



TAHOE
REGIONAL
PLANNING
AGENCY

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2019 ANNUAL MONITORING REPORT

TAHOE REGIONAL PLANNING AGENCY

|| *Lake Tahoe*



TRPA Annual Monitoring Report - 2019

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Overview: This report summarizes monitoring conducted by the Tahoe Regional Planning Agency (TRPA) in 2019. The Bi-State Compact directs TRPA to establish environmental goals for the Tahoe Region (threshold standards) and TRPA and its partners monitor progress towards those goals. TRPA and its partners produce the threshold evaluation report every four years to provide a snapshot of the overall environmental health in the Region. Like project work in Tahoe, monitoring is a collaborative endeavor supported by many partners in the Region. In addition to the work summarized here, TRPA funds monitoring work completed by partners (e.g. lake clarity) and helps partners coordinate monitoring work in the Tahoe Region. The findings of those monitoring programs are summarized elsewhere. This report focuses on the monitoring work done by the two TRPA staff dedicated to monitoring in 2019. All monitoring programs described in this report use widely accepted monitoring protocols and have Region-wide perspective. Additional detail on monitoring programs including details on methodologies and findings from previous years is available at <https://monitoring.laketahoeinfo.org>

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STREAM MONITORING (BIOASSESSMENT)

Overview: TRPA began monitoring stream habitat and stream biotic integrity in 2009. Healthy streams are critical to a healthy watershed. To measure the health of the Basin’s streams, TRPA uses bioassessment, a method that collects benthic macroinvertebrates (BMI) and stream habitat data to obtain a stream health rating. BMI are insects such as mayflies and stoneflies that spend most of their lives in streams. They are highly sensitive to water quality pollution like stormwater runoff and watershed degradation such as erosion and are therefore a good indicator of stream health. TRPA monitors 20 randomly selected “status” sites every year to obtain an overall picture of the Basin’s streams and monitors 20 repeat sites every four years to obtain long-term trend data on the health of Tahoe’s streams. All stream data is available at <https://monitoring.laketahoeinfo.org>



Figure 1: TRPA staff collecting macroinvertebrates in General Creek.

Results: This report focuses on stream results from 2018, because lab processing of samples takes a year. In 2018, 41 total stream sites were sampled. In the

summer of 2018, the Basin’s streams had an average streamflow year after the record-breaking runoff year of 2017. 2018 represented the third year in a row with average or above average runoff after a prolonged drought. Therefore, streams are flowing with higher volumes and not drying up as they did during the drought.

2018 Stream Monitoring Results (41 sites)



Figure 2: Most streams sampled in 2018 were healthy.

Key Findings for 2018:

- A large number of sites were sampled in un-impacted watersheds. These sites show extremely high overall biotic integrity and are in “reference” condition.

- Several sites were re-sampled on streams where restoration projects have been completed. The biotic integrity for these sites improved substantially following restoration. At Rosewood Creek, CSCI scores went from 0.75 (degraded) pre-project to 0.90 (good) following the project. Absent a restoration project, stream condition generally remained the same at re-sampled sites.
- Several sites showed improvements in condition relative to condition during the drought conditions in 2014 / 2015. Overall, 14 sites were re-sampled in 2018 that were also sampled in 2014 / 2015. The overall CSCI score for these sites was 0.90 in 2014 / 2015 while it was 0.99 in 2018. Four sites moved into healthier rating categories while no sites moved into more degraded rating categories.

Index of Physical Habitat Integrity (I-PI): In addition to macroinvertebrates, the TRPA bioassessment program collects physical stream habitat data. In 2018, the California Department of Fish and Wildlife developed a new method (I-PI) to summarize and score stream physical habitat. The I-PI is calculated using riparian cover, diversity of flow habitats (riffles, pools, etc.), diversity of substrate types (cobble, boulders, etc.), percent sands/fines, and in-stream habitat complexity (woody debris, etc.). All sites sampled by TRPA have now been scored using the I-PI, which will allow TRPA to track changes in the stream's physical habitat.



Figure 4: (Left) Rosewood Creek prior to restoration. (Right) Rosewood Creek following restoration. The BMI community showed large improvements following restoration.



Figure 3: (Left) Blackwood Creek drying out with algae blooms in the 2014 drought year. (Right) The same section of Blackwood Creek flowing healthy and clear in 2018. The BMI community greatly improved from drought to non-drought conditions.

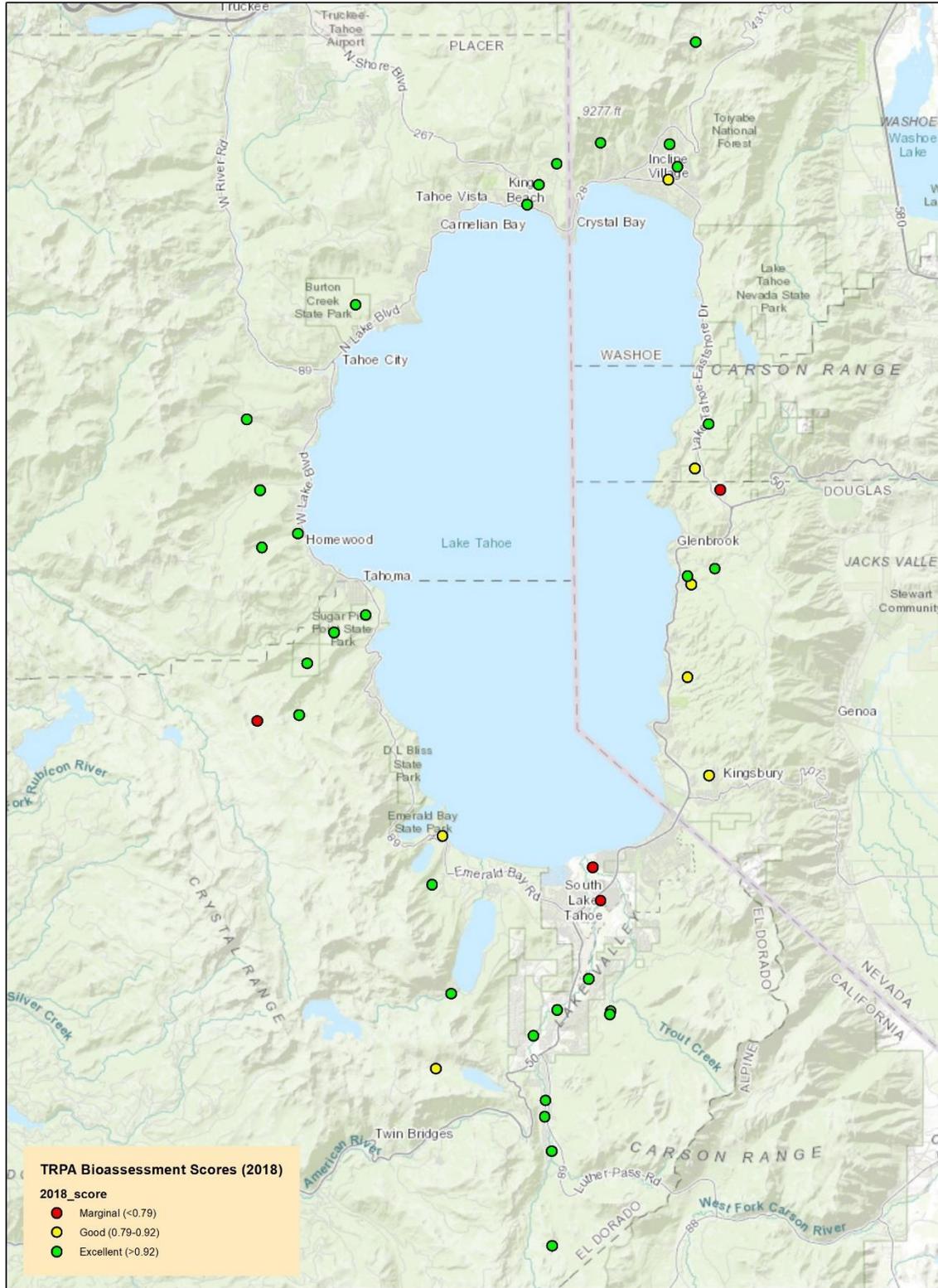


Figure 5: 2018 bioassessment sampling locations and scores.

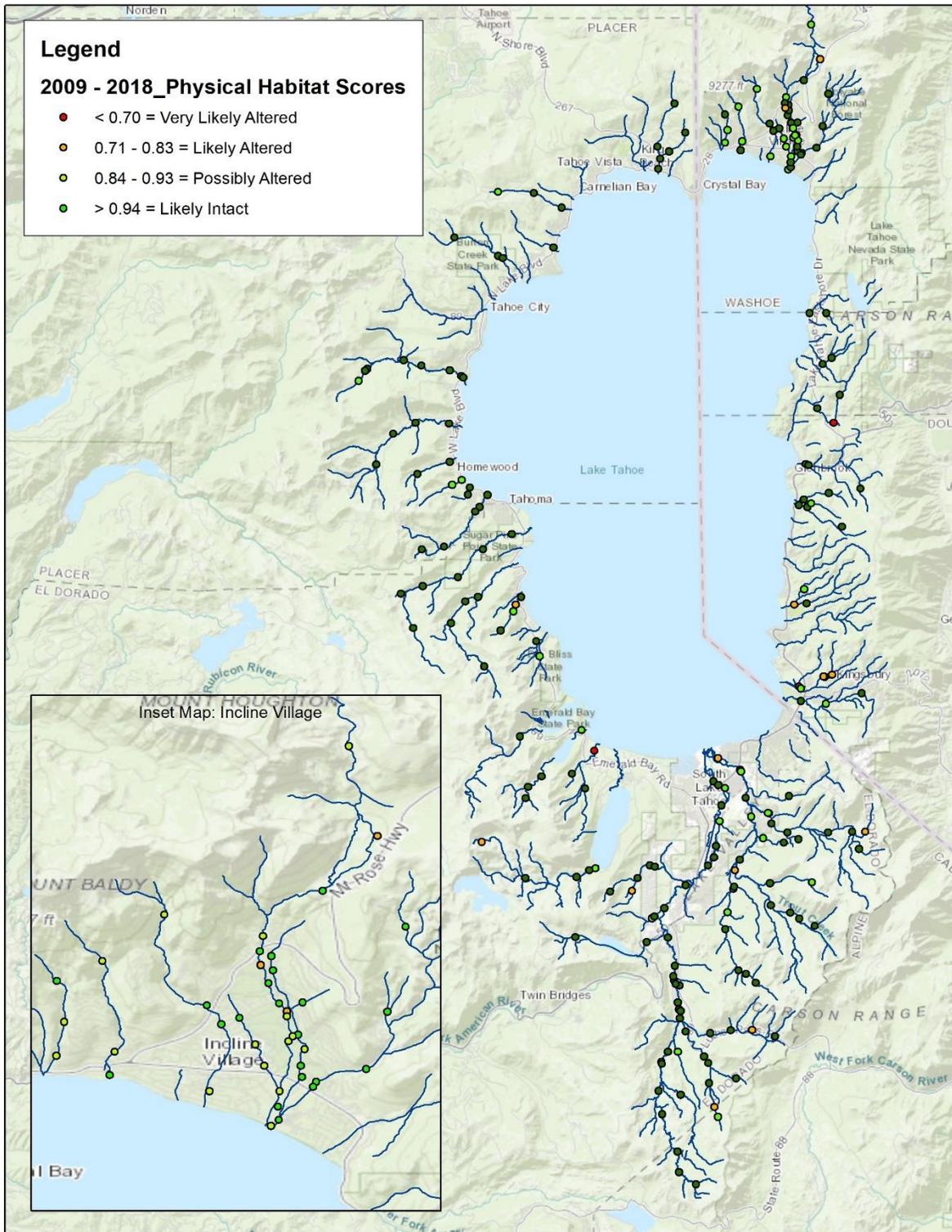


Figure 6: Index of Physical Habitat Integrity Scores for the Lake Tahoe Basin from 2009-2018. A new model created by the California Department of Fish and Wildlife allowed TRPA to calculate these scores based on existing data collected as part of TRPA's bioassessment program for the first time in 2019, greatly improving TRPA's understanding of stream conditions.

MEADOW AND WETLAND MONITORING

Overview: In 2019, TRPA field staff concentrated on completing data collection on meadows and wetlands as part of the Stream Environment Zone (SEZ) Baseline Condition Assessment. This project was a collaborative effort with partners in the Basin to document the current conditions of SEZ on a Basin-wide scale. This project will help develop a new SEZ threshold and will set a baseline from which to measure the Basin's progress in protecting and restoring SEZ. To complete this assessment, TRPA and partners developed ten indicators of SEZ condition to determine overall SEZ health. Indicators were first populated with previously collected data from partners and TRPA. Targeted field collection in 2019 helped fill the remaining gaps. Complete condition assessments are now available for over 90% of meadows, marshes, and fens. Data collection on streams and their riparian areas will be completed in 2020. A draft version of the assessment can be found [here](#) and the web map with all the data can be found [here](#).



Figure 7: Hell Hole meadows.

Preliminary Results: It is important to note only a draft version of this assessment has been completed, so all results are preliminary. 10,239 acres of existing SEZ were assessed as part of this project (5,592 acres of meadows, marshes, and fens; 4,647 acres of streams and associated riparian areas). The assessment confirmed prior findings, that a significant portion of meadows, marshes, and fens in the Basin have been lost to development. Prior to development in the Tahoe Basin, there were 6,608 acres of meadows,



Figure 8: A healthy meadow in the upper Cold Creek drainage.

marshes, and fens. Before broad protections for SEZ in the Basin, 1,016 acres (15% of the total) of meadows, marshes, and fens were lost to development. Of the 5,592 acres of remaining meadows, marshes, and fens, two-thirds are in relatively good condition, while the assessment identified 1,626 acres (29%) that are likely degraded and offer potential restoration opportunities. Combined, 2,642 acres of meadows, marshes, and fens have been lost to development or are in degraded condition (40% of the original 6,608 acres of meadows, marshes, and fens).

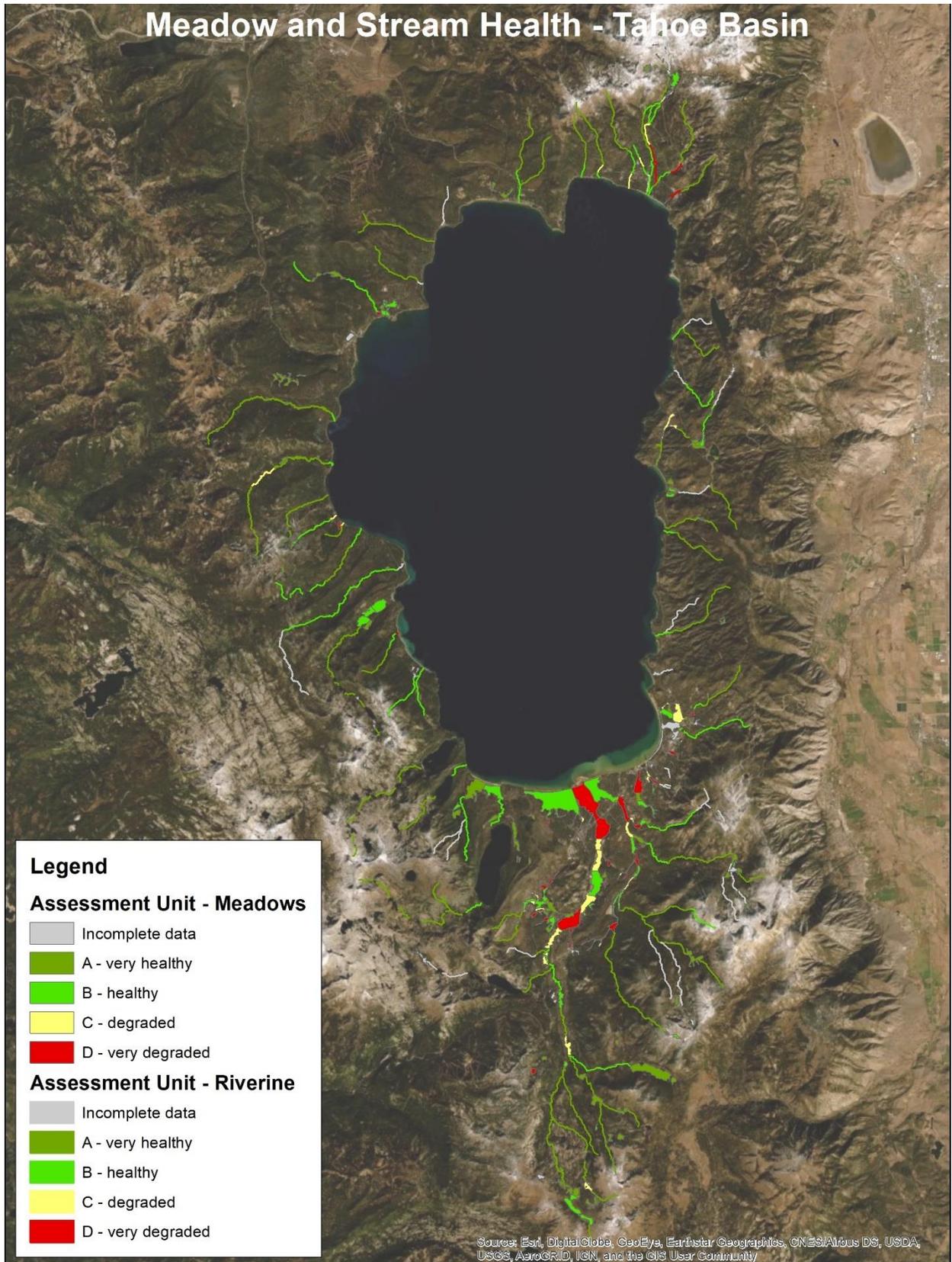


Figure 9: Preliminary SEZ condition ratings for the SEZ Baseline Condition Assessment



Figure 12: Most past SEZ restoration sites are functioning well in the long-term (left: Cookhouse meadow; right: Angora meadow)



Figure 11: Channel incision and bank erosion continue to impact some meadows and streams in the Tahoe Basin (left: Upper Truckee River; right: Benwood meadows area).



Figure 10: TRPA staff and interns collecting samples and taking streams measurements in Summer 2019.

NOISE MONITORING

Overview: TRPA has been monitoring noise levels in the Tahoe Region since 1982. Noise is monitored separately in Plan Areas, transportation corridors (highways), and shorezone areas. Noise monitors are deployed for one to three weeks during peak noise periods to determine whether each area is exceeding the adopted TRPA noise standards. All noise data can be found at <https://monitoring.laketahoeinfo.org>

Plan Areas: There are hundreds of Plan Areas in the Tahoe Region, each with their own allowable noise levels. TRPA monitors 140 Plan Areas over a four-year reporting period, generally monitoring in 35 areas each year. Allowable noise levels vary from 45 decibels (dB) in low-density residential areas to 65 dB in industrial areas. The Community Noise Equivalent Level (CNEL) decibel level is used to assess noise levels. The CNEL uses a 24-hour measurement and adds penalties for noise at night and the early morning when people and wildlife are most sensitive to noise levels. 34 Plan Areas were monitored in 2019. Of these Plan Areas, 59 percent met TRPA standards for noise while 41 percent exceeded the noise standards. This is mostly consistent with results from past years.

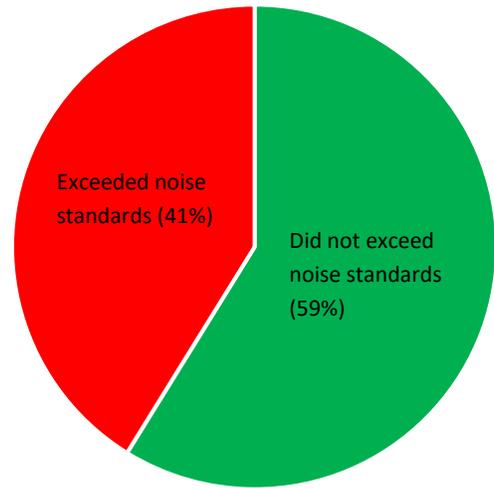


Figure 13: Percent of Plan Area Statements in compliance with adopted noise standards (based on 34 Plan Areas monitored in 2019).

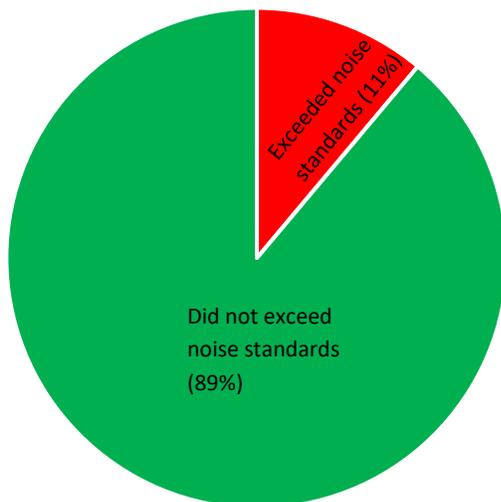


Figure 14: Percent of transportation corridor monitoring sites in compliance with adopted noise standards (9 locations were monitored in 2019).

Transportation Corridors: Each highway in the Tahoe Region has its own allowable noise level for the area within 300 feet of the highway. TRPA monitors 30 transportation corridor sites over a four-year reporting period, with seven to nine monitored each year. Like Plan Areas, the CNEL decibel level is used to assess noise levels and determine if highway corridors are meeting TRPA noise standards. In 2019, nine transportation corridor sites were monitored along the Highway 50 corridor. Of these, 11 percent exceeded noise standards, while 89 percent met the standards for noise. Highway 50 noise monitoring sites met noise standards more often than other highways in the Region monitored in past years.

Shorezone: TRPA has monitored noise from motorized watercraft in the shorezone of Lake Tahoe since 2009. Normally 10 locations are monitored for two weeks during peak boating season (July Fourth through Labor Day). Every noise event that exceeds the 75 dB shoreline standard is automatically recorded. All recordings are then analyzed to determine whether they came from motorized watercraft. In 2019, efforts were intensified because it was the first summer after the implementation of the Lake Tahoe Shoreline Plan. Nine locations were monitored for 6 weeks, and 2 of the monitors were equipped with cameras that



Figure 15: A “go-fast” boat on Lake Tahoe.

took a photo when a boat exceeded 75 dB. Overall noise exceedance rates from boats were low and were comparable to data from past years except for a spike in 2017. Rubicon Point continued to be the location of the highest number of exceedances, with Emerald Point and Round Hill Pines also logging several noise exceedances. Most sites had few or no noise exceedances. Preliminary work to photograph noise exceedances revealed that most (72%) of the noise exceedances were caused by “go-fast” boats, mostly outside the 600-foot no-wake zone. Some noise exceedances were caused by all types of boats within the no-wake zone.

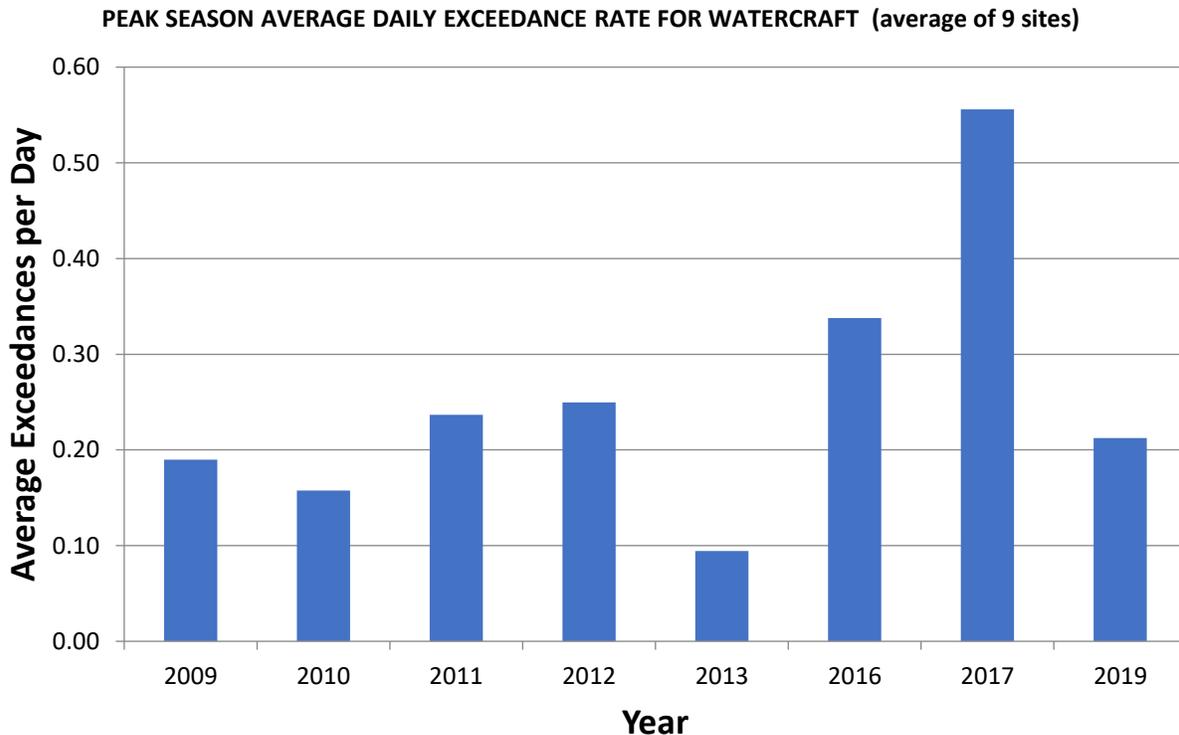


Figure 16: Shoreline noise exceedances on Lake Tahoe from 2009 - 2019

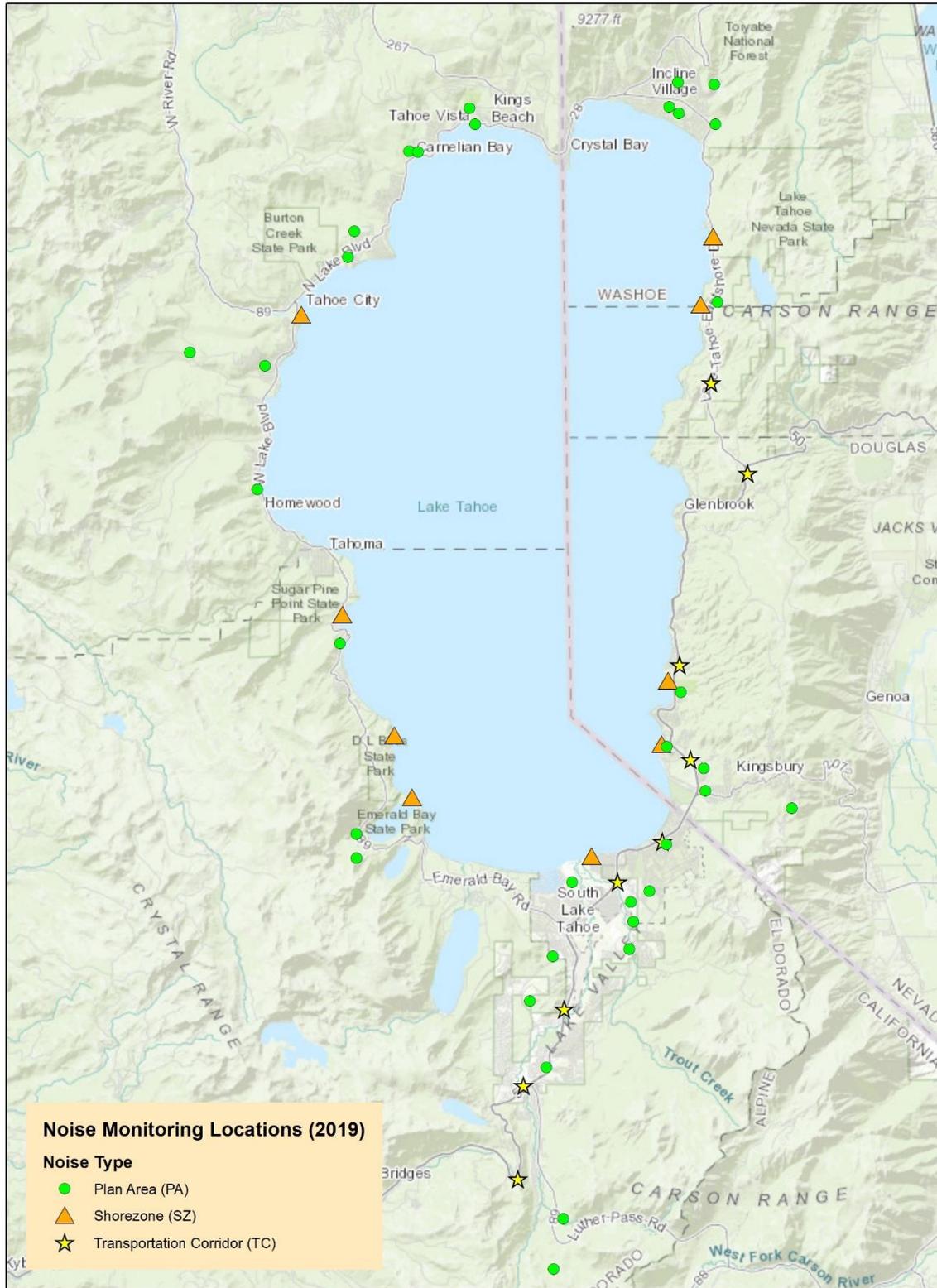


Figure 17: TRPA noise monitoring locations – 2019

SnowGlobe: TRPA worked with the City of South Lake Tahoe and event organizers to monitor noise from the SnowGlobe music festival in South Lake Tahoe which took place Dec. 29-31, 2019 at Lake Tahoe Community College. Monitoring was initiated in response to citizen concerns over noise impacts on neighborhoods from the festival. Four noise monitors were placed in neighborhoods closest (Black Bart, Sierra Tract, Pioneer Village, and Glenwood) to the festival. Noise was calculated using the Community Noise Equivalent Level (CNEL) which is a 24-hour average of noise levels with extra penalties added for nighttime and early morning noise.

Results: Noise monitoring from the four neighborhoods indicates compliance in certain neighborhoods on certain nights, but some noise readings are slightly over the target levels, but generally consistent with levels observed during other periods. It is important to note that historical data from these neighborhoods suggests that the current regional targets are sometimes exceeded during normal, non-event conditions as well. The table below compares historical noise data in these neighborhoods with that collected during 2019 SnowGlobe.

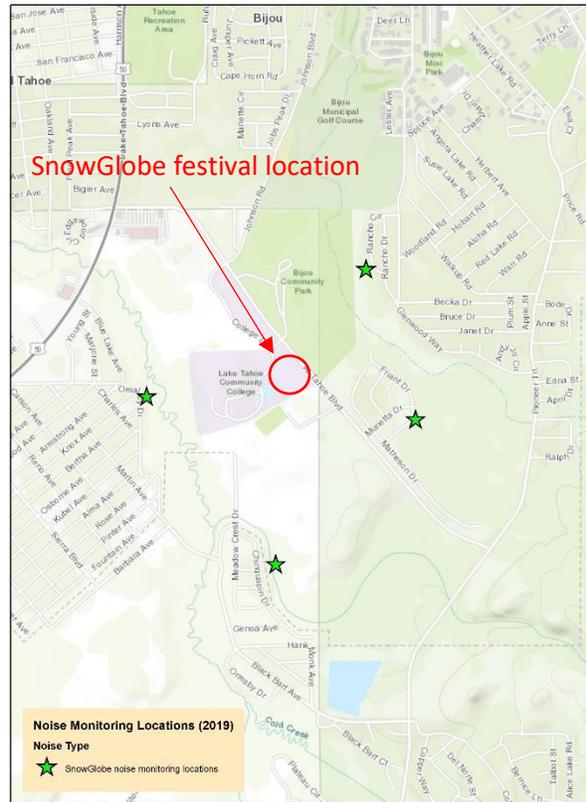


Figure 18: 2019 SnowGlobe noise monitoring locations

	TRPA Noise Limit	<i>SnowGlobe 2019 measurements</i>			<i>Non-Event measurements</i>									
		12/29	12/30	12/31	1991	1996	2001	2011	2013	2014	2015	2016	2018	2019
Black Bart	50	50.1	51.5	51.3	53	54.5	51.7	57.9	51.4	53.8	47.5			54.2
Glenwood	50	50.8	50	52.4										45.6
Pioneer Village	50	53.4	53.3	50.2									51.5	
Sierra Tract	55	53.2	54.3	56.3	55	50.3	51.6					57.4		

Figure 19: Noise monitoring results for neighborhoods closest to SnowGlobe during the event and during non-event times. Numbers highlighted in red are levels exceeding the adopted TRPA noise standards for each Plan Area.

AIR QUALITY MONITORING



Figure 20: Mid-lake NASA buoy where TRPA ozone monitor was installed.

Results: In 2019, air quality in the Tahoe Region continued to show improvements in long-term trends. Carbon monoxide, ozone, and particulate matter all show continued decreasing or stable trends since monitoring began in the 1970's and 1980's. Smoke from wildfires was not very impactful in 2019 as only one day exceeded national standards for particulate matter. Ozone monitoring was also conducted on Lake Tahoe itself as required by the Shoreline Plan. Data from the mid-lake ozone monitor revealed ozone levels were very similar to levels in Tahoe City. Neither monitoring station recorded any levels above TRPA standards.

Overview: TRPA monitors air quality around the Lake Tahoe Region using several monitoring stations operated both by TRPA and partner agencies. Particulate matter (PM), ozone (O₃), visibility, oxides of nitrogen (NO₂), and carbon monoxide (CO) are the main constituents monitored. In 2018, TRPA was able to put all Tahoe Region air quality data online at <https://monitoring.laketahoeinfo.org> with daily data for all pollutants measured.

Number of days exceeding national air quality standards for Particulate Matter 2.5 (Tahoe City station)

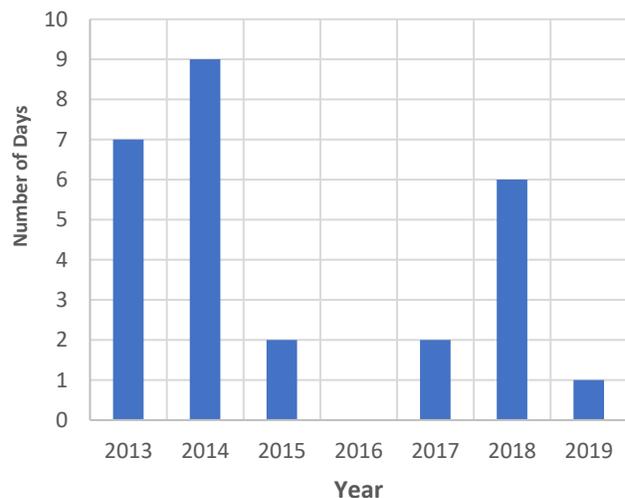


Figure 21: Due to low amounts of wildfire smoke, 2019 had only one day that exceeded national standards for Particulate Matter.

Daily maximum 1-hr ozone at Tahoe City and mid-lake buoy

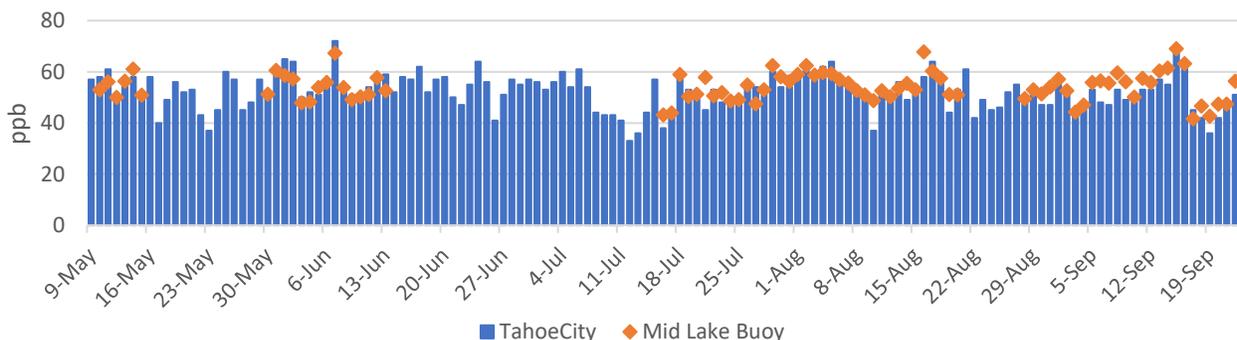


Figure 22: Results from Tahoe City and mid-lake ozone monitors showed overall similar levels that did not exceed TRPA standards.

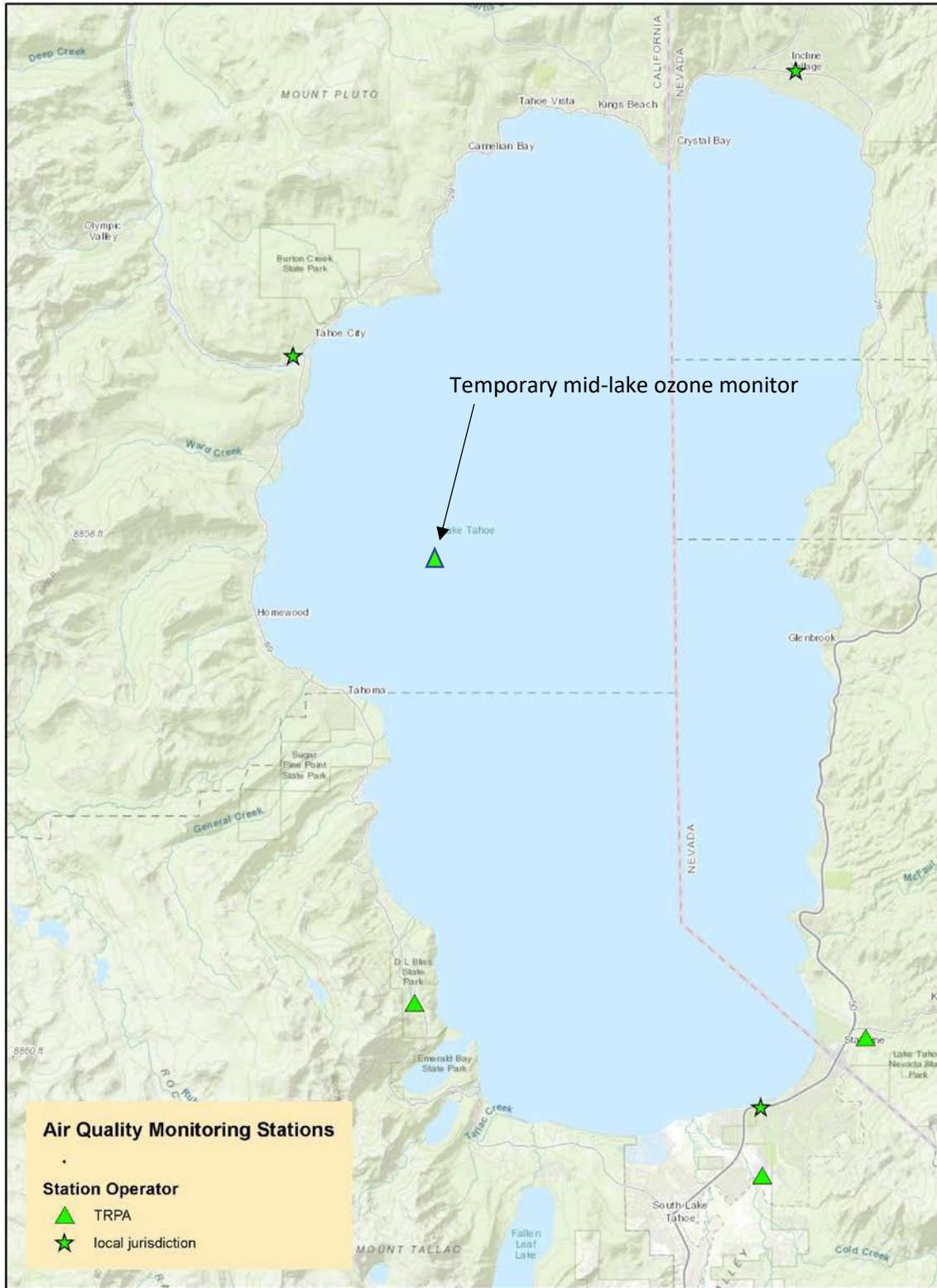


Figure 23: Tahoe Region air quality monitoring stations - 2019

WILDLIFE MONITORING

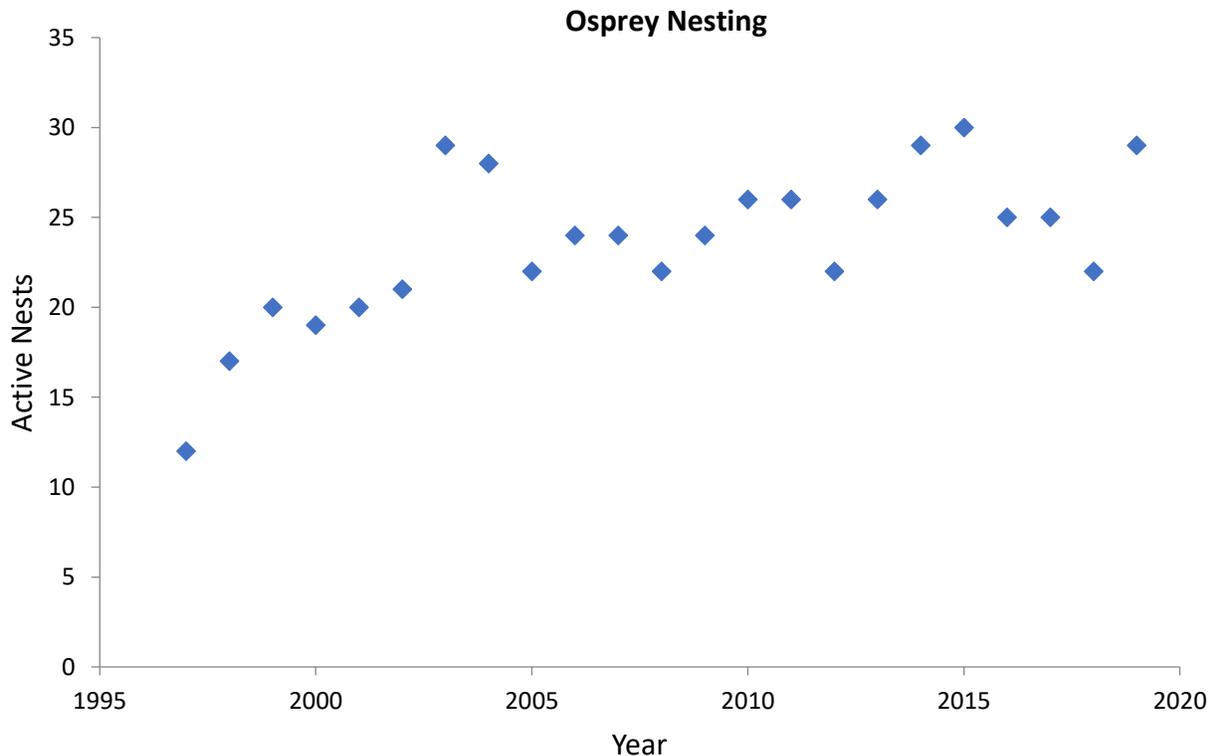
Overview: TRPA monitors special interest wildlife species with partners including California State Parks (CDPR), Nevada Department of Wildlife (NDOW), U.S. Forest Service (USFS), California Tahoe Conservancy (CTC), and Tahoe Institute for Natural Sciences (TINS).

Osprey: TRPA took over coordinating Osprey surveys in 2015 from the U.S. Forest Service, and is joined by NDOW and CDPR in the monitoring. Three surveys are completed annually by boat along the entire shoreline of Lake Tahoe and by foot at a number of other



Figure 24: Adult osprey returning to the nest to feed chicks at Emerald Bay.
Photo: Beth Vollmer, TRPA

large lakes in the Region. The number of active Osprey nests has grown considerably since monitoring began in 1997. In 2019, there were a total of 40 nests. 29 of these were active nests which is an increase of 7 active nests from 2018. 11 of the 29 nests successfully produced fledglings. Emerald Bay (10 nests),



D.L. Bliss (3 nests), and the undeveloped portion of Lake Tahoe’s East Shore (5 nests) continued to be the main reproductive areas for Osprey in 2019. Four active nests were also observed at Fallen Leaf Lake and three of these nests were successful.

Peregrine Falcon: TRPA, in collaboration with TINS, CTC, and NDOW, took over Peregrine Falcon surveys in 2015 from the USFS. Peregrine Falcons were monitored by the USFS from 2009-2014. Falcon nesting has increased dramatically since 2008 when no nests were observed. In 2018 a record five active nests were observed. In 2019, the same five nests were active with four of them successfully producing fledglings. In 2019, TRPA, NDOW, USFS, TINS, and other volunteers continued monitoring potential climbing impacts on nesting Peregrines at Castle Rock. Early in the breeding season, aggressive behavior from the Falcons toward hikers who climbed to the top of Castle Rock was noted, while the Falcons did not respond to climbers. Therefore, signs were posted around Castle Rock asking hikers to stay off the top of the rock while the Falcons are nesting. For the most part, the signs were observed, and the Falcons were able to nest without much human interference. In 2019, the Falcons successfully nested for the first time in over three years.

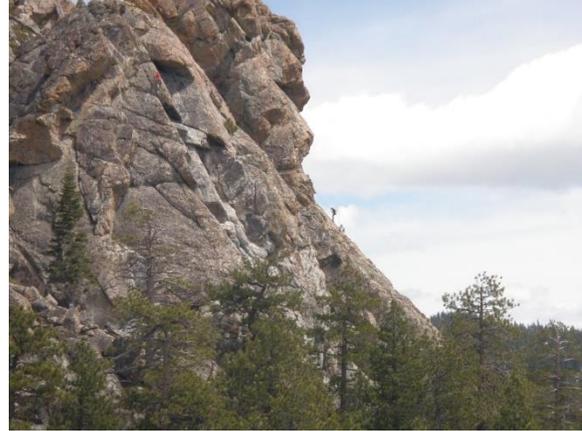
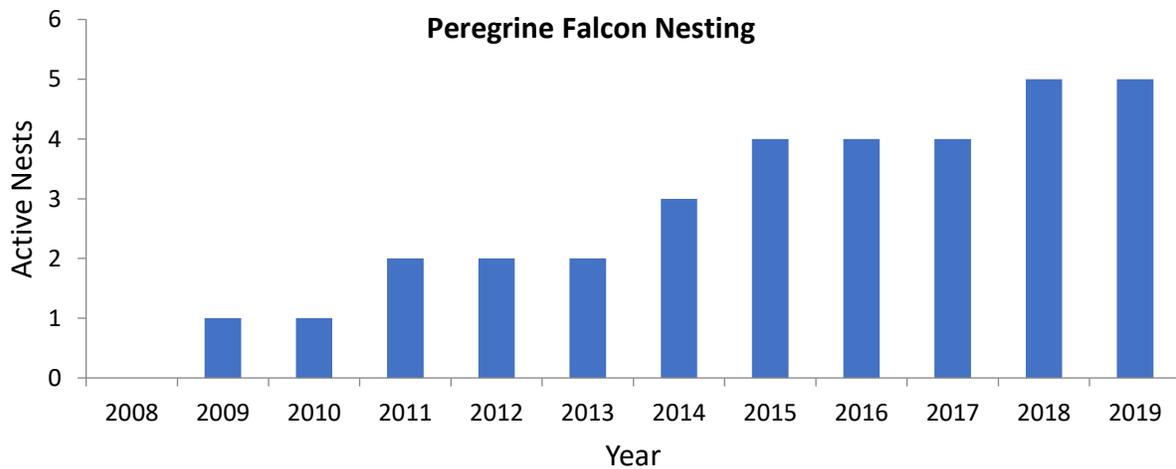


Figure 25: Volunteer climbers heading up Castle Rock as the Falcons are observed by TRPA staff to determine if they show aggressive behavior toward the climbers.



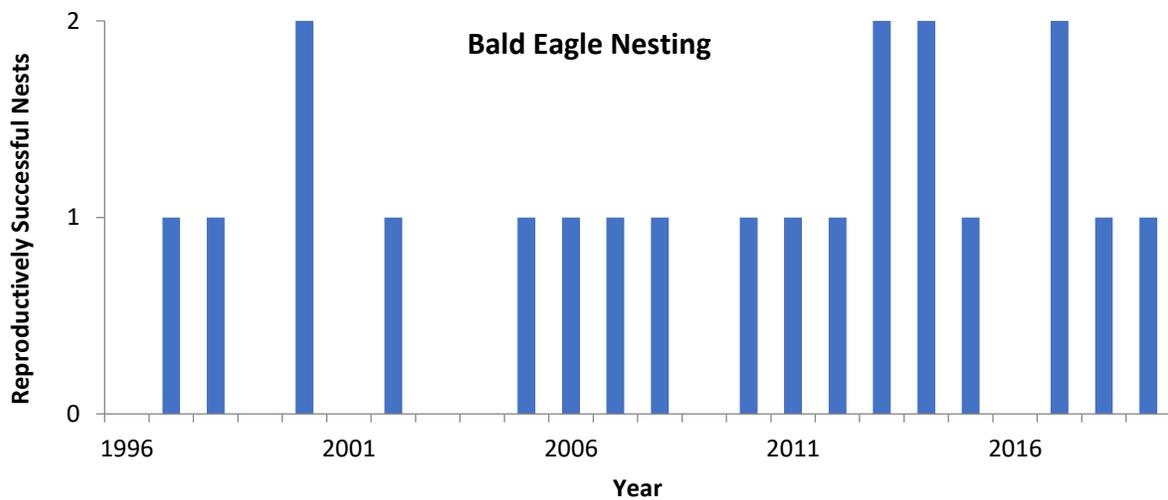
Figure 26: An adult Peregrine Falcon near Castle Rock. Photo: Mark Enders, NDOW.



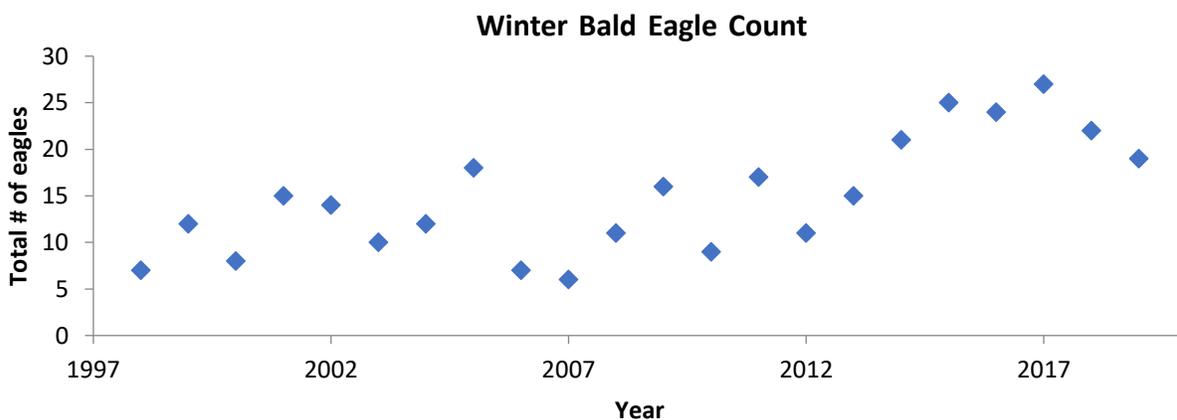
Nesting Bald Eagle: In 2019, a new Bald Eagle nest was found on the East Shore. While this nest was not active in 2019, it was nearly complete and may signal that Bald Eagles are attempting to nest on the East Shore of Lake Tahoe. This would be the first time that has occurred outside of Marlette Lake. The other three nests in the Tahoe Region are at Emerald Point, Sugar Pine Point, and Marlette Lake. The nests at Eagle Point and Marlette Lake were inactive this year. The nest at Sugar Pine Point was active in 2019, and for the first time in at least five years, was successful and produced a fledgling.



Figure 27: A new Bald Eagle nest on Lake Tahoe's East Shore.



Wintering Bald Eagle: TRPA participates in the annual mid-winter Bald Eagle Count at Lake Tahoe led by TINS. The count has taken place since 1998. Bald Eagles from colder northern areas winter in Lake Tahoe and take advantage of prime habitat and available food. The number of wintering bald eagles has generally been increasing at Lake Tahoe. In 2019, a total of 19 individuals were counted, the lowest count since 2015, and a drop from the record high count of 27 individuals recorded in 2017.



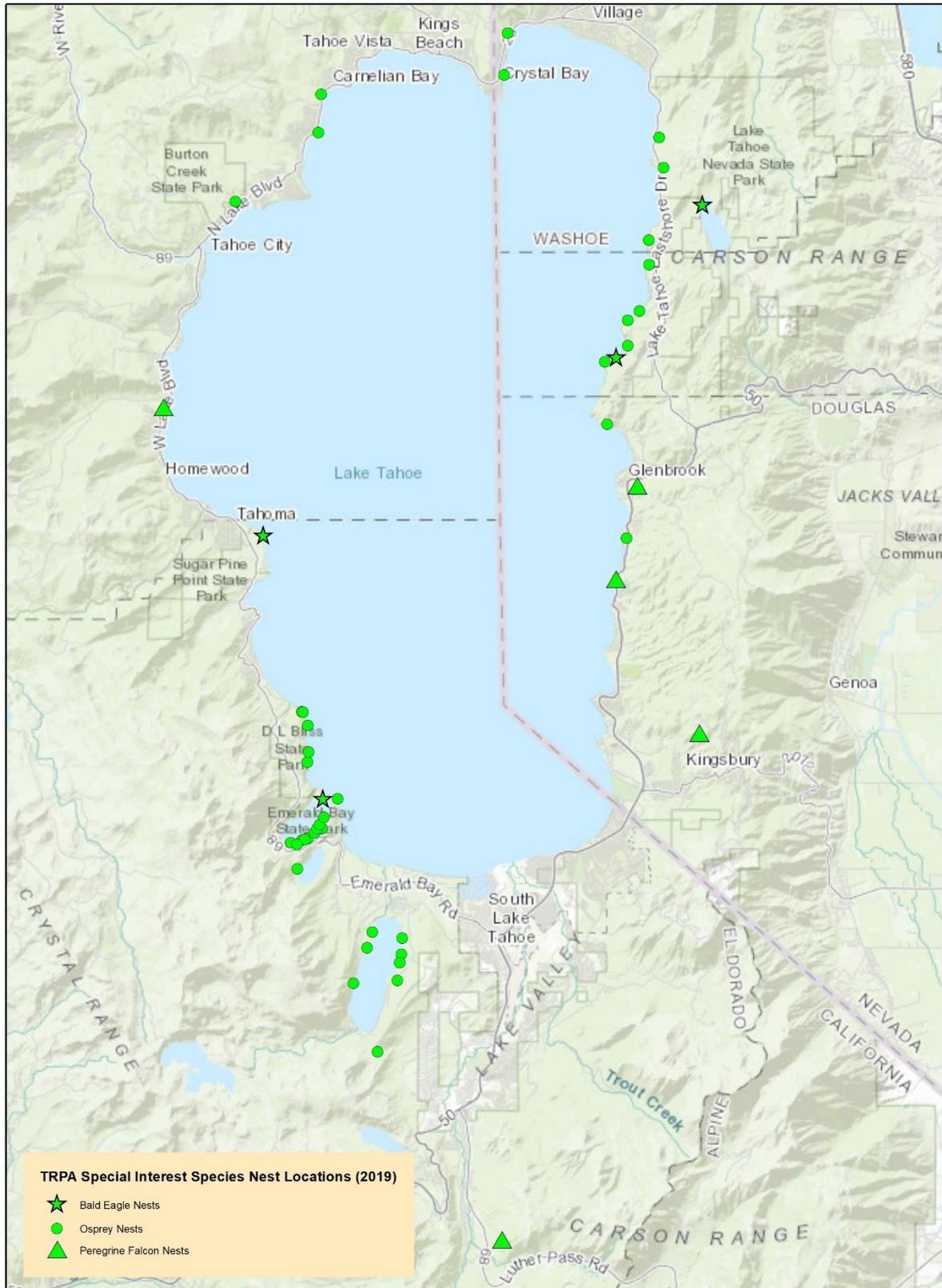


Figure 28: TRPA Special Interest Species general nest locations - 2019

BICYCLE AND PEDESTRIAN MONITORING

Overview: In 2015, as part of the update to the Active Transportation Plan, TRPA developed the Lake Tahoe Region Bicycle and Pedestrian Monitoring Protocol. Implementation began in 2015 with seasonal videos recorded and limited automated counting. In 2016, TRPA purchased automated bicycle and pedestrian counters that collect year-round data, differentiate between the two different users, and collect directional information. Through partnerships with local jurisdictions, counters were installed on paths throughout the Region. Three new counters became active in 2019: two on the newly built East Shore Trail and one on the newly built Dollar Creek Trail. The addition of three counters brought the total in 2019 to 30 active monitoring locations. TRPA and local partners monitor bicycle and pedestrian activity to understand high use areas and trends, measure mode-split, and support infrastructure grant management and reporting. Count information also informs policies and programs targeted to improve and support active transportation. All data can be found at <https://monitoring.laketahoeinfo.org>



Figure 29: A new bicycle and pedestrian counter on the East Shore Trail near Hidden Beach.

Bicycle and Pedestrian Counts (2018 and 2019)

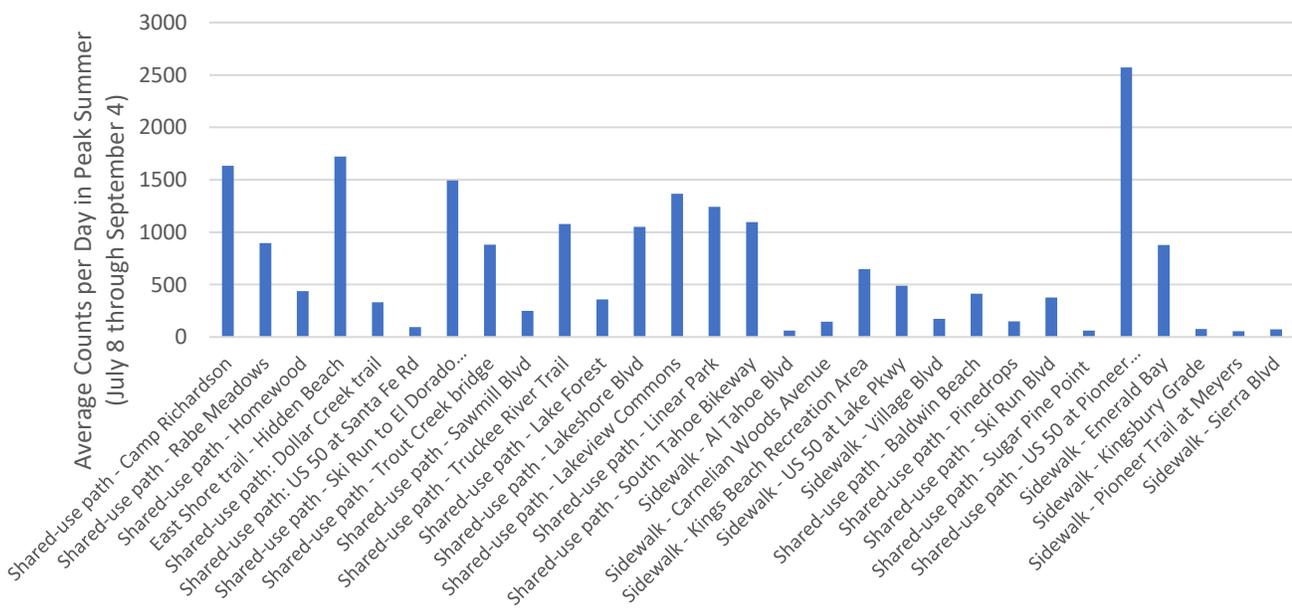




Figure 31: The Ski to El Dorado Beach bike trail.



Figure 30: The newly completed East Shore trail.

Results: Over 2 million bicycle and pedestrian trips were counted in 2019. 2019 marked the first year where preliminary trend data became available as TRPA counters have now been in place for three years in most locations. Overall, there was a 15% increase in 2019 summertime counts (defined as July 8th – September 4th) in the 15 counters that had multiple years of comparable data. Total counts at these 15 sites during this time frame went from 553,872 in 2017 to 636,088 in 2019, an increase of 82,216. The largest increases were in South Lake Tahoe at two counters on the newly completed Ski to El Dorado Beach trail. At these two counters, summertime total counts before the project in 2017 were 85,949, while summertime total counts after the project in 2019 were 153,818. This is an increase of 67,869 counts (an increase of 79%). 2019 also marked the completion of the East Shore trail between Incline Village and Sand Harbor. This trail was completed in early summer and it quickly became the second most highly trafficked summertime trail in the Region. Perhaps the most remarkable finding from this trail is that fall counts barely dropped off from summer counts. Most paths in the Region see a large decrease after Labor Day. The East Shore trail counts remained high through the fall with average daily counts of 1150 in September, 959 in October, and 876 in November. In July 2019 there were 2000 counts per day.

Bicycle and Pedestrian Counts at Camp Richardson

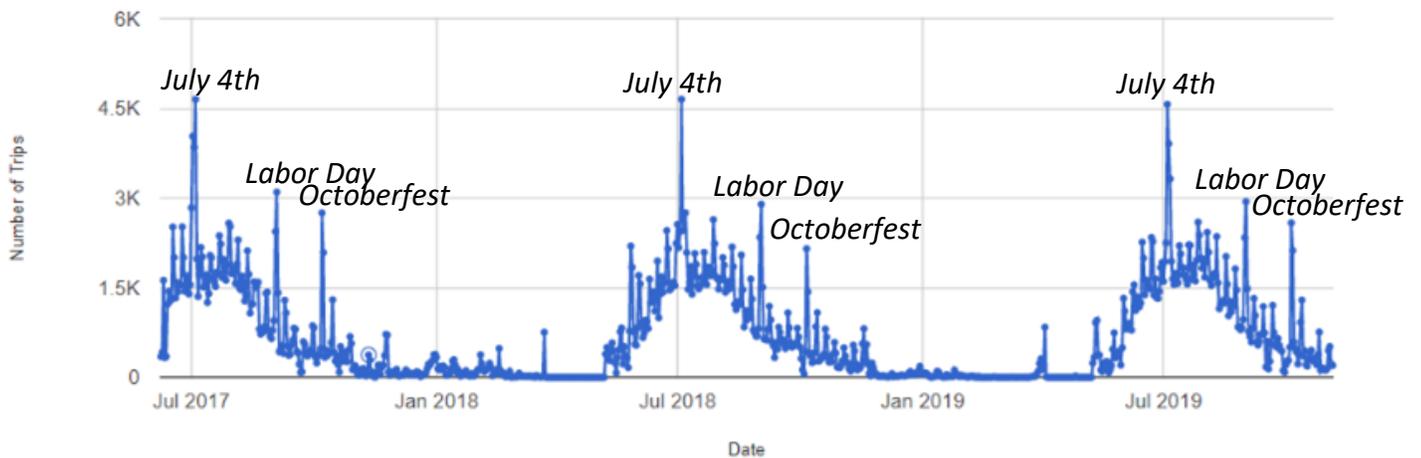


Figure 32: Three years of counts near Camp Richardson reveal remarkably consistent seasonal trends in bicycle and pedestrian usage at this site.

Site / Year	2017 or 2018 (July 8 – Sept 4) counts	2019 (July 8 – Sept 4) counts	Percent Change
Shared-use path - Camp Richardson	91504	96383	2018 to 2019 = +5.3%
Shared-use path - Rabe Meadows	49641	52846	2018 to 2019 = +6.4%
Shared-use path: US 50 at Santa Fe Rd	5718	5647	2017 to 2019 = -1.3%
Shared-use path - Ski Run to El Dorado Beach	84342	88134	2018 to 2019 = +4.4%
Shared-use path - Trout Creek bridge	45865	51973	2018 to 2019 = +13.3%
Shared-use path - Sawmill Blvd	11412	14720	2017 to 2019 = +28.9%
Shared-use path - Lake Forest	32838	21094	2017 to 2019 = -35.8%
Shared-use path - Lakeshore Blvd	60429	61950	2017 to 2019 = +2.5%
Shared-use path - Lakeview Commons	32627	80554	2017 to 2019 = +146.8%
Shared-use path - Linear Park	53322	73264	2017 to 2019 = +37.3%
Sidewalk - Al Tahoe Blvd	3206	3701	2017 to 2019 = +15.4%
Sidewalk - Carnelian Woods Avenue	9858	8565	2017 to 2019 = -13.2%
Sidewalk - Kings Beach Recreation Area	34507	38198	2017 to 2019 = +10.6%
Sidewalk - US 50 at Lake Pkwy	26563	28857	2017 to 2019 = +8.6%
Sidewalk - Village Blvd	12040	10202	2017 to 2019 = -15.3%
OVERALL	553872	636088	+14.8%

Figure 33: Bike and pedestrian counts from 2017, 2018, and 2019 showing mostly increases in use over time.

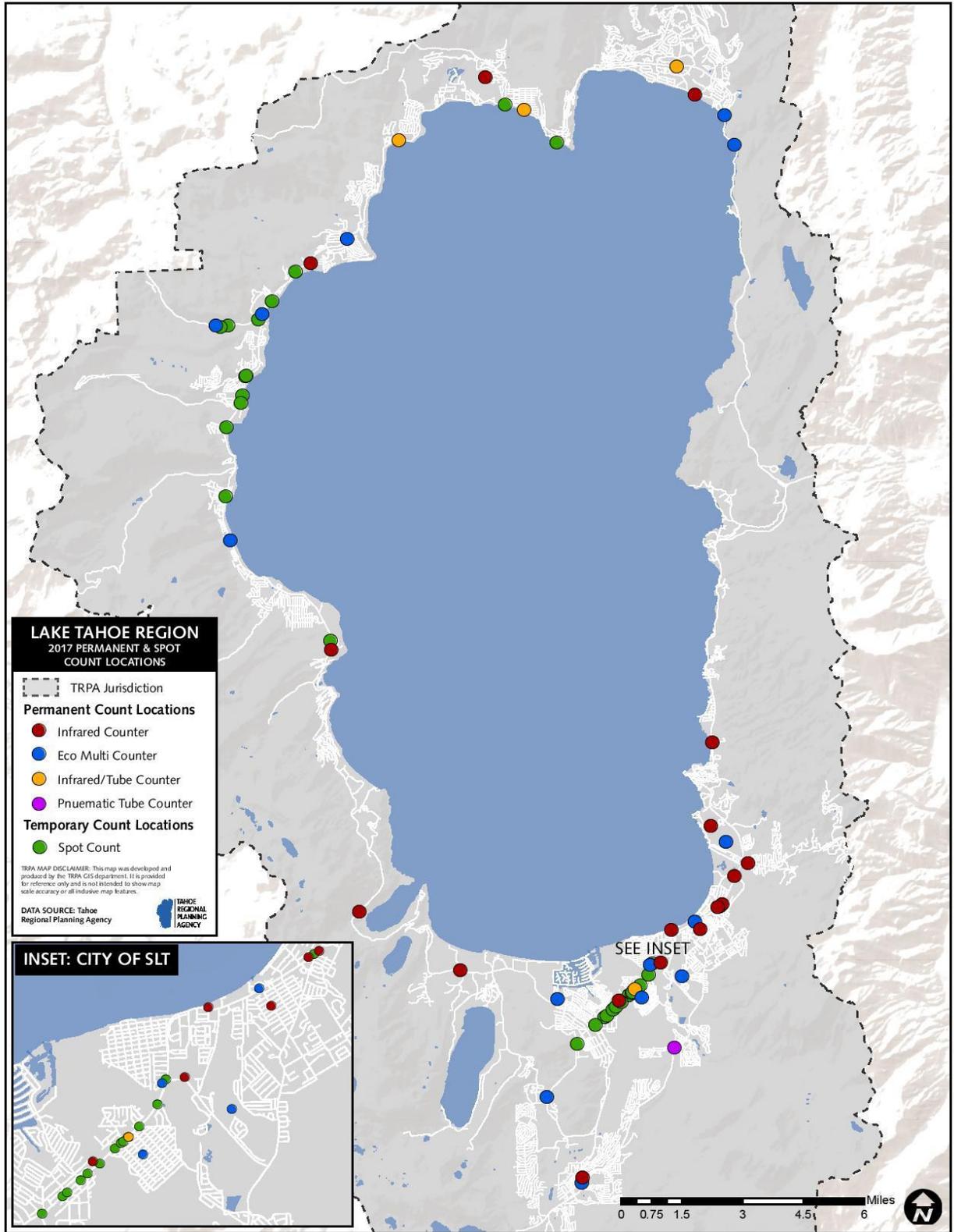


Figure 34: Bicycle and Pedestrian Count Locations - 2019

TAHOE YELLOW CRESS MONITORING



Figure 35: Tahoe Yellow Cress grows next to beach chairs during the 2019 survey. Impacts from beach use are among the largest threats to TYC.

Overview: Tahoe yellow cress (TYC) is a small native plant that grows on the shoreline of Lake Tahoe and nowhere else in the world. It lives only on the sandy beaches and dunes at the ever-changing margin of the lake. As recently as 1996, this unique member of the mustard family teetered on the brink of extinction when it disappeared from beaches in Nevada and was found growing at less than 10 sites on the California side of the lake. The concerted and collaborative approach to protection and restoration by the partners in the Region is altering the trajectory for this sensitive plant. While TYC’s population is still at risk, it is stable, and was removed from the Endangered Species candidate list in 2015. TRPA participates in annual Tahoe yellow cress surveys with agency partners led by the U.S. Forest Service in 2019. In 2019, two TRPA staff participated in the field surveys and the TRPA watercraft team helped surveyors get to locations only accessible by boat. All data can be found at <https://monitoring.laketahoeinfo.org>

Results: In 2019, Lake Tahoe remained near its legal limit for the third summer in a row. This greatly reduced TYC habitat and surveys were initiated to ensure the plant is surviving despite the high lake levels. The 2019 survey results show a slight decrease in the number of occupied sites over 2018. Overall, total populations appear to be stable but are low because of the high lake levels. Due to continued high lake levels, extra conservation efforts are being undertaken to protect the remaining populations such as increased protective beach fencing and efforts to increase supplemental plantings.

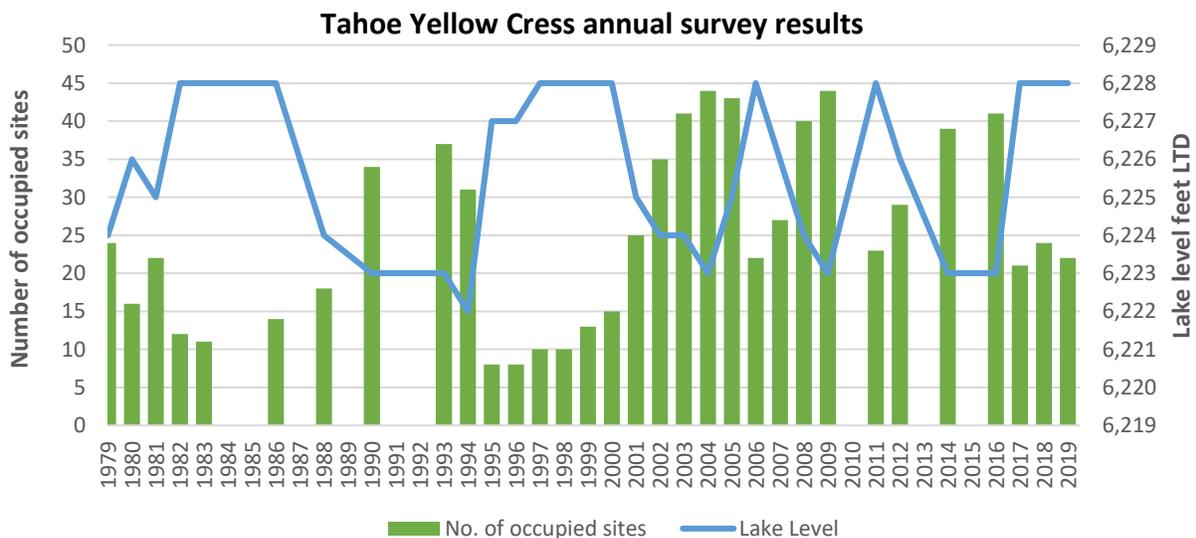


Figure 36: Tahoe Yellow Cress counts during the annual survey in September.