented in the parking lot, along the walkway to the overlook, and below the lookout point where people threw items over the edge. Examples of items found on the ground included: A candy wrapper and ATM card cover, a plastic Placker tooth flosser, plastic bags, cigarette butts, and a pull tab from a soda can.

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**Paper, Plastic, Cigarette Butt, and Metal Litter at Many Parks
Curve Lookout, © 2016 Jonathan V. L. Kiser.**

Continuing west on the Trail Ridge Road, we noticed one piece of paper litter along side of road near the Rainbow Curve.

Ute Trail

The KEC team next stopped for a 4-mile hike along the Ute Trail and were surrounded by spectacular mountain scenery. Fortunately, no litter was observed!



**Jonathan on the Ute Trail (Left), © 2016 Grant R. E. Kiser;
Rhett on the Ute Trail (Right), © 2016 Jonathan V. L. Kiser.**

Alpine Visitor Center

No litter was observed during our stop at the Alpine Visitor Center (11,796 elevation)! A dramatic summer snowfield scene greeted us instead.

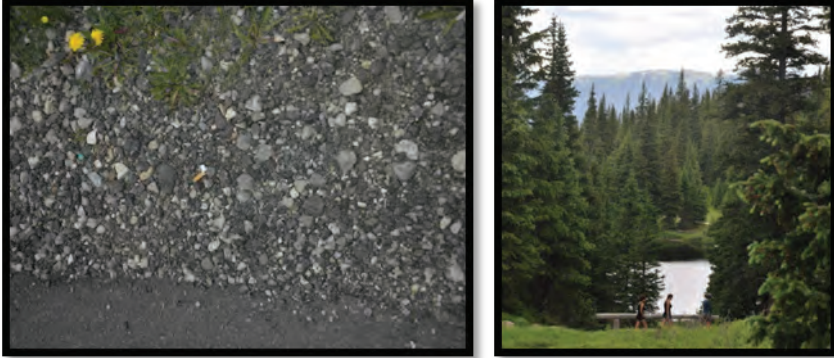


**Alpine Visitor Center Rooftop with Snowfield Backdrop,
© 2016 Jonathan V. L. Kiser.**

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Lake Irene

The KEC team continued along the Trail Ridge Road, stopping at the scenic Lake Irene. There in the parking lot we documented two pieces of litter, a cigarette butt and a piece of foil.



**Cigarette Butt in Lake Irene Parking Lot and Lake Irene,
© 2016 Jonathan V. L. Kiser.**

Holtzwarth Historic Site

Our next stop was the Holtzwarth Historic Site. This comprises a series of cabins dating back to the early 1900s built by the Holtzwarth family as a guest ranch. We were delighted to find no litter in the parking lot or at the site itself. There was a green recycling container in the parking lot which was apparently being put to good use (i.e., judging from the lack of litter in the area).



**Holtzwarth Site (Left) and Recycling Can in
Parking Lot (Right), © 2016 Jonathan V. L. Kiser.**

KEC Litter Survey Results

KEC’s litter survey within RMNP encompassed stops at nine locations, including two visitor centers, hiking more than five miles of trails, and traveling about 50 miles along park roads. Based on our count of paper, plastics, cigarette butts, and metals, KEC’s overall average litter rating for RMNP was 2.0 out of 4. There was some litter found at many of sites we stopped to visit.

A total of 45 pieces of litter were counted in RMNP. This ranked 7th out of ten in terms of the most litter documented (i.e., with a one ranking of one having the most and a ten ranking having the least) at any one park or area visited. See Exhibit 1 for details.

Exhibit 1
Rocky Mountain National Park Litter Survey Details

| Location | Paper | Plastic | Cigarette Butts | Non-Ferrous Metal |
|---------------------------------|--------------|----------------|------------------------|--------------------------|
| Park Entrance Sign | 5 (a) | - | 1 | - |
| Beaver Meadow Visitor Center | 3 (b) | 4 (c) | 2 | - |
| Many Parks Curve | 16 (d) | 5 (e) | 2 | 4 (f) |
| Trail Ridge Road Near Ute Trail | 1 | - | - | - |
| Lake Irene | - | - | 1 | 1 (g) |
| RMNP Totals (n=45) | 25 | 9 | 6 | 5 |

(a) Includes one lollipop stick; (b) Includes one brown bag; (c) Includes a piece of hard plastic (#7 plastic type), one bag (#4), a bottle (#1), and a straw (#5); (d) Includes one sucker wrapper and one ATM card cover; (e) Includes one Placker flosser (#5), one ATM card (#3), and three bags (#4); (f) Includes one metal pull tab, three foil wrappers; (g) One piece of foil.

Source: Kiser Environmental Consulting, 2016.

KEC Improvement Recommendations for RMNP

1. Secure additional funding for waste management, reuse, recycling, and anti-litter education programs, staff resources, etc.
2. Spread more public awareness on the RMNP website and elsewhere about proper waste management practices, the value of recycling, and the impact of litter. When people understand that they could be individually contributing to related problems in the park, they will hopefully adjust their behavior and real progress can be made toward minimizing litter.
3. Ramp up outreach efforts to secure volunteers to patrol parking lots for litter at visitor centers and other popular tourist destinations. RMNP staff should lead the effort to solicit and secure assistance from volunteer organizations. Continue efforts to make motivated people aware of how they can get involved. Consider targeting groups like the Boy Scouts and religious organizations. Also consider involving the court system to direct those who have been ordered to provide community service to do so in the park.
4. Strategically place anti-litter signage in parking lots and popular road pull-off locations (e.g., Many Parks Curve). During our travels through RMNP, cigarette butts were noticed on the ground at the most popular locations.
5. Strategically place cigarette receptacles in parking lots.
6. Specifically implement an anti-cigarette butt campaign including signage with a noticeable logo image at visitor centers, roadside stops, and other parking areas.



**Anti-Cigarette Butt Campaign Example,
© Jonathan V. L. Kiser 2016.**

7. Raise awareness with the same anti-cigarette butt message in park newsletters and other publications to help reduce the litter problem. Also promote among smokers the use of new "all natural" cigarettes, with organic cotton and de-gummed hemp filters packed with flower seeds that can be either composted or literally planted to grow plants.
8. Make clear on the RMNP website and in the Visitor Guide and other handout literature the importance of reusing water bottles, where visitors can specifically recycle in the park, and find cigarette butt receptacles.



RMNP View from the Ute Trail, © 2016 W. Rhett Kiser.



Chapter 2

Arches National Park



ANP Directional Sign, © 2016 Jonathan V. L. Kiser.

Overview

ANP was initially established as a national monument by President Herbert Hoover's administration on April 12, 1929. It became a national park on November 12, 1971. According to the NPS, the park contains 76,519 acres, and ranges in elevation from 4,085 feet to 5,653 feet. With more than 2,500 natural sandstone arches, ANP boasts the largest concentration in the world. An official stone arch must have an opening at least three feet long in any direction. There is no width requirement. During 2015, the NPS reported that 1.39 million people visited ANP.

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KEC Field Observations: July 15 – 16, 2013

ANP Entrance

The KEC research team's first stop in ANP was at the entrance sign. There in the parking lot we counted six pieces of litter comprised of paper, hard plastic, part of a plastic cup, and three cigarette butts.



**Parking Lot Litter at the ANP Entrance,
© 2016 Jonathan V. L. Kiser.**

Visitor Center (Park Headquarters)

The research team next journeyed the short distance to the Park Headquarters Visitor Center where we encountered even more litter (11 pieces). This was distributed in the parking lot, along the sidewalk leading to the building, and on the surrounding grounds. We couldn't help wonder why people were so careless given there were attractive trash bins, plus aluminum and plastic recycling containers, just a few feet from the parking lot.



ANP Visitor Center Trash Bins, Aluminum Cans and Plastic Bottle Recycling Bins, © 2016 Jonathan V. L. Kiser.



Paper, Plastic, and Cigarette Litter at ANP Visitor Center, © 2016 Jonathan V. I. Kiser.

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Park Avenue

Driving on to our next stop, Park Avenue, we documented 14 pieces of litter (e.g., paper, plastic, cigarette butts, and a tin lid) and plenty of tourists. We also documented human footprints leading off the clearly designated trail and up to paper litter (toilet paper?).

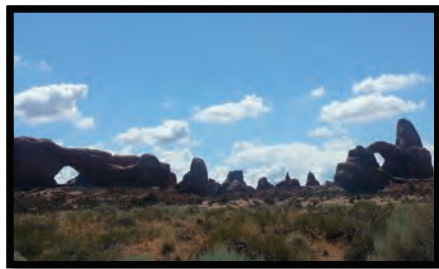


**Q-Tip and Cigarette Butt Litter in Park Ave. Parking Lot (Top);
Apple Core at Park Ave. (Left); and Off-Trail Footprints
to Paper Litter (Right), © 2016 Jonathan V. L. Kiser.**

We continued our drive on Arches Scenic Drive past Sheep Rock, Balanced Rock, the Garden of Eden, and through the Windows Section en route to our first hike along the Double Arch trail. Fortunately, we did not see any litter along the way.



Sheep Rock and Balanced Rock, © 2016 Grant R. E. Kiser.



Garden of Eden (Left), © 2016 W. Rhett Kiser; ANP Windows Section (Right), © 2016 Grant R. E. Kiser.

Double Arch

Our hike to the incredible Double Arch was well worth the effort. This is the 3rd largest ANP arch, with the larger span measuring 114 feet wide by 112 feet high, and the smaller span measuring 67 feet wide by 86 feet high. We were delighted to not see any litter in the parking lot or along the trail. The parking lot sign describing the arch also included the trail rule of carrying out all trash.

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**Double Arch Trail Sign and The Boys Between The Arches,
© 2016 Jonathan V. L. Kiser.**

Panorama Point

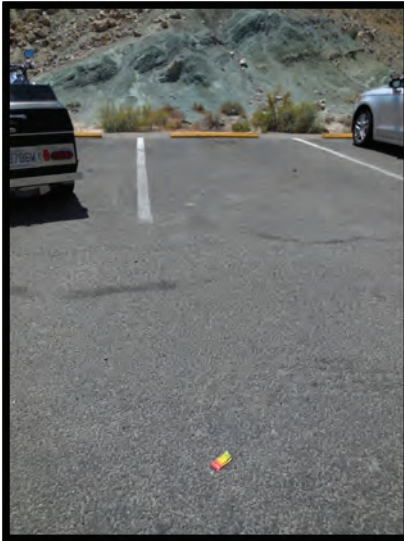
Our next stop was Panorama Point, which offered an unforgettable view of the Salt Valley. While there was no litter at Panorama Point, we did see a few pieces of paper once back on the the main road.



Panorama Point View, © 2016 W. Rhett Kiser.

Wolfe Ranch/Delicate Arch

The KEC team then traveled to Wolfe Ranch and the trailhead to Delicate Arch. Despite there being a strategically placed trash bin and recycling bins for plastic and aluminum near the pit toilet, the research team still documented ten pieces of litter including a piece of plastic, cigarette butts, a foil wrapper, and food litter in the parking lot.



Trash and Recycling Bins and Litter in the Wolfe Ranch Parking Lot, © 2016 Jonathan V. L. Kiser.

The Wolfe Ranch was established by John Wesley Wolfe and his son in the late 1800s. They developed a 100-acre tract next to the Salt Valley Wash to take advantage of the water and grassland – enough for a few cattle. Mr. Wolfe moved west from Ohio seeking a drier climate due to a persistent painful leg injury from the Civil War.

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The Wolfe Ranch, © 2016 Jonathan V. L. Kiser.



Plastic Bottle in the Salt Valley Wash and Rhett Pointing Out Litter Along Delicate Arch Trail, © 2016 Jonathan V. L. Kiser.

Along the three mile (round trip) Delicate Arch trail, we passed over the Salt Valley Wash where there was an abundance of wildlife (otter, cat fish, dragon flies, a big bull frog, butter flies, other types of fish). However, there was also a plastic water bottle that had been carelessly thrown in the water.

We continued along the Delicate Arch trail and encountered additional litter in the form of paper (four pieces) and one food item (an apple). The Delicate Arch lived up to its billing. Standing on the edge of a sliprock bowl, the Arch is 46 feet high and nearly 32 feet wide.



Delicate Arch (distant right) Panorama, © 2016 Grant R. E. Kiser.

Final Destination: Devils Garden

We next passed by the Salt Valley Overlook and briefly stopped at the Fiery Furnace Viewpoint. Fortunately there was no litter to be found.



Fiery Furnace, © 2016 Jonathan V. L. Kiser.

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Pressed for time, our final destination in the park was Devils Garden. As we soaked up this remarkable landscape there was fortunately no litter.



Devils Garden, © 2016 W. Rhett Kiser.

Backtracking our way out of the park, we documented one more piece of paper litter along the roadway near the Visitor Center.

KEC Litter Survey Results

KEC's litter survey within ANP encompassed stops at nine locations, including one visitor center, hiking about five miles of trails, and traveling about 45 miles along park roads. Based on our

count of paper, plastics, cigarette butts, metals, and food discarded by uncaring visitors, KEC’s overall litter rating for ANP was 2.5 out of 4. This means that there was some litter found at most sites where we stopped (plus some along the roadway).

A total of 50 pieces of litter (3% of the total documented in all ten places) were counted in ANP. This ranked 6th out of ten in terms of the most litter documented at any one park or area visited. See Exhibit 2 for details.

Exhibit 2
Arches National Park Litter Survey Details

| Location | Paper | Plastic | Cigarette Butts | Ferrous Metal | Non-Ferrous | Food |
|---------------------------|--------------|----------------|------------------------|----------------------|--------------------|-------------|
| Park Entrance | 1 (a) | 2 (b) | 3 | - | - | - |
| Visitor Center | 7 (c) | 2 (d) | 2 | - | - | |
| Park Ave. Parking Lot | 5 (e) | 1 (f) | 6 | 1 (g) | - | 1(h) |
| Roadway Near Panorama Pt. | 2 | - | - | - | - | - |
| Wolfe Ranch Parking Lot | - | 1(i) | 6 | 1 | 1(j) | 1(k) |
| Delicate Arch Trail | 4 | 1 (l) | - | - | - | 1 (m) |
| Roadway Near Visitor Ctr. | 1 | - | - | - | - | - |
| ANP Totals (n=50) | 20 | 7 | 17 | 2 | 1 | 3 |

(a) Includes one lollipop stick; (b) Includes one Great Smokey Mountain tag (#7 plastic type) and a piece of a cup (#6); (c) Includes one receipt and one Burger King fries wrapper; (d) Includes portion of a food bag (#4) and a plastic shopping bag (#2); (e) Includes one Q Tip; (f) Plastic bag (#2); (g) A tin lid; (h) Apple core; (i) Piece of hard plastic (#7); (j) A foil wrapper; (k) A piece of licorice; (l) Plastic water bottle (#1) in the Salt Valley Wash; (m) An apple.

Source: Kiser Environmental Consulting, 2016.

KEC Improvement Recommendations for ANP

1. Secure additional funding for waste management, reuse, recycling, and litter prevention education programs.
2. Use the popularity of the park to its own advantage. Consider increasing the park admission fee and link it to specific, high profile efforts (e.g., recycling, litter control, etc.) that the public and others can identify with and support.
3. Consider providing visitors with a brief questionnaire touching upon topics such as litter prevention at their favorite park features (and their willingness to donate financial support and/or contribute volunteer time). Visitors can fill this out while visiting the park or mail it in after their visit. Then follow-up with those who have expressed a willingness to help.
4. Implement a “citizen ranger” program that encourages park visitors to report litter and other issues they encounter during their park visit. Establish anonymous “tip lines,” and/or suggestion boxes to facilitate timely feedback.
5. Strategically place anti-litter signage and cigarette receptacles in parking lots and popular road pull-off locations (e.g., Visitor Center, Park Avenue, Wolfe Ranch). Include more signage reminding people that cigarette butts are litter too and that the park is a “butt free” area.
6. Increase efforts that encourage people to bring their own reusable water bottles. Better promote the concepts of Reduce, Reuse, and Recycle. Reduce the waste associated with single use plastic water bottles.

7. Make people aware of what happens to their single use bottle, how much energy is required to recycle a single bottle, and the resulting carbon footprint impact. Tie the environmental impacts to individual visitor actions with the hope that more awareness will result in changed, more eco-friendly behavior.
8. Expand the practice of including waste management rules on signage at popular trails and locations including: Park Avenue, Double Arch, Delicate Arch, and other places where the rules are being neglected.



The Authors Under Delicate Arch.



**Crescent Moon-Shaped Rock,
© 2016 Jonathan V. L. Kiser.**



Chapter 3

Great Basin National Park



GBNP Entrance, © 2016 Grant R. E. Kiser

Overview

Great Basin National Park (GBNP) lies within the Great Basin, a vast region of valleys and mountain ranges stretching from California's Sierra Nevada to Utah's Wasatch Mountains. The park is located approximately 290 miles north of Las Vegas and 240 miles southwest of Salt Lake City. It sits on the western edge

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of the Snake Valley and protects 77,180 acres, including the South Snake Range near the Utah border.

GBNP was created in 1986 by the U.S. Congress and represents a desert mountain island, from sagebrush at its base to the 13,063-foot summit of Wheeler Peak. There are lakes, streams, ancient bristlecone pine groves, limestone caverns, an alpine glacier, abundant wildlife, and so much more. During 2015, the NPS reported that there were more than 116,000 visitors to GBNP.

KEC Field Observations: July 17, 2013

Great Basin Visitor Center (Town of Baker)



**View of Wheeler Peak from Visitor Center,
© 2016 Jonathan V. L. Kiser.**

Upon our arrival at the Great Basin Visitor Center in the town of Baker (along Route 487), the KEC research team counted several pieces of litter outside the building (i.e., a cigarette butt, a plastic drink lid and straw). This was the case in spite of there being

a trash can and separate can for aluminum recycling a few feet away outside the visitor center entrance door.



Plastic Litter, Trash Bin, and Aluminum Recycling Bin at Great Basin Visitor Center, © 2016 Jonathan V. L. Kiser.

As we continued next on Route 488 toward the Lehman Caves Visitor Center, individual pieces of paper and rubber were documented along the side of the road.



Paper and Rubber Litter along GBNP Entrance Road, © 2016 Jonathan V. L. Kiser.

Lehman Caves Visitor Center

The KEC team next stopped at the Lehman Caves Visitor Center located inside the park. A helpful ranger answered our environmental questions and provided useful park literature. No litter was seen at this visitor center.

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We next began a 12-mile, 3,400-foot elevation ascent along Wheeler Peak Scenic Drive and passed by a trash “dumping station,” complete with garbage dumpsters, for park visitors.



**Trash Dumping Station along Wheeler Peak Drive,
© 2016 Jonathan V. L. Kiser.**

Osceola Ditch

Our next stop was the Osceola Ditch, which is a 34 mile ditch constructed (beginning in 1884) by the Osceola Gravel Mining Company. The purpose of the ditch was to carry water and facilitate gold mining operations which lasted until about 1905.



**Rhett and Grant (Left) and Jonathan (Right) near the Osceola Ditch,
© 2016 by J. V. L. Kiser (Left) and W. R. Kiser (Right).**

While the Osceola Ditch area was overgrown with a lot of fallen trees (very undermanaged), we did not see any litter in the parking area or along the shale-based stone trail.

Mather Overlook Parking Lot

The research team's next stop was the Mather Overlook (elevation 9,000 feet). The view across the vast forest to the Wheeler Peak was beautiful. Unfortunately, we found a few pieces of litter in the parking lot (e.g., paper and ferrous metal).



Wheeler Peak from Mather Overlook, © 2016 Grant R. E. Kiser.



Ferrous Metal and Paper Litter in the Mather Overlook Parking Lot, © 2016 Jonathan V. L. Kiser.

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Wheeler Peak Overlook

Upward and onward we traveled, next stopping at the Wheeler Peak Overlook (elevation 10,000 feet). There were chip monks scurrying about and fortunately no litter!



**Wheeler Peak from Wheeler Peak Overlook,
© 2016 Jonathan V. L. Kiser.**

Bristlecone-Glacier Trail Parking Lot and Trail

Our final stop in the park was the Bristlecone-Glacier trail where we embarked on a 4.6 mile hike to the foot of the Wheeler Peak Glacier. As the research team headed out on the trail, we documented two old trash cans and one aluminum recycling can next to the bathroom. There was also one piece of plastic wrapper litter in the parking lot.



Plastic Wrapper Litter, Aluminum Recycling and Trash Cans, Bristlecone-Glacier Trail Parking Lot, © 2016 Jonathan V. L. Kiser.



Grant and Rhett on the Bristlecone Trail, © 2016 Jonathan V. L. Kiser.

We followed the Bristlecone-Glacier Trail through the subalpine forest and encountered bristlecone pines and other tree species. According to the NPS, bristlecone pines found in GBNP are remarkable for their great age (i.e., some are more than 3,000 years old!) and their ability to survive adverse growing conditions.

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GBNP Bristlecone Trees, © 2016 W. Rhett Kiser.



GBNP Bristlecone Tree Detail, © 2016 Jonathan V. L. Kiser.

At the Glacier Point stop along the trail there was a picture of the GBNP Glacier showing retreat over time. This is the only alpine glacier in Nevada, and one of the southernmost glaciers in the United States. With continued warming predicted, the NPS estimates it is likely that the glacier will disappear in as little as 20 years.



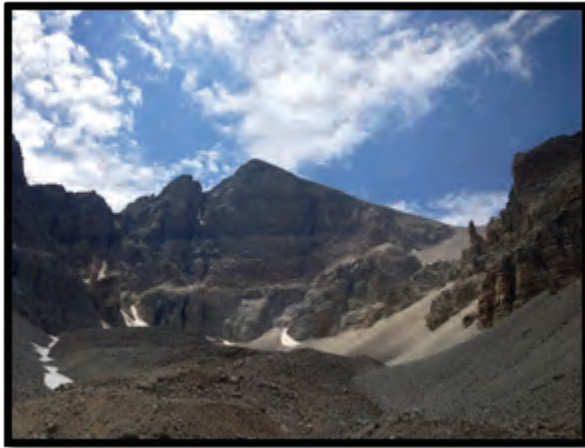
GBNP Glacier, © 2016 Jonathan V. L. Kiser.

Continuing on the Bristlecone-Glacier Trail, we found crossing the rocky slopes of glacial debris to be quite strenuous and challenging. We ultimately reached the foot of the glacier, near where we also documented one piece of gum litter.

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**Rhett and Grant on the Bristlecone-Glacier Trail and Gum Litter,
© 2016 Jonathan V. L. Kiser.**



GBNP Wheeler Peak View, © 2016 W. Rhett Kiser.



GBNP Glacier Debris Field, © 2016 W. Rhett Kiser.

KEC Litter Survey Results

KEC's litter survey within GBNP encompassed stops at nine locations, including two visitor centers, hiking more than five miles of trails, and traveling about 30 miles along park roads. Based on our count of paper, plastic, rubber, cigarette butt litter, and food waste discarded on the ground by uncaring visitors, KEC's overall litter rating for GBNP was a 2.0 out of 4. This means that there was some litter found at most sites we visited and along the Wheeler Peak Scenic Drive. It also reflects that, while there are far fewer annual visitors at GBNP than the other parks we visited, they are still littering too much.

A total of nine pieces of litter were counted in GBNP. Consequently, GBNP ranked 9th out of ten in terms of the most litter documented at any one park or area visited. See Exhibit 3 for details.



**GBNP from the Bristlecone-Glacier Trail,
© 2016 Jonathan V. L. Kiser.**

**Exhibit 3
Great Basin National Park Litter Survey Details**

| Location | Paper | Plastic | Cigarette Butts | Ferrous Metal | Food | Rubber |
|---|--------------|----------------|------------------------|----------------------|-------------|---------------|
| Great Basin Visitor Center (Town of Baker) | - | 2 (a) | 1 | - | - | |
| Roadside Near Park Entrance | 1 | - | - | | - | 1 |
| Mather Overlook Parking Lot | 1 | - | - | 1 | - | - |
| Bristlecone-Glacier Trail Parking Lot and Trail | - | 1 (b) | - | - | 1 (c) | - |
| GBNP Totals (n=9) | 2 | 3 | 1 | 1 | 1 | 1 |

(a) Includes one lid (#1 plastic type) and one straw (#5); (b) Wrapper (#2); (c) A piece of gum.

Source: Kiser Environmental Consulting, 2016.

KEC Improvement Recommendations for GBNP

1. Expand education outreach programs. More visitor awareness should be raised regarding proper waste management, reuse, recycling, and litter prevention etiquette. Making people better aware that their actions are adversely impacting the environment will improve the likelihood that at least some will stop their thoughtless behavior.
2. Consider creative fundraising initiatives tied to issues faced by the park, including litter control. One example could involve silent auctions with proceeds going toward designated projects of interest to the public and other

- stakeholder groups. Use the Internet to facilitate participation on an international level.
3. Establish recycling and anti-litter signage in strategic park locations (e.g., visitor centers, popular roadway stops, and trail heads).
 4. Strategically install cigarette butt receptacles at popular visitor destinations (e.g., visitor centers, Bristlecone-Glacier Trail parking lot).
 5. Encourage recycling by allowing visitors to recycle more items like bottles, cans, and paper at the park visitor centers in exchange for “I Recycled Today at GBNP” stickers or other inexpensive “give-aways.” Such an effort should be aimed at promoting good feelings for positive actions taken on behalf of the environment.
 6. Seek more help from volunteer organizations such as area church groups to promote on-going stewardship practices in the park, including patrolling parking lots and trails for litter.



**Along the GBNP Bristlecone-Glacier Trail,
© 2016 W. Rhett Kiser.**



Chapter 4

Mono Lake



**Grant and Rhett at Mono Lake South Tufa Entrance Sign,
© 2016 Jonathan V. L. Kiser.**

Overview

Mono Lake, located in the Mono Basin National Forest Scenic Area, is a large, shallow saline soda lake in Mono County, California. It is located 13 miles east of Yosemite National Park and was formed at least 760,000 years ago as a terminal lake in a basin that has no outlet to the ocean.

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The Mono Lake Tufa State National Reserve was established to preserve the spectacular "tufa towers," calcium-carbonate spires and knobs formed by interaction of freshwater springs and alkaline lake water. The Reserve also protects the lake surface itself as well as the wetlands and other sensitive habitat for the more than one million birds that feed and rest at Mono Lake each year. Throughout its long existence, salts and minerals have washed into the lake from eastern Sierra streams. Freshwater evaporating from the lake each year has left the salts and minerals behind so that the lake is now about two-and-one-half times as salty as the ocean.



**Rhett and Grant Next to Mono Lake Tufa Towers,
© 2016 Jonathan V. L. Kiser.**

According to the Mono Lake Committee (www.monolake.org), in 1941, the Los Angeles Department of Water and Power began diverting Mono Lake's tributary streams 350 miles south via an aqueduct to meet the growing water demands of Los Angeles. The high desert area around Mono Lake was viewed as wasted space

and the Department felt no one would notice or be able to stop them from stealing the water. It took the Department 20 years to build the aqueduct and dams and reservoirs infrastructure to divert all the water from four of the five streams that fed Mono Lake. As a result, Mono Lake's water level started dropping and that's when the tufa towers, originally formed underwater, started appearing.

There was a big legal fight over Mono Lake up until 1994. At that point the California State Water Resources Control Board issued an order to protect Mono Lake and its tributary streams. It was decided that rich and powerful L.A. would not get away with completely killing the Mono Lake ecosystem. The Board ruled that Los Angeles had to fix a lot of the problems they created, must let 80% of the water they capture run free, and must let the lake rise 20 feet (a compromise, instead of the original 45 feet). Unfortunately, it's been more than 20 years and the lake has not risen due to dry weather conditions.

The South Tufa area of Mono Lake receives thousands of visitors each year and is one of the largest tufa groves on the lake. A self-guided tour allows visitors to see previous lake levels, walk next to the tufa towers, and enjoy the abundance of wildlife at the lake.

KEC Field Observations: July 18, 2013

South Tufa Trail

As we approached the Mono Lake South Tufa parking lot off of Route 120 east, the research team noted a combination brown trash and recycling can (separate bins). We also noticed that the type of acceptable recyclables was not specified on the can. This no doubt results in visitor placing recyclables in the trash bin and vice versa.

Litter Crisis in Our National Parks



**Mono Lake Parking Lot Side-by-Side Bin,
© 2016 Jonathan V. L. Kiser.**

We then hiked along several miles of the South Tufa Trail past multiple signs indicating previous water levels of the lake. It was shocking to see, in person, how low the water level has dropped due to the Los Angeles water diversion campaign dating back to the 1940s.



**1963 Mono Lake Water Level Indicator,
© 2016 Jonathan V. L. Kiser.**

Continuing down to the water's edge, we encountered the exotic tufas and hundreds of thousands of alkali flies feeding on microscopic algae. Birds, in turn, enjoy eating these flies.



Tufa Formations along the Southern Shore of Mono Lake,
© 2016 Jonathan V. L. Kiser.



Story of the Mono Lake Flies and Birds, Public Domain.

We followed the loop trail until it ended back in the parking lot. At various trail locations, the research team documented litter in the form of paper, plastic, and cigarette butts.

Litter Crisis in Our National Parks



Paper, Plastic, and Cigarette Butt Litter along the Mono Lake South Tufa Trail, © 2016 Jonathan V. L. Kiser.

KEC Litter Survey Results

KEC's litter survey at Mono Lake encompassed surveying the parking lot area and hiking about two miles along the South Tufa Trail. Based on our documentation of paper, plastic and cigarette butt litter, KECs overall litter rating for Mono Lake was a 2.0 out of 4. This means that we saw some litter along many stretches of the trail.

A total of 18 pieces of litter were counted at Mono Lake. This ranked 8th out of ten in terms of the most litter documented at any park or area visited. See Exhibit 4 for details.

**Exhibit 4
Mono Lake Litter Survey Details**

| Location | Paper | Plastic | Cigarette Butts |
|---|--------------|----------------|------------------------|
| Mono Lake South Tufa Trail Totals (n=18) | 8 | 7 (a) | 3 |

(a) Includes six pieces of hard plastic (#7 plastic type) and one polyurethane foam ear plug (#7).

Source: Kiser Environmental Consulting, 2016.



Mono Lake Looking West toward the Eastern Sierra Range and Yosemite National Park, © 2016 Jonathan V. L. Kiser.

KEC Improvement Recommendations for Mono Lake

1. Install clearer signage regarding the type of acceptable recyclables allowed in the existing bins. For the best results, use pictures to show the acceptable materials.
2. Place additional recycling and trash bins, plus cigarette butt receptacles closer to the edge of the lake and/or other locations along the South Tufa Trail wherever litter tends to accumulate.
3. Install anti-litter signs in prominent parking lot locations so visitors will see them when exiting their vehicles.
4. Mobilize volunteer organizations and individuals to help clean up litter around Mono Lake on a regular basis.
5. Expand public education efforts that encourage visitors to support on-going Mono Lake restoration efforts, reuse of water containers, recycling, proper waste management, and litter control.



Tufas Stranded on Dry Land, © 2016 Grant R. E. Kiser.



Chapter 5

Yosemite National Park



**YNP Eastern Entrance,
© 2016 Jonathan V. L. Kiser.**

Overview

Yosemite Valley was discovered by white prospectors in 1851 during the gold rush when they were chasing the Native Americans into the mountains. Yosemite was first set aside for protection during the American Civil War by President Abraham Lincoln when he signed the Yosemite Grant in 1864. The grant deeded Yosemite Valley and the Mariposa Grove of Big Trees to the state of California. In 1889, naturalist John Muir and Century Magazine

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Editor Robert Underwood Johnson initiated a campaign to make the high country surrounding Yosemite Valley, including two watersheds, into a national park. The following year, the U. S. Congress set aside more than 1,500 square miles of “reserved forest lands” soon to be known as Yosemite National Park (YNP). It took a meeting between John Muir and President Theodore Roosevelt to have the Mariposa Grove and Yosemite Valley ceded from California’s control and included with the National Park in 1903.

The granite walls, spires, and cliffs of Yosemite originated 100 million years ago with granitic magma from within the earth. About 35 million years ago, dramatic uplift began which resulted in the Sierra Nevada Mountains. Subsequently, periods of glaciations occurred and rivers of ice moved down canyons and stream courses. In Yosemite Valley, where the granites contained vertical cracks and joints, moving ice tore away the fractured rock, leaving behind such impressive sights as Half Dome. YNP has 747,956 acres and is about the size of Rhode Island. During 2015, the NPS reported that there were 4.10 million visitors to YNP.

KEC Field Observations: July 18 – 19, 2013

Entering Yosemite from the East

The KEC research team departed from Mono Lake and traveled west. We entered YNP via Tioga Pass on the Tioga Road (Route 120 west). We documented four pieces of tire debris along the road outside of the park boundaries. Our first destination inside the park was the Tuolumne Meadows Visitor Center to interview a ranger about environmental issues confronting the park.

Tuolumne Meadows Visitor Center

As the team entered the visitor center parking lot we took note of a large green animal-proof dumpster for recyclables. This container had a helpful long list of acceptable items printed in green and a shorter list of non-acceptable items printed in red. It would have been helpful to also provide visual images of acceptable materials to further minimize the potential of people throwing trash in this dumpster. A short distance away was a large brown animal-proof dumpster for trash only.



Recycling and Trash Dumpsters at Tuolumne Meadows Visitor Center, © 2016 Jonathan V. L. Kiser.

During our lengthy conversation with the visitor center park ranger we were informed that YNP, due to budget restrictions, relies on their volunteer Junior Ranger program to help with litter pickup. Judging from the amount of litter we saw in the parking lot, they very much have their work cut out for them.

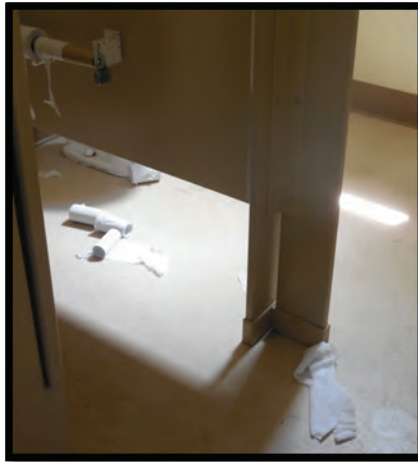
Exiting the visitor center, we checked out the nearby bathrooms and noted both green recycling cans (no acceptable material types specified) and old rusted brown trash cans nearby.

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**Tuolumne Meadows Visitor Center
Recycling and Trash Bins, © 2016 Jonathan V. L. Kiser.**

Inside the men's bathroom there was toilet paper litter all over the floor. This was very disappointing and made us begin to realize how stretched for workforce resources YNP was relative to the millions of annual visitors placing demands on the system.



**Bathroom Paper Litter,
© 2016 Jonathan V. L. Kiser.**

Back in the parking lot, in spite of there being plenty of recycling and trash bins, plus the so-called litter collection efforts by the Junior Rangers, we counted a total of 26 pieces of litter. Most was paper (16 pieces), followed by cigarette butts, (8), non-ferrous metal (foil) (1), and food (1).



Cigarette Butts and Paper Litter in the Tuolumne Meadows Visitor Center Parking Lot, © 2016 Jonathan V. L. Kiser.

Lembert Dome Trail

The KEC research team next backtracked east on the Tioga Road to climb the Lembert Dome. The 2.8 mile (round-trip) trail led us through a beautiful pine forest and up to the exposed granite face of the Lembert Dome. Along the trail, we counted four piece of litter (paper, plastic, and two pieces of non-ferrous metal).



Lembert Dome from the Trail, © 2016 W. Rhett Kiser.



View from the Top of Lembert Dome, © 2016 W. Rhett Kiser.

Litter Crisis in Our National Parks

Tenaya Lake

We next drove west along the Tioga Road and stopped at the beautiful Tenaya Lake. Since this popular lake is right next to the road, there is significant evidence of human impact, especially litter.

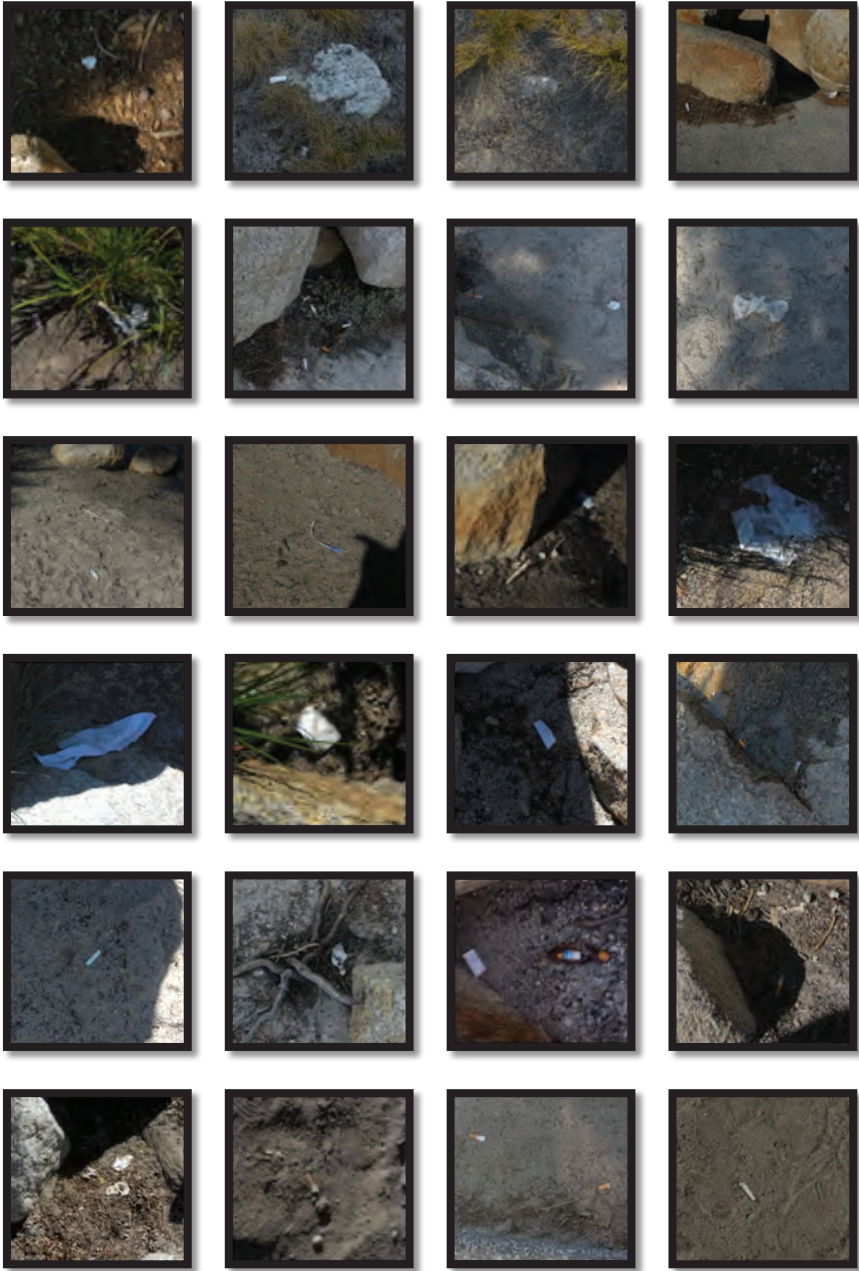


Tenaya Lake in YNP, © 2016 W. Rhett Kiser.

In the parking lot area and also among the rocks next to the lake we counted 58 pieces of litter. There were cigarette butts (27), paper (23 pieces), plastic (4), non-ferrous metal (3), and a banana. The research team is confident that we did not fully count all of the litter at this location. We did also make note of an unappealing, rusted trash can in the parking lot at the western end of the lake. This served as another reminder of the aging waste management infrastructure at YNP.



Rusted Trash Can and Grant Pointing Out Litter at Tenaya Lake, © 2016 Jonathan V. L. Kiser.



Out-Of-Control Litter at Tenaya Lake, © 2016 Jonathan V. L. Kiser.

Litter Crisis in Our National Parks

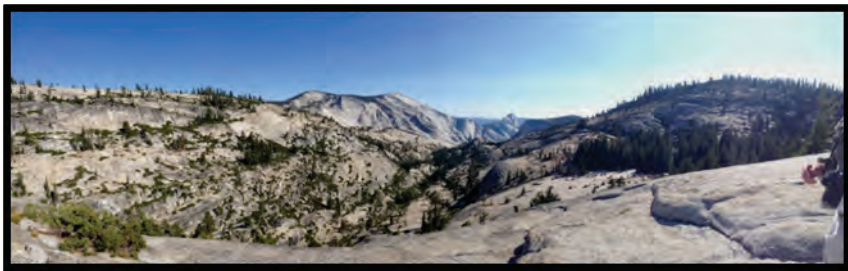
From a litter perspective, Tenaya Lake was the worst single location we had seen to date in any of the parks visited. Clearly a 4 out of 4 on the litter severity scale (very littered), and a reflection of filthy, uncaring tourists and a park system that is not able to keep up with the obvious problem.



**Documenting Still More Litter at Tenaya Lake,
© 2016 Jonathan V. L. Kiser.**

Olmsted Point

At our next stop was Olmsted Point where the NPS completed an impressive restoration already eight years ago (in response to the excessive tourist volumes). Prior to closing for two summers to complete the work, animals mooching food was a common sight. We did not see any of this activity nor did we see any food litter.



**Olmsted Point View with Half Dome in the Distance,
© 2016 W. Rhett Kiser.**

The park ranger at the Tuolumne Meadows Visitor Center had informed us that there were no trash cans at Olmsted Point since

there is no budget for staff to drive 30 minutes one-way to pick it up! In spite of this, the KEC team only counted three pieces of litter (a flip-flop, Styrofoam cup, and a cigarette butt).



**Abandoned Flip-Flop at Olmsted Point,
© 2016 Jonathan V. L. Kiser.**

Cathedral Beach Roadside

We continued on the Tioga Road west and followed the Big Oak Flat Road to the Southside Yosemite Valley Drive. Stopped at Cathedral Beach Roadside. There we viewed the mighty El Capitan, the world's largest solid granite monolith that extends about 3,593 feet from base to summit along its tallest face.

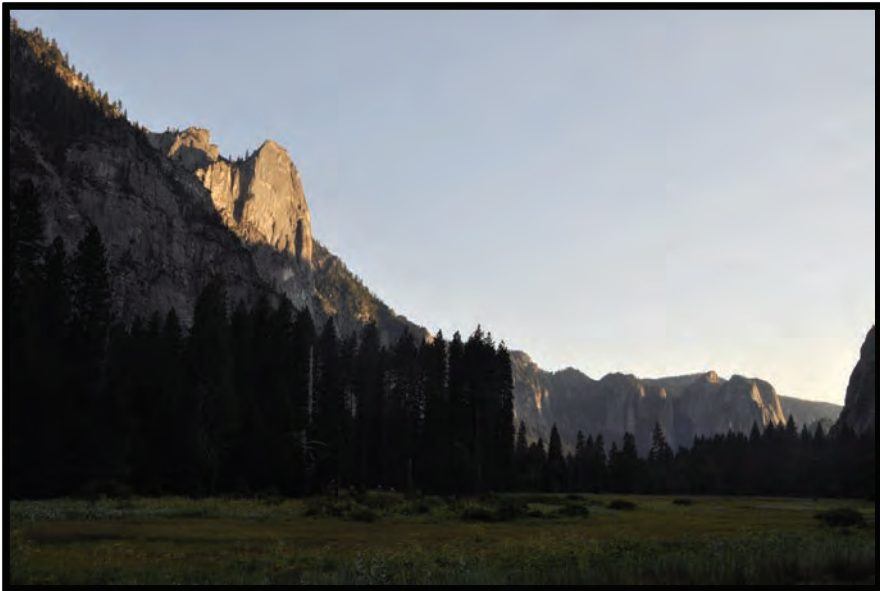


**El Capitan from Cathedral Beach Roadside,
© 2016 Jonathan V. L. Kiser.**

There was a tremendous amount of litter along this popular turnout location, indicating the total disregard people have for the very sacred ground they have traveled great distances to admire. 110 Cigarette butts were counted, along with ten pieces of paper, two plastic bottle caps, two six pack rings, and more. Definitely another 4 out of 4 on the litter severity scale for this very neglected site.

Yosemite Valley

The research team continued our way up Yosemite Valley, stopping often to take pictures, look for litter, and otherwise soak up the feeling of being in one of the most awe-inspiring places on earth. Spent some time exploring the famous Ahwahnee Hotel before exiting YNP on El Portal Road toward our overnight accommodation. No litter was seen during this portion of our trip.



**Yosemite Valley from Northside Drive,
© 2016 Jonathan V. L. Kiser.**

Tunnel View

Our first stop during the second day in YNP was the Tunnel View vista (on the road to Glacier Point). This is another favorite tourist destination since it affords an amazing, easy access view of Yosemite Valley. Upon our arrival, the parking lot was teeming with tour buses, cars, RVs, and tourists, many striking ridiculous poses in front of the world famous panorama.

Litter Crisis in Our National Parks

We counted 119 pieces of litter all around the parking lot and the valley viewing points. There was 52 pieces of paper litter, eight pieces of plastic, 48 cigarette butts, two pieces of non-ferrous metal, two pieces of food, a feather, candy box, Q tip, cloth, and two corks. And we certainly did not count it all!



**Paper and Plastic Litter at the Tunnel View Vista,
© 2016 Jonathan V. L. Kiser.**

This litter scene was quite upsetting to the KEC research team and prompted us to brainstorm possible solutions to this out of control tourist litter problem. We also documented that there was a lack of adequate recycling and litter prevention signage, bins, and cigarette butt receptacles needed to start combating this situation.

YNP faces a number of realities. First, a huge number of tour buses transport an even huger number of tourists to YNP each year. These buses transport the tourists to the most popular YNP destinations for quick photo opportunities. Many of these tourists smoke and think nothing of grinding their cigarette butts on the sidewalks and along the parking lot curbs. Other tourists think nothing of throwing their trash and recyclables on the ground. Their behavior is senseless nonsense.

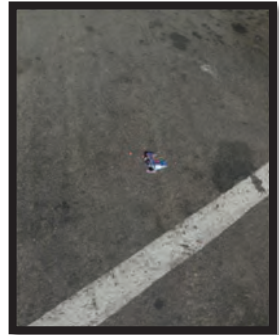
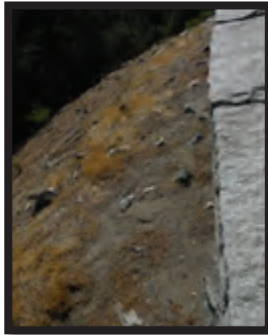
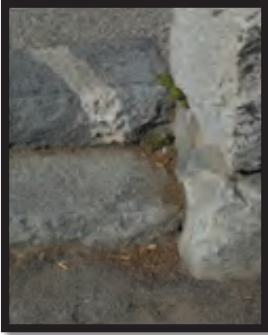
This situation needs to be aggressively confronted on multiple, creative levels. Solutions should certainly be multi-stakeholder based (e.g., the NPS teaming with the tour bus industry). Clearly there is an immediate need for additional strategically placed litter prevention and recycling signs at the Tunnel View location, along with the additional cigarette receptacles and recycling bins that will allow people to do the right thing.

One way to help pay for these additions would be to implement a littering fine program with actual enforcement. A transparent add-on waste management/recycling/litter prevention fee could also be added to the park entrance fee, coupled with a public awareness campaign explaining the need and asking for public support. Additional suggestions on how to solve this complex issue are provided in the *KEC Improvement Recommendations for YNP* section.



**Tourists Striking the Pose and Parking Lot Litter,
YNP Tunnel View Vista, © 2016 Jonathan V. L. Kiser.**

Litter Crisis in Our National Parks



Litter Variety at YNP Tunnel View Vista,
© 2016 Jonathan V. L. Kiser.

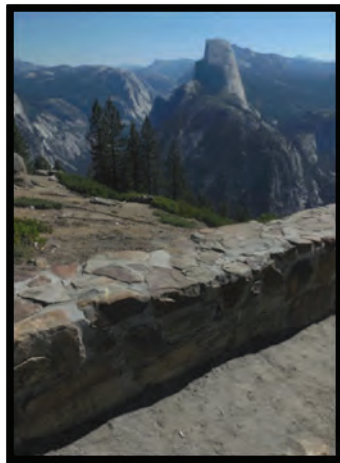
Washburn Lookout Point

As the team continued on our way to Glacier Point, we passed road kill and two pieces of paper litter along the road side. We then stopped at the Washburn Lookout Point to take in an unreal view of the valley.



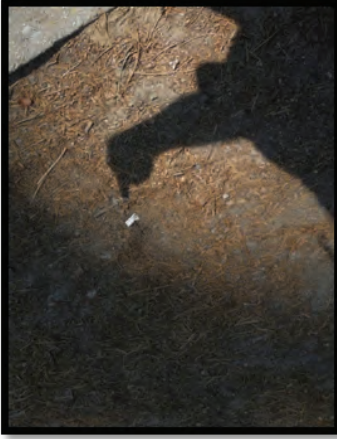
Yosemite Valley from Washburn Lookout, © 2016 W. Rhett Kiser.

There was a lot of litter in and around the parking lot (2+ on the litter severity scale). We specifically counted 34 individual pieces, including 18 pieces of paper, a plastic water bottle, eight cigarette butts, and seven pieces of food (orange peels).



**Plastic and Cigarette Litter at Washburn Lookout,
© 2016 Jonathan V. L. Kiser.**

Litter Crisis in Our National Parks



Paper Litter at Washburn Lookout, © 2016 J. V. L. Kiser.

Glacier Point

The team reached our Glacier Point destination to discover 13 pieces of litter (two pieces of paper, two pieces of hard plastic, one plastic bag, two plastic bottles, one cigarette, two pieces of metal, a rubber band, a piece of cardboard, and a glass) in the parking lot and along the path leading to the remarkable point. One of the tour guides was waving her lit cigarette around in the parking lot and we couldn't help but wonder if it too would end up on the ground once she was done with it.



Recycling and Trash Bins at Glacier Point, © 2016, J. V. L. Kiser.

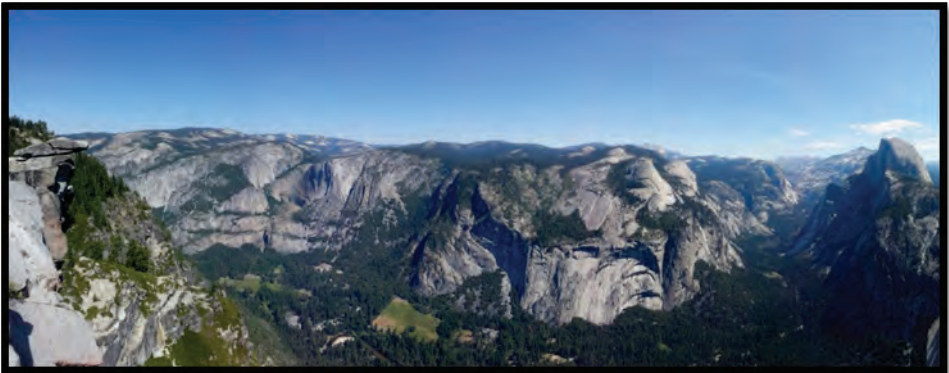
On our walk to the Glacier Point, we passed by a number of recycling cans for plastic, aluminum, and glass. Unfortunately,

these were quite old and the labeling was dramatically fading on some. This will make it more difficult for well-intended visitors to recycle properly. We also passed by a food concession stand and saw several old rusted trash cans.



**Rusted Trash Cans and Cardboard Litter at Glacier Point,
© 2016 Jonathan V. L. Kiser.**

Glacier Point itself was not too littered, although several water bottles were observed. The view from the point was majestic. Rhett and Grant called it substantially spectacular! A one of a kind panoramic view, 3,214 feet above the valley floor.



The View from Glacier Point, © 2016 Grant R. E. Kiser.

Bridalveil Fall Parking Lot and Trail

The research team next returned to the valley floor to check out Bridalveil Fall. The parking lot was completely full and there were hundreds of tourists along the trail slipping and sliding their way up the granite to the base of the fall.



Two Views of Bridalveil Fall, © 2016 Grant R. E. Kiser (Left) and Jonathan V. L. Kiser (Right).

Litter was clearly evident along the trail, in the parking lot, and around the bathrooms. In total, we counted 50 pieces of litter in this location. Most of the litter was paper (41 pieces), followed by cigarette butts (4), aluminum cans (3), and two pieces of plastic. We also counted four trash cans and four recycling cans in the parking lot.

One of the more disturbing observations at Bridalveil Fall was the quantity of paper litter found in certain trail locations plus in and behind the bathrooms. This served as yet another example of the infrastructure being overwhelmed by the demand and also the irresponsibility of park visitors.



**Bridalveil Fall Parking Lot Recycling and Trash Cans (Top) and
Paper Litter Behind and Inside the Bathroom (Bottom),
© 2016 Jonathan V. L. Kiser.**



**Plastic Litter along Bridalveil Fall Trail,
© 2016 Jonathan V. L. Kiser.**

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**Excessive Paper Litter along Bridalveil Fall Trail,
© 2016 Jonathan V. L. Kiser.**

Yosemite Valley Visitor Center

We next made our way to the Yosemite Valley Visitor Center where the nice park ranger reiterated that the Junior Rangers provided litter pickup assistance. We were specifically informed that 100 kids come through YNP daily picking up trash. While this may be the case, the research team never saw any Junior

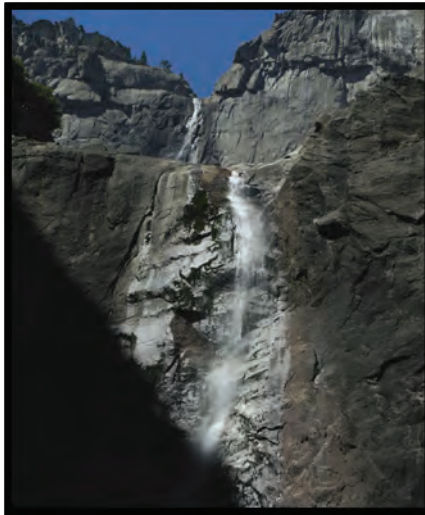
Rangers picking up any litter here or in any of the other parks visited. If they are actually picking up litter, the problem is far worse than we documented. In any event, there is clearly not enough being done to get the litter problem under control.



Yosemite Valley Visitor Center,
© 2016 Jonathan V. L. Kiser.

Lower Yosemite Fall

From the visitor center we journeyed to the lower Yosemite Fall by way of a 1.1 mile loop trail. Yosemite Fall ranks as the 5th tallest waterfall in the world (ten times higher than Niagara).



Lower Yosemite Fall, © 2016 J. V. L. Kiser.

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We counted 12 pieces of litter along the trail. This included eight pieces of paper, one plastic bottle, two composite plastic and foil wrappers, and a Coke can.



**Litter along the Lower Yosemite Fall Trail,
© 2016 Jonathan V. L. Kiser.**

Yosemite Lodge at the Falls and Bus Stop

We then stopped by the Yosemite Lodge at the Falls for some much needed food and drink and noticed a sign indicating that takeout meals from Yosemite restaurants are served in cartons and with utensils made from plant starch. These will biodegrade in the Mariposa County Composting Facility in 60 to 120 days. This compares with the typical plastic utensils which require 25 to 100 years to decompose!

At the bus stop outside the Yosemite Lodge at the Falls, we counted three pieces of litter (two pieces of paper and one plastic straw). Everywhere we went there seemed to be litter to be found.



**YNP Use of Plant Starch Cartons and Utensils,
© 2016 Jonathan V. L. Kiser.**

Mariposa Grove

We next traveled to the famous Mariposa Grove by way of the Wawona Road. This amazing grove, near Yosemite's south entrance, contains about 500 mature giant sequoias. These trees, *Sequoiadendron giganteum*, can grow to be 311 feet high with a maximum diameter of about 40 feet. Their bark is up to 31 inches thick. From a total volume standpoint, they are the largest living things known to humans. The Giant sequoias grow only on the Sierra Nevada's western slope.



**The Bachelor and Three Graces in Mariposa Grove,
© 2016 Jonathan V. L. Kiser.**

Litter Crisis in Our National Parks

The research team followed the Mariposa Grove Trail for about one-half mile into the lower grove, passing by unworldly trees like the Fallen Monarch, the Bachelor and Three Graces, the Grizzly Giant, and the California Tunnel Tree. Unfortunately, there was also litter found all along the way.



**The Grizzly Giant, Age: 1,800 Years, Height: 210 Feet,
Diameter: 30 Feet, © 2016 Jonathan V. L. Kiser.**

The research team counted a total of 20 pieces of litter along one mile of trail (round trip) and in the parking lot (two pieces). There was ten pieces of paper, a plastic lid, a plastic bag, a plastic bottle, a straw, a Styrofoam cup, a metal can tab, and four pieces of orange peel.



**Litter along the Mariposa Grove Trail,
© 2016 Jonathan V. L. Kiser.**

Upon our return to the parking lot, Rhett made a major observation. There was a trash can full of recyclable plastic bottles at the grove entrance and no alternative recycling bin to put them in. This was not the only location we visited where this was the case. The clear conclusion was that YNP does not provide ready accessibility for visitors to recycle plastic bottles at many of the most popular destinations. Perhaps this is another indication of budget constraints. The bottom line is that a lot of plastic is being thrown out in YNP which should otherwise be recycled.

Litter Crisis in Our National Parks



**Paper Litter in the Mariposa Grove Parking Lot,
© 2016 Jonathan V. L. Kiser.**

Leaving Yosemite

The following morning the research team drove through YNP one last time en route to San Francisco. We witnessed nine pieces of litter (six pieces of paper, a paper cup with a plastic lid, and a piece of foil) along the banks of the Merced River just inside the Arch Rock entrance to the park.



**Paper and Plastic Litter near the Merced River,
© 2016 Jonathan V. L. Kiser.**

We then connected with Oak Flat Road and drove toward the YNP exit on Route 120. Along this stretch we counted 24 more pieces

of litter (paper, plastic bags, and a wheel cover) along the side of the road. It was plain to see that wherever many of the tourists traveled within YNP they left a trail of litter. How disappointing, discouraging, and disturbing.

KEC Litter Survey Results

YNP has a litter problem. Based on our travels along the main roads and stops at many of the main tourist spots, wherever there was a bus stop our litter severity rating tended to be at least a 3 on the severity scale (littered) and often a 4 (very littered).

While the food concession stand at Glacier Point received a 2 rating, the Tunnel View stop (where all the buses go) was a 4. We found litter in all the wrong places, those locations with the best, most iconic views. Every place we stopped to be inspired there tended to be a frickin piece of litter to dampen the moment. It will probably ultimately remain unclear to the research team why many humans deliberately desecrate the places they are most attracted to.

KEC's overall litter rating for YNP was 3.5 out of 4. This means that there was a lot of litter at most of sites we stopped. A total of 556 pieces of litter and trash where counted in YNP. This ranked 1st out of ten in terms of the most litter documented at any one park or area visited. See Exhibit 5 for details.



**Rhett Holding Up Half Dome,
© 2016 Grant R. E. Kiser.**

Litter Crisis in Our National Parks

Exhibit 5
Yosemite National Park Litter Survey Details

| Location | Paper | Plastic | Cigarette Butts | Ferrous Metal | Non-Ferrous | Food | Other |
|--|--------------|----------------|------------------------|----------------------|--------------------|-------------|--------------|
| Tuolumne Meadows Visitors Center | 16 (a) | - | 8 | - | 1 (b) | 1 | - |
| Lembert Dome Trail | 1(c) | 1(d) | - | - | 2 (e) | - | - |
| Tenaya Lake | 23 (f) | 4 (g) | 27 | - | 3 (h) | 1 (i) | - |
| Olmsted Point | - | 2 (j) | 1 | - | - | - | - |
| Cathedral Beach Roadside (El Capitan) | 10 (k) | 5 (l) | 110 | 2 (m) | 1 (n) | - | - |
| Tunnel View Parking Lot and Vista | 52 | 8 (o) | 48 | - | 2 (p) | 2 (q) | 7 (r) |
| Tunnel View to Washburn Lookout | 2 | - | - | - | - | - | 1 (s) |
| Washburn Lookout Point | 18 (t) | 1 (u) | 8 | - | - | 7 (v) | - |
| Glacier Point | 2 | 5 (w) | 1 | - | 2 (x) | - | 3 (y) |
| Bridalveil Fall | 41 (z) | 2 (aa) | 4 | - | 3 (ab) | - | - |
| Lower Yosemite Fall | 8 | 1 (ac) | - | - | 1 (ad) | - | 2 (ae) |
| Bus Stop Near Yosemite Lodge at the Falls | 2 | 1 (af) | - | - | - | - | - |
| Mariposa Grove | 10 | 5 (ag) | | | 1 (ah) | 4 (ai) | 50 (aj) |
| El Portal Road, Merced River Near Arch Rock Entrance | 7 (ak) | 1 (al) | - | - | 1 (am) | - | - |
| Oak Flat Rd. to Route 120 to YNP Exit | 16 | 8 (an) | - | - | - | - | - |
| Totals (n=556) | 208 | 44 | 207 | 2 | 17 | 15 | 63 |

(a) Includes six pieces of toilet paper on the men's bathroom floor; (b) Foil; (c) A cough drop wrapper; (d) Plastic bag (#4 plastic type); (e) One beer can and one piece of foil; (f) Including one Wrigley gum wrapper; (g) Three bags (#4) and one straw (#5); (h) Two pieces of foil and one wrapper; (i) A banana; (j) One flip flop (#3) and a Styrofoam cup (#6); (k) Includes one cup; (l) Two bottle caps (#5) one container (#7), and two six pack rings (#4); (m) Bottle caps; (n) Foil; (o) Includes one fork (#5), two lids (#1), one heart (#7), one cup (#5), and three bottles (#1); (p) One foil wrapper and one soda can; (q) Includes a jolly rancher candy and a fruit chew; (r) Includes a feather, candy box, a Q tip, a piece of cloth, rubber, and two corks; (s) Road kill; (t) Includes one cup, a AA battery package, and a Yosemite brochure; (u) Bottle (#1); (v) Pieces of orange peel; (w) Two pieces of hard plastic (#7), one bag (#4), and two bottles (#1); (x) One piece of foil and one container; (y) One rubber band, one piece of old corrugated cardboard, and one glass; (z) Including 5 pieces of paper behind the bathroom and 15 pieces of toilet paper on the bathroom floor; (aa) Includes one cup (#5) and one ring (#5); (ab) Cans; (ac) Bottle (#1); (ad) Includes one Coke can; (ae) Includes two composite plastic and foil wrappers (af) A straw (#5); (ag) Includes a lid (#1), Styrofoam cup (#6), bag (#4), straw (#5), and bottle (#1); (ah) Metal can tab; (ai) Orange peel pieces; (aj) A trash can full of recyclable plastic bottles (#1) not counted in the litter total since they were not found on the ground; (ak) Including one cup; (al) A lid (#1); (am) Foil; (an) Seven bags (#4) and one wheel cover (#7).

Source: Kiser Environmental Consulting, 2016.



KEC Improvement Recommendations for YNP

1. Secure additional funding for education programs and waste management staff resources. Engage the public and other park stakeholders in the fundraising process by explaining the importance of reuse and recycling practices from a climate change, individual carbon footprint reduction standpoint. Also explain why litter prevention is essential to reduce desecration of the park and the harm litter causes to the ecosystem. Pursue additional creative public-private funding initiatives that will generate positive public relations for the private sector partner (i.e., similar to the joint effort with Subaru for the zero landfill effort).
2. Consider establishing a waste management/recycling/litter fee as part of the park entrance fee for use in the implementation of adequate park waste management and recycling infrastructure, anti-litter efforts, and staffing resources. Couple this with a public education outreach effort making it clear why this fee is needed.
3. Regardless of whether a recycling/litter fee is established, provide all visitors at the park entrance with a brief litter awareness brochure/questionnaire explaining the problem and seeking their pledge to be good environmental stewards and reduce their individual carbon footprints by practicing reuse, recycling, and proper waste management. As part of the questionnaire, ask if visitors are willing to donate time and/or money for the cause. Ask that they either fill out the questionnaire while visiting the park or mail in after their visit. Then follow-up with those who have expressed a willingness to help.

4. Encourage recycling by allowing visitors to recycle items like bottles, cans, and paper at the park visitor centers in exchange for “I Recycled Today at YNP” stickers or other inexpensive “give-aways” aimed at promoting good feelings for positive actions taken on behalf of the park and the environment.
5. Create educational anti-litter DVDs/videos in various languages and show them on shuttles, in visitor’s centers, etc.
6. Strategically place anti-litter signage, in parking lots and popular road pull-off locations. Indicate on the signs what happens to the litter that is carelessly thrown on the ground. One message concept might include showing an iconic park image with and without litter in the foreground and the caption reading: “Which scene to you prefer to remember your park by?” or “Which scene would like to return to on your next visit?”
7. Specifically implement an anti-cigarette butt litter campaign including signage and receptacles with a noticeable logo image at strategic roadside stops and parking areas.
8. Raise awareness with the same anti-litter and anti-cigarette messages on the YNP website (<https://www.nps.gov/yose/planyourvisit/basicinfo.htm>), in park newsletters, and other publications with the aim being to help reduce the litter problem.



**Anti-Cigarette Butt Campaign Example,
© 2016 Jonathan V. L. Kiser.**

9. Beef up litter pickup efforts at the most popular YNP locations. Involve the Junior Rangers in a more systematic, expanded, and aggressive manner. Start documenting what type of material they are collecting and how much of each by weight. This will help to establish a baseline for real progress. Further expand this effort by including other volunteer organizations like the Boy Scouts, environmental clubs at colleges/universities, and church organizations. Use social media to mobilize the Millennials.
10. Consider the implementation of littering fine signage coupled with actual enforcement action. This could serve as a much needed source of revenue that could be used toward proper waste management infrastructure and outreach programs.
11. Step up efforts to properly manage trash and recyclables in YNP. Replace aging labeling on recycling and trash containers with both written descriptions of acceptable

materials and supporting pictures to make it clear what materials go in each bin. This should help minimize contamination of the recyclables stream and recyclables being tossed into the trash containers.

12. Expand efforts to provide tourists with convenient, obvious places to dispose of trash and recycle plastic and other materials. Target popular destinations that currently lack adequate waste management and recycling infrastructure (e.g., Tenaya Lake, Olmsted Point, Cathedral Beach Turnout, Tunnel View, Maraposa Grove, etc.). In terms of infrastructure, consider the installation of solar trash and recyclables compactor bins. These will not only reduce the frequency of materials collection and improve trash and recyclables management efficiency, but also promote alternative energy.



Solar-Powered Recycler at Iowa State, Public Domain.

13. Implement an environmental stewardship art program using postcards with iconic images and pledge language asking for positive personal action(s) (e.g., to reuse water containers, recycle, and not litter). Work with the tourist industry to widely distribute and promote the postcards.

Litter Crisis in Our National Parks

As a first recommended project, YNP should partner with bus companies to produce the postcard. The front side should have a picture of Yosemite Valley taken from the Tunnel View location. The back side of the postcard should be a list of pledges each bus passenger will be instructed to read, along with a checklist of personal action steps they can agree to in order to be a good environmental steward.



**Front of Souvenir Postcard Example:
Yosemite Valley from Tunnel View,
© 2016 Jonathan V. L. Kiser.**

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- ❖ While visiting _____ National Park, an Eden on earth, I pledge to be a good environmental steward.
- ❖ I pledge to take only photos and leave only footprints.
- ❖ I pledge to not litter.
- ❖ I pledge to responsibly recycle or properly dispose of my trash including any cigarette butts.
- ❖ I pledge to leave to leave this piece of paradise a little bit better than how I found it.
- ❖ Here are ways I will do this:
 - _____ I will recycle my plastic bottles and other materials.
 - _____ I will pick up any litter encountered on the trail and in parking lots.
 - _____ I will stay on the designated hiking trails to prevent erosion.
 - _____ I will not feed any animals to prevent them from becoming no longer wild.
 - _____ I will volunteer my time to enhance the park for future generations.
 - _____ I will use the park's free public transit system to minimize vehicle air emissions.
 - _____ I will make a financial contribution to the park.
 - _____ Other (specify): _____.

**Back of Souvenir Postcard, Visitor Pledge Statements,
© 2016 Jonathan V. L. Kiser.**

It would be the responsibility of the bus tour guide to distribute the pledge postcards and explain them to passengers a short while before their arrival at Tunnel View. They would explain that the postcard is a free souvenir from the NPS as a show of appreciation for their interest in YNP. The tour guide would then ask for each passenger's cooperation and understanding in taking this outreach effort seriously. As part of the standardized script, the tour guide would finally remind passengers to appropriately use the recycling bins, cigarette receptacles, and trash cans in the parking lot (NPS needs to make sure these are all adequately in place in the best locations) once the passengers have left the bus to capture their picture in front of the iconic valley.

This type of creative program would be relatively inexpensive (e.g., primarily involving the creation and mass distribution of a simple postcard) and easy to implement. The end objective would be to directly encourage positive environmental stewardship in a timely manner that achieves results. By providing visitors with a souvenir picture, coupled with the meaningful pledge/action messages just before they depart their bus, they will be more inclined to do the right thing for the environment. Passengers will know that others will be watching and that both YNP and the tour bus company take this initiative seriously.

This concept could readily be expanded to include distribution to each vehicle entering the park. It could also be underwritten by private sector sponsors whose livelihood is dependent on bringing millions of visitors to YNP.



Chapter 6

Battery Spencer (Golden Gate National Recreation Area)



Battery Spencer with Gun Emplacement and Abandoned Military Buildings, © 2016 Jonathan V. L. Kiser.

Overview

Battery Spencer (1897-1942) was a reinforced concrete gun battery located on Fort Baker in Marin County, California. During the early 1900s, Battery Spencer was one of the main protection points for the San Francisco harbor. It featured multiple 12” guns that were manned by the military, along with support buildings for housing the generators and shells. It was operated on and off until World War II when the battery was decommissioned for the new war effort.

Litter Crisis in Our National Parks

Battery Spencer is now part of the Golden Gate Recreation Area and is administered by the National Park Service. It offers one of the very best views of the Golden Gate Bridge and San Francisco. During 2015, the NPS reported that there were 14.9 million visitors to the Golden Gate National Recreation Area.



**Proximity of the Golden Gate Bridge to Battery Spencer,
© 2016 Jonathan V. L. Kiser.**

KEC Field Observations: July 21, 2013

Upon our arrival at Battery Spencer, the research team noted a rust-covered recycling bin for aluminum, glass, and plastic near the parking lot. We then took a quick tour of the abandoned buildings and empty gun turrets in the fog. During our visit, the team counted an excessive amount of litter all around the site. The litter details are provided below on a material by material basis. Due to the foggy conditions, we were unable to see across the Golden Gate Bridge to San Francisco from Battery Spencer.



Aluminum, Glass, and Plastic Recycling Bin at the Battery Spencer Parking Lot, © 2016 Jonathan V. L. Kiser.



Voluminous Battery Spencer Litter, © 2016 Jonathan V. L. Kiser.

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**Still More Battery Spencer Litter,
© 2016 Jonathan V. L. Kiser.**

KEC Litter Survey Results

KEC's litter survey at Battery Spencer encompassed a stop at one location and hiking about one-half a mile around the site. Based on our count of paper (133 pieces), plastic (24), cigarette butts (54), and four pieces of old corrugated cardboard, KEC's overall average litter rating for Battery Spencer was 4.0 out of 4. There was litter found all around the site, especially near the parking lot area.

A total of 215 pieces of litter were counted at Battery Spencer. This ranked 4th out of ten in terms of the most litter documented.



**Yet More Battery Spencer Litter,
© 2016 Jonathan V. L. Kiser.**

at any one park or area visited. In terms of single physical locations (i.e., at most other places we stopped at multiple locations), Battery Spencer had the most litter by far. See Exhibit 6 for details.

**Exhibit 6
Battery Spencer Litter Survey Details**

| Location | Paper | Plastic | Cigarette Butts | Old Corrugated Cardboard |
|---------------------------------------|----------------|----------------|------------------------|---------------------------------|
| Battery Spencer Totals (n=215) | 133 (a) | 24 (b) | 54 | 4 |

(a) Includes one paper roll; (b) Includes one spoon (#5 plastic type), one Placker flosser (#5), one cup (#6), nine bags (#4), six candy wrappers (#7), two straws (#5), and four hard pieces (#7).

Source: Kiser Environmental Consulting, 2016.

KEC Improvement Recommendations for Battery Spencer

1. Establish additional trash and recycling bins in the parking lot and other strategic locations around Battery Spencer. In light of the extreme amount of paper litter documented, dedicated paper recycling bins are highly encouraged.
2. Install cigarette butts receptacles in the parking lot and other strategic locations around the site. This is critical due to the excessive amount of cigarette butt litter documented.
3. Install litter prevention signage in the parking lot so visitors are reminded to not desecrate this historic and beautiful location.

4. Consider the installation of littering fine signs in the parking lot to help deter the incredible amount of littering taking place.
5. Consider the implementation of a random monitoring and fine enforcement program to support the littering fine signage.
6. Add language to the NPS web page (<https://www.nps.gov/goga/planyourvisit/basicinfo.htm>) for Battery Spencer encouraging visitors to reuse water bottles, recycle, not litter, and otherwise properly manage their waste while there.



**Battery Spencer Emplacement and Support Buildings,
© 2016 Jonathan V. L. Kiser.**

North in Search of the Mighty Coastal Redwoods

The following day, the research team followed Route 128 west through Navarro River Redwoods State Park. This provided us with our first glimpse of a dense forest filled with coastal redwood trees, *Sequoia sempervirens* (“ever living”).

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**Anti-Litter Sign along the Route 1 Scenic Highway,
© 2016 Jonathan V. L. Kiser.**

We continued our journey by following the Route 1 Scenic Highway north through Mendocino. It was nice to see a few anti-litter signs along the way.

The KEC team then drove onward past Fort Bragg and rejoined Highway 101 north at the town of Leggett, California, home of the famous Chandelier Tree.



Chandelier Tree, © 2016 Jonathan V. L. Kiser.



**Chandelier Tree, Height: 315 Feet, Diameter: 21 Feet,
Age: ~2,400 Years, © 2016 W. Rhett Kiser.**

After driving through the amazing tree and dutifully posing by its imposing trunk, we checked the parking lot for litter (none!) and continued our journey north on the Redwood Highway (Route 101) toward Humboldt Redwoods State Park.



Chapter 7

Humboldt Redwoods State Park



Humboldt Redwoods State Park Map, © 2016 Jonathan V. L. Kiser.

Overview

Located at the southern end of Humboldt County, with 53,000 acres (an area almost twice the size of San Francisco) Humboldt Redwoods State Park (HRSP) is California's largest redwood state park. With 17,000 acres of old-growth coastal redwoods, the park boasts the largest remaining contiguous old-growth coastal redwoods in the world. The trees here are thousands of years old and have never been logged. This is true because, in 1921, the Save the Redwoods League acquired and preserved the first grove

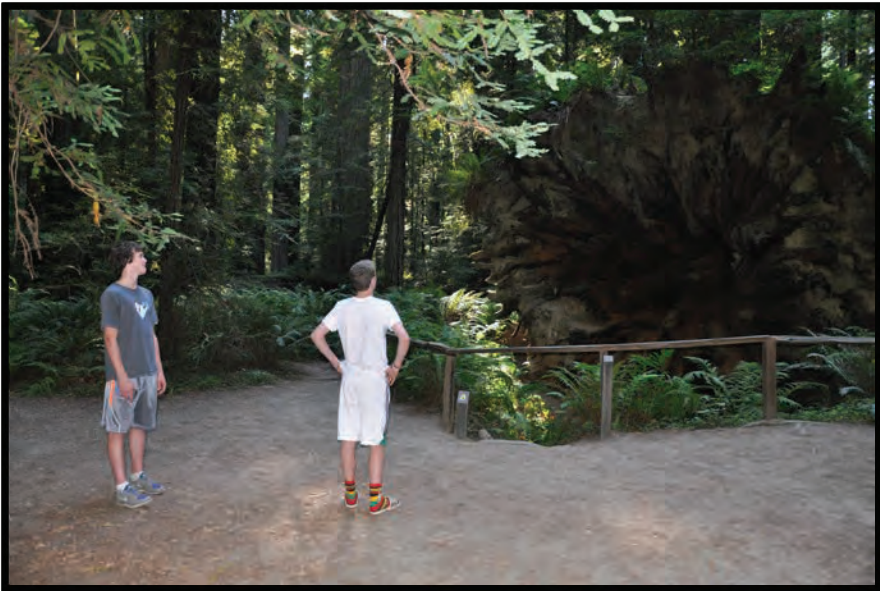
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and has since raised millions of dollars to expand this park. Famous features within HRSP include the Avenue of the Giants, and the Founders' Grove, with its fallen Dyerville Giant.

KEC Field Observations: July 22, 2013

The KEC team reached the HRSP by way of the Avenue of the Giants. This scenic drive is a 31-mile portion of old Highway 101, and provides an outstanding display of giant coastal redwood trees. We did not observe any litter along this stretch of the highway.

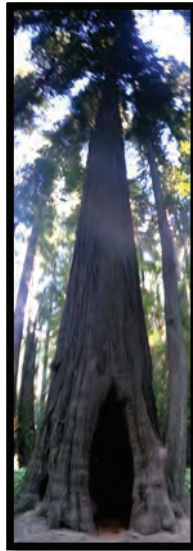
We then drove through the Roosevelt Forest, which is the largest single stand of redwoods on the planet. Our next stop was the Founders' Grove, the place that first inspired conservationists to save the redwoods. We walked along the Dyerville loop and saw the fallen Dyerville Giant. When it fell on March 24, 1991, it was at least 362 feet tall (i.e., 200 feet taller than Niagara Falls) and 17 feet in diameter.



**Rhett and Grant Paying Respect to the Dyersville Giant,
© 2016 Jonathan V. L. Kiser.**

Humboldt Redwoods State Park

The research team then saw the Founders Tree (346 feet high with a diameter of 12.7 feet), which was dedicated to those inspired conservationists who, in 1918, led the drive to establish the “Save-the-Redwoods League.” We also walked down a huge, colorful fallen tree and later encountered a piece of paper litter disgracefully left at the base of one of the magnificent giants.



**Jonathan w/Founders Tree, © 2016 W. R. Kiser;
HRSP Paper Litter and Grant on Fallen Redwood,
© J. V. L. Kiser; Hollow Redwood, © G. R. E. Kiser.**

Litter Crisis in Our National Parks

KEC Litter Survey Results

We fortunately only documented one piece of litter (paper) while in HRSP. This ranked 10th out of ten in terms of the most litter documented at any one park or area visited.



**Grant and Rhett with Giant Friend in HRSP,
© 2016 Jonathan V. L. Kiser.**

KEC Improvement Recommendations for HRSP

1. Promote proper waste management, recycling, and litter prevention practices on the HRSP handout materials.
2. Consider the placement of more recycling bins and cigarette butt dispensers in and around the most popular tourist destinations.
3. Consider the strategic placement of anti-litter signs in the park.
4. Maintain strong monitoring practice and remain vigilant in terms or making sure that visitors do not trash this precious state park resource.
5. Expand the Rules and Notifications on the HRSP website (https://www.parks.ca.gov/?page_id=425). While the current noted requirements to store food in an animal-proof container, to put trash in an animal-proof container, and keep it crumb clean video are all important, mention should also be made of reusing water containers, recycling, and litter prevention.



Blocked Pathway in HRSP, © 2016 J. V. L. Kiser.



Chapter 8

Humboldt Lagoons State Park



Map of Humboldt Lagoons State Park, Public Domain.

Overview

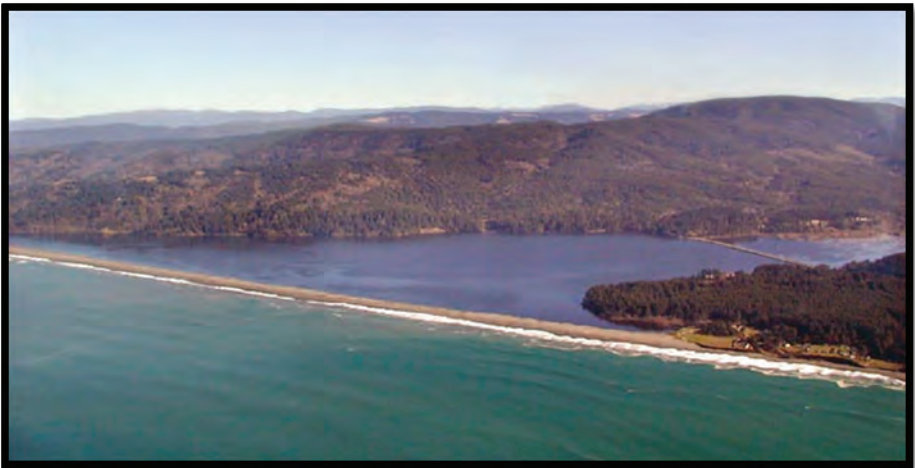
Humboldt Lagoons State Park (HLSP) is situated 40 miles north of Eureka, California along the coast where the Pacific Ocean meets the forest. It was formed by the clash of two tectonic plates and is part of the largest lagoon (i.e., a stretch of salt water separated from the sea by a low sandbank) system in the United States.

Litter Crisis in Our National Parks

HLSP includes Big Lagoon, Stone Lagoon, Freshwater Lagoon, and Dry Lagoon, which is now a marsh, bordered by dunes, coastal scrub, prairies, and forests. The summer months here are cool and damp with temperatures averaging 50-60 degrees Fahrenheit. Winter temperatures average 40-50 degrees Fahrenheit. There is about 60 annual inches of rainfall in this region occurring mostly from November into May.

KEC Field Observations: July 23, 2013

After spending the night in Eureka, California, the KEC research team headed north on the Redwood Highway 101 stopping briefly in Patrick's Point State Park (no litter observed). We continued on to HLSP, where we drove past the Big Lagoon, Dry Lagoon Beach, and the Stone Lagoon and then on to the southern entrance of Redwood National and State Parks. Unfortunately, we saw a lot of litter along the Redwood Highway in HLSP (i.e., from the Big Lagoon to the Stone Lagoon). We stopped occasionally to document this.



The Big Lagoon in HLSP, Public Domain.

KEC Litter Survey Results

KEC’s litter survey within HLSP encompassed driving about seven miles along the Redwood Highway from Big Lagoon to the Stone Lagoon. Based on our count of paper and plastic along the roadside, KEC’s overall average litter rating for HLSP was 3.5 out of 4. There was way too much litter inexplicably being tossed out of motor vehicles by uncaring humans.

A total of 160 pieces of litter were counted in HLSP. This ranked 5th out of ten in terms of the most litter documented at any one park or area visited. See Exhibit 7 for details.

**Exhibit 7
Humboldt Lagoons State Park Litter Survey Details**

| Location | Paper | Plastic |
|--|--------------|----------------|
| Redwood Highway 101 (Big Lagoon to Dry Lagoon) | 60 | 40 (a) |
| Redwood Highway 101 (Dry Lagoon to Stone Lagoon) | 36 | 24 (b) |
| HLSP Totals (n=160) | 96 | 64 |

(a) Includes 20 pieces of hard plastic (#7 plastic type) and 20 bags (#4);

(b) Includes 12 pieces of hard plastic (#7) and 12 bags (#4).

Source: Kiser Environmental Consulting, 2016.

KEC Improvement Recommendations for HLSP

1. Install littering fine signs in multiple locations along the section of Highway 101 passing through HLSP.

Litter Crisis in Our National Parks



**Paper Litter along the Redwood Highway in HLSP,
© 2016 Jonathan V. L. Kiser.**

2. Initiate litter enforcement patrols at stationary locations along Highway 101 where litter is most problematic. Observe who may be littering and impose fines.
3. Consider establishing an automated litter patrol and fine system similar to construction zone cameras that take pictures of speeding vehicles and generate a ticket that is mailed to the motorist's home.
4. Include on the HLSP website (https://www.parks.ca.gov/?page_id=416) information about proper waste management, reuse of plastic bottles, recycling, and litter prevention along Highway 101 and elsewhere in the park.
5. Establish seasonal litter pickup campaigns along Highway 101 and, as needed, elsewhere in HLSP. Seek the help of volunteer organizations like the Boy Scouts and others.



Chapter 9

Redwood National and State Parks



**Rhett and Grant at the North Entrance of RNSP,
© 2016 Jonathan V. L. Kiser.**

Overview

According to the NPS, origins of Redwood National and State Parks (RNSP) date back to 1918 when a national campaign was launched by paleontologists to preserve the tallest trees in the world with a link to our evolutionary past. Scientific community interest led to the creation of three North Coast redwoods state parks: Prairie Creek in 1923, Del Norte in 1925, and Jedediah Smith in 1929. Interest in preserving the trees' natural setting in the Coast Range and the associated animals and plants led to the creation of Redwood National Park in 1968, and its 48,000 acre expansion by the U.S. Congress in 1978. The national park boundary encircles the three state parks and provides increased

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protection of the ancient redwood forests. Redwood National and State Parks is a cooperative management effort of the NPS and the California Department of Parks and Recreation. In 1963, the tallest tree in the park was 369 feet in the Tall Tree Grove. Today, the tallest known redwood tree is 379 feet tall, located in the Redwood Creek watershed.

The NPS reports that the park currently contains 131,983 acres, of which 71,715 are federal and 60,268 is state. Old-growth forest comprises 38,982 acres. During 2015, the NPS reported that there were more than 527,000 visitors to RNSP.

KEC Field Observations: July 23 – 24, 2013

Park Entrance

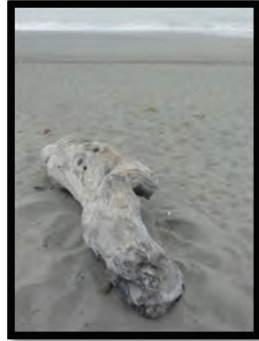
The KEC research team's first stop in RNSP was at the Freshwater Lagoon sign where we counted one piece of paper litter. Continuing north, we encountered the official southern entrance sign to RNSP near the Kuchel Visitor Center. While taking a photograph of the sign, we counted 61 pieces of litter (mostly paper and plastic, plus one rubber piece) in a 100 yard area surrounding it.



**Paper Litter at RNSP Freshwater Lagoon,
© 2016 Jonathan V. L. Kiser.**

Kuchel Visitor Center

Our next stop was at the Kuchel Visitor Center where we talked with a ranger about RNSP environmental challenges. On the nearby beach, we documented one piece of paper litter.



Rhett and Grant at Kuchel Visitor Center (Left); Paper Litter on the Beach (Right) © 2016 Jonathan V. L. Kiser.

On the visitor center deck, there was a lot of bird poop, suggesting that birds were nesting above. Next to the parking lot, there was a park employee managing trash at the side-by-side trash and recyclables bin (i.e., for aluminum, plastic, glass, tin). In the parking lot, we documented two pieces of cigarette butt litter.



**Kuchel Center Bird Poop,
© 2016 Jonathan V. L. Kiser.**

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Kuchel Center Side-by-Side Trash/Recyclables Collection Bin and Cigarette Butt Litter, © 2016 Jonathan V. L. Kiser.

Town of Orick

Following our stop at the Kuchel Visitor Center, we continued north along Highway 101, exiting the RNSP and passing through the small town of Orick. While stopped at a small tourist shop, we counted about 100 pieces of litter (60 pieces of paper and 40 pieces of plastic).

Even though Orick is outside the RNSP boundary and therefore not included in the park litter totals, the KEC team wanted to document that litter in Orick is part of the bigger litter problem we found along the continuous stretch of Highway 101 from Humboldt Lagoons State Park in the south to the northern entrance or RNSP near Crescent City.



Orick Tourist Shop, © 2016 Jonathan V. L. Kiser.

Lady Bird Johnson Grove

Next stop was the 300-acre Lady Bird Johnson Grove, where the National Park was dedicated in 1968. The grove was absolutely beautiful! Unfortunately, we counted 20 pieces of paper litter along the trail.



**Paper Litter in Lady Bird Johnson Grove,
© 2016 Jonathan V. L. Kiser.**



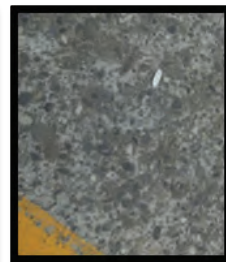
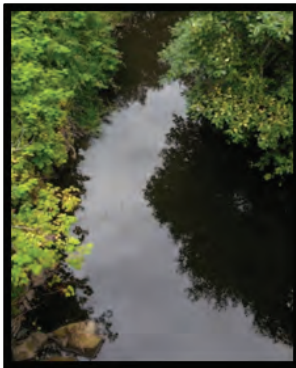
**Jonathan in Lady Bird Johnson Grove,
© 2016 W. Rhett Kiser.**



Grant in Lady Bird Johnson Grove, © 2016 W. Rhett Kiser.

Redwood Creek/CRD Timber & Logging Site

We then passed over Redwood Creek and were reminded that former logging activities have resulted in the creek being filled with silt. We also saw a few pieces of litter there, more at the nearby former CRD Timber & Logging facility location, and still more litter along the nearby Highway 101 section in the park.



Redwood Creek, Paper Litter, Closed CRD Timber & Logging Site, and Highway 101 Cigarette Butt Litter, © 2016 Jonathan V. L. Kiser.

Fern Canyon

Our next stop was Fern Canyon in Prairie Creek Redwoods State Park via a windy dirt road along God Bluffs Beach. One piece of paper litter was seen along the road.



Grant and Jonathan in Fern Canyon, © 2016 W. Rhett Kiser.

Fern Canyon has California native ferns covering the 33 – 49 foot sheer walls, giving it a primeval habitat quality. The research team documented a few pieces of paper and one piece of cigarette butt litter in the parking lot and approaching Fern Canyon. One cigarette butt was seen on the ground in the canyon.



**Paper Litter near Fern Canyon,
© 2016 Jonathan V. L. Kiser.**

Litter Crisis in Our National Parks

Big Tree Wayside and South Fork Trail

The research team next traveled to Prairie Creek Redwoods State Park along the Newton B. Drury Scenic Parkway (a Highway 101 diversion). Three pieces of litter (one piece of paper and two pieces of plastic) were spotted along the road.

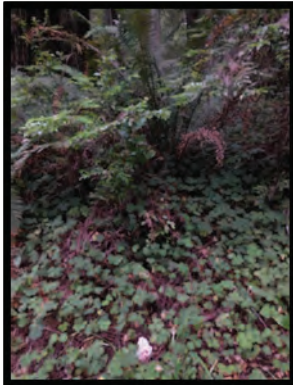
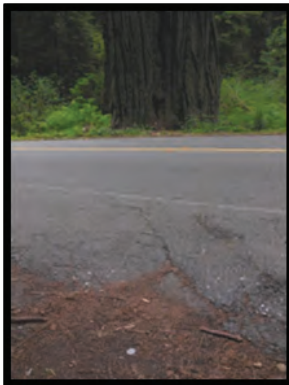
We stopped at the Big Tree Wayside and marveled at the 1,500 year-old Big Tree! One piece of paper litter was spotted.



**Grant with the Big Tree,
Height: 304 Feet, Diameter: ~22 Feet,
© 2016 W. Rhett Kiser.**

We then followed the trailhead of the South Fork Trail toward the Rhododendron Trail. Along the way observed a moment of complete forest stillness which was absolutely exquisite!

Unfortunately, we found 24 pieces of litter on and near the trail (e.g., 22 pieces of paper, one cigarette butt, and one metal bottle cap).



**Litter On and Near the South Fork Trail,
© 2016 Jonathan V. L. Kiser.**

Ah-Pah Interpretive Trail and Northern Entrance

Our next stop was the Ah-Pah Interpretive Trail where the research team witnessed the successful results of post-logging road removal and hill slope rehabilitation. Much to our relief, no litter was observed in either the parking lot or along the trail.



Ah-Pah Trailhead, © 2016 Jonathan V. L. Kiser.

We did notice an animal proof trash container nearby with a No Recycling Label. This struck us as a bit odd since recycling should be the priority and there were no recycling bins to be found.



No Recycling Trash Can!, © 2016 Jonathan V. L. Kiser.

We next traveled up to Crescent City to the north to get some supplies. Upon our return south to RNSP we stopped at the northern entrance sign and counted five pieces of paper litter.



Litter at the Northern RNSP Entrance, © 2016 Jonathan V. L. Kiser.

The following day, on our way out of the Del Norte Redwoods State Park, we counted 130 pieces of paper and plastic litter (i.e. along the roadside stretch covering from our campsite to the RNSP exit). We then continued our journey north to Crescent City and stopped at the Battery Point Lighthouse.



**Battery Point Lighthouse, Crescent City,
© 2016 Jonathan V. L. Kiser.**

Boy Scout Tree Trail

From Crescent City, the KEC team followed the unpaved Howland Hill Road (Route 199), weaving through truly top-notch old growth redwoods in the Jedediah Smith Redwoods State Park. We

Litter Crisis in Our National Parks

stopped for a hike on the gorgeous Boy Scout Tree Trail. We documented two pieces of paper litter in the parking area there.



**Jonathan Hiding along the Boy Scout Tree Trail,
© 2016 W. Rhett Kiser.**

Stout Memorial Grove

We next stopped at the Stout Memorial Grove in the Jedediah Smith Redwoods State Park. This is a 44-acre grove adjacent to the Smith River (the last major free-flowing river in the state). Unfortunately, we also saw four pieces of paper litter, two on the trail and two near the footbridge that crosses the Smith River to the Jedediah Smith campground. The highlight of this stop was the fabulous Stout Tree!



Grant in the Stout Grove, © 2016 W. Rhett Kiser;
Paper Litter by the Smith River, © 2016 Jonathan V. L. Kiser.

KEC Litter Survey Results

KEC's litter survey within RNSP encompassed stops at about a dozen locations, including one visitor center within the parks, hiking at least six miles of trails, and traveling about 60 miles along park roads.

Along Highway 101, which runs through many sections of the RNSP, the litter rating was a 4. There was an extreme amount of litter along many park stretches of the highway. At the trail heads, the litter rating was rolled back to a 2. There was clear evidence of humans along the trails from the paper litter that was typically left a short distance off the trail. In general, the state park sections appeared to be a bit cleaner than the national park sections.

Based on our count of paper, plastic, metals, cigarette butts, and other materials discarded by uncaring visitors, KEC's average overall litter rating for RNSP was a 3. This means that, unfortunately, there was litter found at most sites we visited.

Litter Crisis in Our National Parks

A total of 255 pieces of litter were counted in RNSP. This ranked 3rd out of ten in terms of the most litter documented at any one park(s) or area visited.



**The Stout Tree in the Memorial Grove, Height: 325 Feet, Girth
(Around the Trunk): 54 Feet (4.5 Feet Off the Ground),
© 2016 Jonathan V. L. Kiser.**

**Exhibit 8
Redwood National and State Parks Litter Survey Details**

| Location | Paper | Plastic | Cigarette Butts | Ferrous Metal | Non Ferrous | Rubber |
|--|--------------|----------------|------------------------|----------------------|--------------------|---------------|
| Freshwater Lagoon | 1 | - | - | - | - | - |
| Southern RNSP Entrance | 36 | 24 (a) | - | - | - | 1 |
| Kuchel Visitor Center | 1 | - | 2 | - | - | - |
| Lady Bird Johnson Grove | 20 (b) | - | - | - | - | - |
| Redwood Creek/CRD Timber Facility/Hwy. 101 | 4 | 1 (c) | - | - | 1 (d) | - |
| Gold Bluffs Beach Road | 1 | - | - | - | - | - |
| Fern Valley Parking Lot | 2 | - | 1 | - | - | - |
| Fern Valley Trail | - | - | 1 | - | - | - |
| Newton B. Drury Parkway | 1 (e) | 2 (f) | - | - | - | - |
| Big Tree Wayside | 1 | - | - | - | - | - |
| South Fork Trail | 22 (g) | - | 1 | 1 (h) | - | - |
| Northern RNSP Entrance | 5 | - | - | - | - | - |
| Del Norte Campground to RNSP Northern Exit | 84 | 36 (i) | - | - | - | - |
| Boy Scout Trail Jedediah Smith Redwood State Park | 2 | - | - | - | - | - |
| Stout Memorial Grove Jedediah Smith Redwood State Park | 4 | - | - | - | - | - |
| RNSP Totals (n=255) | 184 | 63 | 5 | 1 | 1 | 1 |

(a) Includes 12 pieces of hard plastic (#7 plastic type) and 12 bags (#4);
 (b) Includes one brochure; (c) A lid (#1); (d) A piece of foil; (e) Jack-n-the-Box packaging; (f) Including one lid (#1) and one Styrofoam cup (#6); (g) Includes three pieces of paper found inside a hollow tree, one cup, one Prairie Creek brochure, and toilet paper; (h) A metal bottle cap; (i) Includes 18 pieces of hard plastic (#7) and 18 bags (#4).

Source: Kiser Environmental Consulting, 2016.

KEC Improvement Recommendations for RNSP

1. Strategically place anti-litter signage and littering fine signs in parking lots and popular road pull-off locations. Signage should emphasize that these majestic forests are not waste receptacles. Mention of the Great Pacific Garbage Patch, a collection of marine debris litter in the North Pacific Ocean, would also be appropriate in the coastal locations.
2. Strategically place cigarette butt receptacles in parking lots and popular road pull-off locations.



RNSP Fern Canyon, © 2016 W. Rhett Kiser.

3. Hold litter cleanup events and encourage volunteer participation from the public and other stakeholder groups such as the Boy Scouts and church organizations.
4. Initiate litter enforcement patrols at stationary locations along Highway 101 where litter is most problematic. Observe who may be littering and impose fines. This would be a way to raise needed money and to hopefully change the bad littering behavior that was observed throughout the RNSP.
5. Consider establishing an automated litter patrol and fine system similar to construction zone cameras that take pictures of speeding vehicles and generate a ticket that is mailed to the motorist's home.



**Redwood with Burls (Knotty Growths),
Stout Memorial Grove, © 2016 Jonathan V. L. Kiser.**

6. Provide visitors with a brief litter awareness brochure/questionnaire explaining the problem and seeking their pledge to be good environmental stewards and reduce their individual carbon footprints by practicing reuse, recycling, and proper waste management. As part of the questionnaire, ask if visitors are willing to donate time and/or money for the cause. Ask that they either fill out the questionnaire while visiting the park or mail in after their visit. Then follow-up with those who have expressed a willingness to help.

7. Don't allow birds to nest at the Kuchel Visitor Center to alleviate the problem of excessive bird poop litter in the deck (which is an eye sore, slippery when wet, and a possible health concern).

Litter Crisis in Our National Parks

8. Include on the RNSP website (<https://www.nps.gov/redw/learn/news/upload/Visitor-Guide-June-2016-4.pdf>) information about proper waste management (beyond “crumb clean”), reuse of plastic bottles, recycling, and litter prevention along Highway 101 and elsewhere in the parks.

North to Crater Lake

We continued to follow the Redwood Highway (Route 199) to the north en route to Crater Lake, Oregon. Stopped at the grocery store in Grants Pass, Oregon and noticed the local green motto to “Rebag, Reduce, Rethink.” Journeyed from Grants Pass on the Pacific Highway 5 to Medford and then headed north on the Crater Lake Highway (Route 62).



**Thought-Provoking Bags in Grants Pass,
© 2016 Jonathan V. L. Kiser.**



Chapter 10

Crater Lake National Park



**Grant and Rhett at CLNP Western Entrance,
© 2016 Jonathan V. L. Kiser.**

Overview

Crater Lake is located in Southern Oregon, 100 miles east of the Pacific Ocean. It was formed 7,700 years ago when the 12,000 foot high Mount Mazama collapsed to form a caldera, following an enormous volcanic eruption. This eruption was connected with “plate tectonics,” with a plate carrying oceanic crust pushed into what is now the northwestern U. S. The lava flows that followed sealed the caldera and additional, smaller eruptions created other park features such as Wizard Island, which projects 764 feet above the lake’s surface. Crater Lake is the deepest in the U.S. (1,958 feet) and seventh deepest in the world. It receives its water only from rain fall (69 inches annually on average) and considerable snow melt (averaging 533 inches annually). CLNP protects 183,000 acres. During 2015, the NPS reported that there were more than 614,000 visitors to CLNP.

KEC Field Observations: July 24 – 25, 2013

Western Park Entrance to Godfrey Glen

At the western entrance sign to CLNP, we documented litter in the form of three cigarette butts and a two piece of paper. Just inside the park entrance there was an aluminum beer can along the roadway.

From the western CLNP entrance area, we followed Munson Valley Road to near Godfrey Glen where we turned left and headed north. In that stretch, we counted 39 pieces of litter (25 pieces of paper, 12 pieces of non-ferrous metal, and 2 pieces of glass).

Rim Village Visitor Center

From the Godfrey Glen area the research team traveled directly to the Rim Village Visitor Center and arrived just before closing (counted three pieces of litter on this stretch of road).



Rim Village Visitor Center, © 2016 Jonathan V. L. Kiser.

The ranger at the visitor center reported that park maintenance personnel do a good job of picking up and otherwise managing the trash generated in the park. KEC's litter survey in the park was to find that this was not so much the case. Understaffing may be the cause of the obvious litter problem at CLNP.

The ranger also mentioned that women are problematic from a litter and environmental impact perspective since they leave a lot of toilet paper along the trails. Based on what KEC subsequently documented in CLNP and previously saw at many of the other parks visited, this is a widespread problem that is not solely tied to women. Men and non-adults are no doubt contributors and proper "toilet etiquette" in the parks is something that should be more directly and aggressively confronted through education outreach initiatives (e.g., in park literature, education seminars, etc.).

Discovery Point

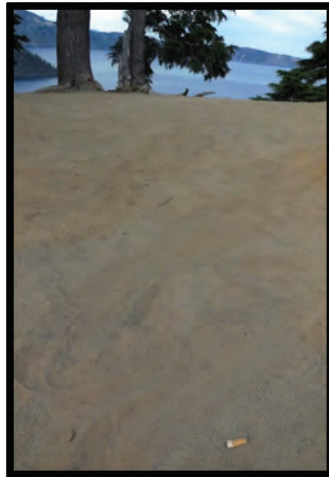
From the Rim Village Visitor Center until our first stop along West Rim Drive at Discovery Point, we counted eight pieces of litter (three pieces of paper, three cigarette butts, and two pieces of foil).

Litter Crisis in Our National Parks

At Discovery Point, there were 17 additional pieces of litter (paper, cigarette butts, non-ferrous metal, and rubber). Discovery Point is where gold prospector John Hillman first saw the Lake in 1853.



Discovery Point, © 2016 Jonathan V. L. Kiser.



Litter at Discovery Point, © 2016 Jonathan V. L. Kiser.

Watchman Overlook

Our next stop was Watchman Overlook where we documented paper (six pieces) and cigarette butt (nine pieces) litter in the large parking lot area. Rhett and Grant climbed to the top of Watchman Peak (elevation 8,013 feet) and captured wonderful views of Wizard Island, the volcanic island on the west side of the lake, and other spectacular sites associated with the CLNP pristine landscape.



**Watchman Overlook Paper and Cigarette Butt Litter,
© 2016 Jonathan V. L. Kiser.**



Watchman Peak View, © 2016 Grant R. E. Kiser.



Watchman Peak North Rim View, © 2016 W. Rhett Kiser.

The research team then followed the Crater Lake Highway and at North Junction continued north through the Pumice Desert. We did not document any litter on the way out of the park to our campsite outside CLNP near Diamond Lake.

Northern Park Entrance to West Rim Drive

The following day, we returned to CLNP via the northern entrance. We counted 30 pieces of litter (21 paper pieces, five plastic bags, two aluminum cans, and two glass bottles) along the road from the CLNP entrance to West Rim Drive near Merriam Point. We then continued around the lake on the East Rim Drive toward Cleetwood Cove. Saw a few deer crossing the road and a plastic bottle on the side of the road side courtesy of some inconsiderate person.



CLNP Morning View near Merriam Point, © 2016 W. Rhett Kiser.

Cleetwood Cove Trail Parking Lot and Trail

At the Cleetwood Cove parking lot, which serves as the trail head access point for the hike down to the edge of the lake, we counted 145 pieces of litter! Cigarette butts mostly (111) but also paper (24), a plastic lid, foil, a piece of gum, wood, a sock, and rubber. An unbelievable mess!



**Paper Litter in Cleetwood Cove Parking Lot,
© 2016 Jonathan V. L. Kiser.**

Litter Crisis in Our National Parks



**Lake View from Cleetwood Cove Trail,
© 2016 Grant R. E. Kiser.**

A nice hike down to Crater Lake followed, where we tasted the pure water and went for a refreshing dip. Counted one piece of wire litter on the trail.



**Wire Litter along the Cleetwood Cove Trail,
© 2016 Jonathan V. L. Kiser.**



Cleetwood Cove Lake View, © 2016 Grant R. E. Kiser.

The KEC team then continued on East Rim Drive toward the Cloudcap Overlook and documented five more pieces of paper litter along the way.

Cloudcap Overlook

At the Cloudcap Overlook we documented two pieces of paper litter and one piece of foil on the ground.



Cloudcap Overlook View, © 2016 W. Rhett Kiser.

Litter Crisis in Our National Parks



Foil Litter in Cloudcap Parking Lot, © 2016 Jonathan V. L. Kiser.

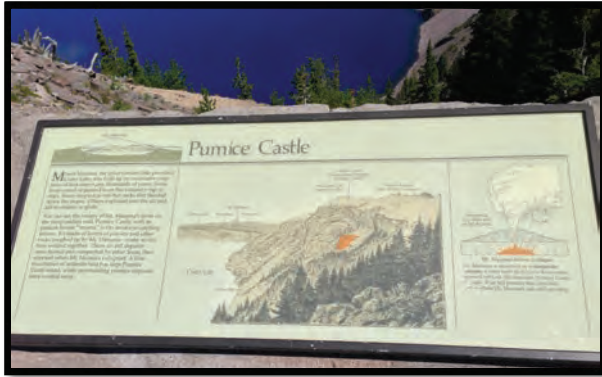
We continued our journey on East Rim Drive toward the Pumice Castle Overlook and caught sight of a porta potty on wheels on the side of the road. This was likely for a construction project but still struck us as being out of place along this scenic drive. Surely this was not part of any new waste management plan in the park??!



Mobile Waste Management along East Rim Drive?!!, © 2016 Jonathan V. L. Kiser.

Pumice Castle Overlook

Our next stop was the Pumice Castle Overlook. There in the parking lot we counted two pieces of paper litter and two pieces of cigarette butt litter.



Pumice Castle Sign, © 2016 W. Rhett Kiser.



Paper Litter in Pumice Castle Overlook Parking Lot, © 2016 Jonathan V. L. Kiser.

Phantom Ship Overlook to Steele Visitor Center

We traveled next to the Phantom Ship Lookout and did not see any litter on the way there. We did find one piece of foil litter in the Phantom Ship Lookout parking lot.

The team then followed East Rim Drive to our final stop in CLNP, Vidae Falls. The falls is a 100-foot, spring-fed creek that descends over a glacier-carved cliff. We documented 15 pieces of litter (five pieces of paper and ten cigarette butts) along East Rim Drive between the Phantom Ship Overlook and the park headquarters at the Steele Visitor Center. From there we headed exited the park along the Crater Lake Highway (Route 62 south).



**Phantom Ship View (Left), © 2016 W. Rhett Kiser; and
Vidae Falls (Right), © 2016 Jonathan V. L. Kiser.**

KEC Litter Survey Results

KEC’s litter survey within CLNP encompassed stops at about 14 locations, including one visitor center, hiking about 4 miles of trails, and traveling more than 60 miles along park roads. Based on our count of paper, plastic, cigarette butts, metal and other materials discarded by uncaring visitors, KEC’s overall litter rating for RMNP was 3.0 out of 4. This means that there was litter found at essentially all of the sites we visited.

A total of 293 pieces of litter were counted in CLNP. This ranked 2nd out of ten in terms of the most litter documented at any one park or area visited. See Exhibit 9 for details.

**Exhibit 9
Crater Lake National Park Litter Survey Results**

| Location | Paper | Plastic | Cigarette Butts | Non-Ferrous | Food | Other |
|--------------------------------------|--------------|----------------|------------------------|--------------------|-------------|--------------|
| CLNP West Entrance | 2 | - | 3 | 1 (a) | - | - |
| West Entrance to Godfrey Glen | 25 | - | - | 12 | - | 2 (b) |
| Godfrey Glen to Rim Visitor Center | - | 1(c) | 2 | - | - | - |
| Rim Visitor Center to Discover Point | 3 | - | 3 | 2 (d) | - | - |
| Discovery Point | 9 (e) | - | 6 | 1 (f) | - | 1 (g) |
| Watchman Overlook | 6 | | 9 | | | |

**Exhibit 9 – Continued
Crater Lake National Park Litter Survey Results**

| Location | Paper | Plastic | Cigarette Butts | Non-Ferrous | Food | Other |
|---|--------------|----------------|------------------------|--------------------|-------------|--------------|
| North Entrance to West Rim Drive | 21 | 5 (h) | - | 2 (i) | - | 2 (j) |
| East Rim Drive to Cleetwood Cove | - | 1 (k) | - | - | - | - |
| Cleetwood Cove Trail Parking Lot | 24 | 1 (l) | 111 | 1 (m) | 1 (n) | 7 (o) |
| Cleetwood Cove Trail | - | - | - | 1 (p) | - | - |
| Cleetwood Cove to Cloudcap Overlook | 5 | - | - | - | - | - |
| Cloudcap Overlook | 2 | - | - | 1 (q) | - | - |
| Pumice Castle Overlook | 2 | - | 2 | - | - | - |
| Phantom Ship Overlook | - | - | - | 1 (r) | - | - |
| East Rim Drive to Steele Visitor Center | 5 | - | 10 | - | - | - |
| Totals (n=293) | 104 | 8 | 146 | 22 | 1 | 12 |

(a) One beer can documented just inside park; (b) Glass; (c) A piece of hard plastic (#7 plastic type); (d) Foil; (e) Includes eight pieces of paper and one lollipop stick; (f) Spray container; (g) Piece of rubber; (h) Bags (#4); (i) Cans; (j) Glass bottles; (k) Bottle (#1); (l) Lid (#1); (m) Piece of foil; (n) Piece of Chiclets gum; (o) Includes five wood pieces, one sock, and a piece of rubber; (p) A piece of wire; (q) Foil; (r) Foil wrapper.

Source: Kiser Environmental Consulting, 2016.

KEC Improvement Recommendations for CLNP

1. Encourage volunteer organizations like the Boy Scouts and community-minded religious organizations to assist with seasonal litter pickup events in the park.
2. Provide visitors with a brief litter awareness brochure/questionnaire explaining the problem and seeking their pledge to be good environmental stewards and reduce their individual carbon footprints by practicing reuse, recycling, and proper waste management. As part of the questionnaire, ask if visitors are willing to donate time and/or money for the cause. Ask that they either fill out the questionnaire while visiting the park or mail in after their visit. Then follow-up with those who have expressed a willingness to help.

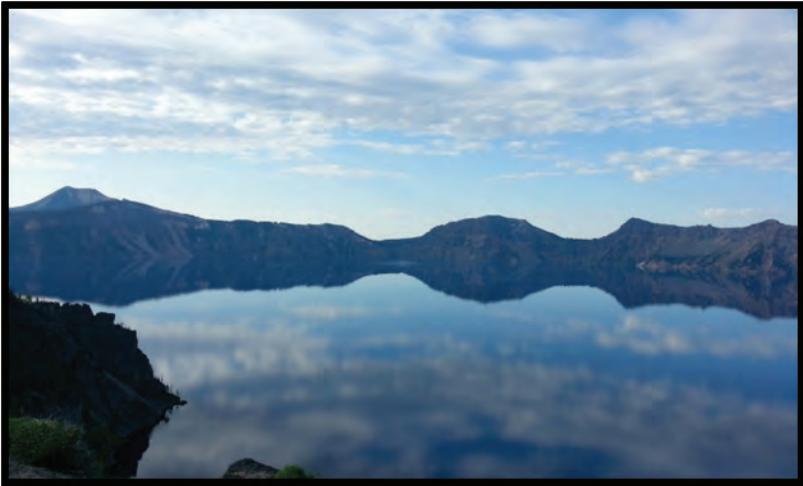


Crater Lake from West Rim Drive, © 2016 G. R. E. Kiser.

3. Strategically place anti-litter signage and littering fine signs (if necessary) in park locations like the visitor centers and the Cleetwood Cove parking lot.
4. Place cigarette receptacles in parking lots and along popular road pull-off locations.

Litter Crisis in Our National Parks

5. Consider the implementation of a littering fine enforcement program as a way to gain more control over the problem and to generate much needed revenue.
6. Consider the installation of surveillance cameras as part of the littering fine program in the Cleetwood Cove parking lot and other locations where litter is an on-going problem.
7. Bolster existing recycling efforts, by giving visitors who recycle items like bottles, cans, and paper at the park visitor centers “I Recycled Today at CLNP” stickers or other inexpensive “give-aways” aimed at promoting good feelings for positive actions taken on behalf of the environment.
8. Make sure that the CLNP website (<https://www.nps.gov/crla/learn/news/newspaper.htm>), visitor guides, and other outreach materials include prominent information about reusing water bottles, recycling, litter prevention, and proper waste management in the park.



Crater Lake Sky Reflection, © 2016 Grant. R. E. Kiser.

About the Authors

Jonathan V. L. Kiser, M.B.A. is the President of Kiser Environmental Consulting and specializes in satisfying client needs through a variety of services. These include: Program management, technical research, writing & analysis, quality assurance/control/management, full cost accounting assessments, due diligence, benchmarking surveys, environmental audits, regulatory compliance, and strategic planning. His areas of subject matter expertise include: NEPA, Integrated waste management, recycling, renewable energy, climate change, air quality, pollution control, regulatory compliance, energy conservation, and litter management.

Mr. Kiser has more than 40 years of experience working on behalf of public and private sector organizations on assignments throughout the U.S. and internationally. Jonathan's first environmental assignments were for the Sanibel-Captiva Conservation Foundation dating back to 1976. There he tagged alligators and sea turtles, completed a field investigation the impact of invasive species on area mammals, and documented the erosion patterns of barrier islands. From 1991 to 1995, Jonathan served as a founding Director for the Integrated Waste Services Association in Washington, D.C. Prior to this, he worked as a Manager at the National Solid Wastes Management Association and served as Project Liaison for an Energy Conservation Program sponsored by University Circle, Inc. and Case Western Reserve University.

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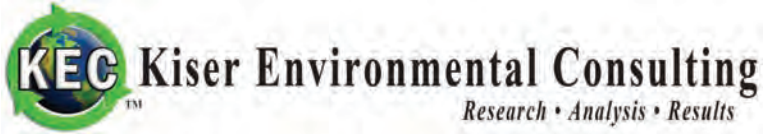
Jonathan received his M.B.A. from George Washington University, and B.S. in Resource Economics from the University of New Hampshire. He has nearly 90 publications and has taught environmental topics on an international level. Mr. Kiser is a Research Associate with the Columbia University Earth Engineering Center for Sustainable Waste Management, a member of James Madison University's Collaboration for Environment, Health and Safety, and a long-standing member of the Solid Waste Association of North America.

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Grant R. E. Kiser is currently a Sophomore at Virginia Polytechnic Institute and State University (Go Hokies!!) seeking a degree in Biochemistry. Grant enjoys cooking, hiking, and mountain biking.



Grant, Jonathan, and Rhett Kiser, next to the San Francisco Bay and Alcatraz Island, © 2016 Dan Rice.



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Litter Crisis in Our National Parks provides detailed litter survey results from a comprehensive KEC field investigation conducted in six national parks plus numerous state parks and other protected areas in the American west.

Included is photographic evidence of litter in each location visited, along with comparative ranking scale findings, and litter documentation on an individual material basis. Specific recommendations are presented on how to effectively address this widespread problem.

It is the authors' hope that this book will generate greater awareness of the major litter problem in our national parks and other preserved settings, and inspire visitors to stop mindless practices and otherwise do more to help improve the situation.



Jonathan Kiser, MBA, is the KEC President and author of nearly 90 publications on timely environmental issues. **Rhett and Grant Kiser** are outdoor enthusiasts and college students at Virginia Tech.

“It is up to all of us to respect and preserve these national treasures so they will endure for future generations.”



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