

# CHAPTER 8

## Wildlife

The Lake Tahoe Basin provides environmental conditions and habitats favorable to a diverse array of species. At least 289 species of terrestrial and semi-terrestrial vertebrates are found in the Lake Tahoe Basin as residents or regular visitors, including 217 birds, 59 mammals, five amphibians, and eight reptiles (Murphy and Knopp 2000). An additional 57 terrestrial species have been recorded in the basin as accidental visitors or as species that no longer occur in the basin (Murphy and Knopp 2000).

The concept of “habitat” is a species-specific construct that relates to the extent to which an area provides a suitable environment (e.g. food, cover, water, etc.) for the species to survive and reproduce. Understanding the relationship between wildlife and habitat, the processes that create habitat, and the life history requirements of a wide diversity of wildlife species is at the heart of sound wildlife planning and management. In addition to physical attributes of the landscape, factors such as predators, parasites, competitors, and disease all influence the suitability of an area as habitat for a species and the overall population of the species. Human disturbances such as development, hunting, or recreational use can also influence the suitability of an area for individual species.

In recognition of the importance of wildlife to the Lake Tahoe Basin, the Tahoe Regional Planning Agency (TRPA) established in Resolution 82-11 the adopted environmental threshold standards for wildlife.

There are two indicator reporting categories in wildlife threshold category: 1) special interest species, and 2) habitats of special significance (Table 8-1). TRPA has adopted 16 threshold standards for the two indicator reporting categories. The following summarizes standards by indicator reporting category for the wildlife threshold category.

- **Special Interest Species:** Identifies seven numerical standards and eight management standards related to six species (bald eagle, osprey, golden eagle, peregrine falcon, northern goshawk and deer) and one group of species (waterfowl, Table 8-1). The numerical standards establish a minimum number of “populations sites” that must be maintained, while the management standards establish “disturbance” zones for each species or species group that are to be managed consistent with the habitat requirements of the associated species. The evaluation of the eight disturbance zone management standards is summarized in the indicator summary below (Table 8-1).

- **Habitats of Special Significance:** Establishes a management standard that directs TRPA to conserve and restore riparian habitat for the benefit of species associated with these areas (Table 8-1).

**Table 8-1:** Summary of wildlife indicator reporting categories and adopted TRPA threshold standards by type and indicators used to assess adopted standards.

Indicator Reporting Category	Standard	Type of Standard	Indicator
Special Interest Species	Provide a minimum number of population sites and disturbance zones for the following species. The minimum number of population sites is as follows: <ul style="list-style-type: none"> <li>• Goshawk (12 population sites)</li> <li>• Osprey (4 population sites)</li> <li>• Bald Eagle Wintering (2 population sites)</li> <li>• Bald Eagle Nesting (1 population site)</li> <li>• Golden Eagle (4 population sites)</li> <li>• Peregrine (2 population sites)</li> <li>• Waterfowl (18 population sites)</li> </ul>	Numerical standard	Number of occupied population sites in the Region.
	Provide a minimum number of population sites and disturbance zones for the following species: <ul style="list-style-type: none"> <li>• Goshawk (Most suitable 500 acres surrounding nest site including a 0.25-mile buffer centered on nest sites)</li> <li>• Osprey (0.25-mile radius around nest sites)</li> <li>• Bald Eagle Wintering (mapped areas)</li> <li>• Bald Eagle Nesting (0.5-mile radius around nest sites)</li> <li>• Golden Eagle (0.25-mile radius around nest sites)</li> <li>• Peregrine (0.25-mile radius around nest sites)</li> <li>• Waterfowl (mapped areas)</li> <li>• Deer (mapped meadow areas)</li> </ul>	Numerical standard	Evidence of TRPA support for the standard.
Habitats of Special Significance	A non-degradation standard shall apply to significant wildlife habitat consisting of deciduous trees, wetlands, and meadows while providing for opportunities to increase the acreage of such riparian associations.	Management standard	Evidence of TRPA support for management standard.

In order to attain and maintain the wildlife thresholds, the wildlife conservation sub-element of the TRPA Regional Plan identifies two goals and six policy statements relative to maintaining wildlife. The goals are:

1. Maintain suitable habitats for all indigenous species of wildlife without preference to game or non-game species through maintenance and improvement of habitat diversity; and
2. Preserve, enhance, and, where feasible, expand habitats essential for threatened, endangered, rare, or sensitive species found in the Region.

The six policies identified to achieve these goals are:

1. Consider and mitigate project impacts to wildlife;
2. Protect and manage riparian vegetation for wildlife;
3. Prohibit the release of non-native species;
4. Control and contain domestic animals;
5. Encourage appropriate bear management strategies; and
6. Protect sensitive species and buffer them against conflicting land uses.

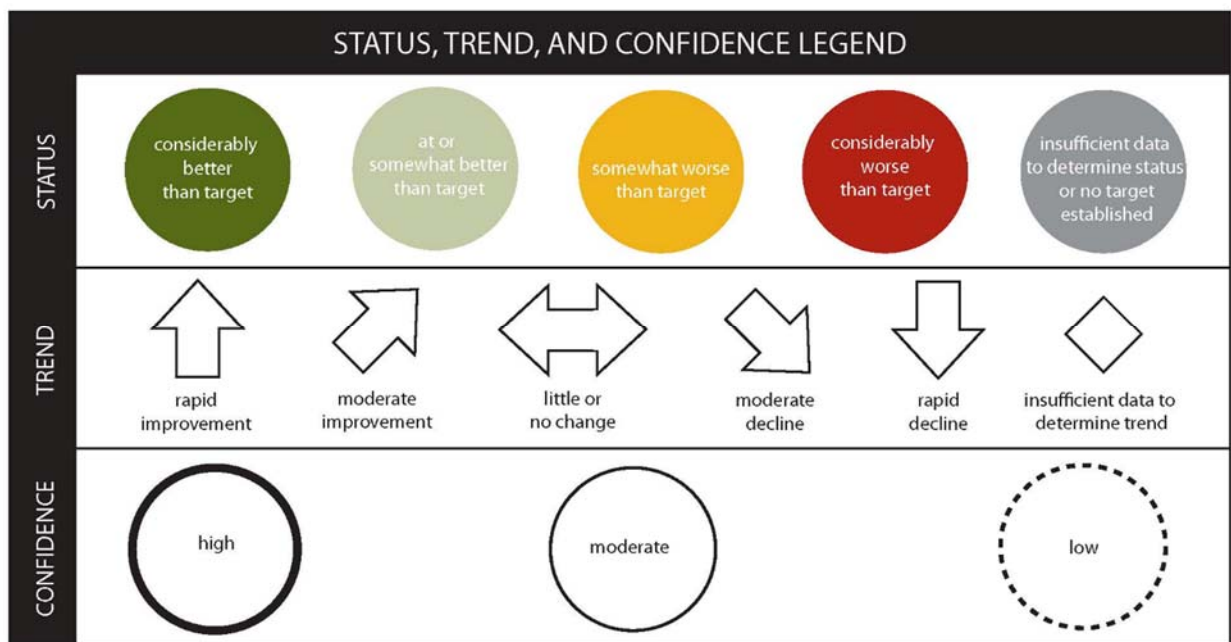
These goals and policies are supported by TRPA's Code of Ordinances which provides more specific provisions pertaining to the protection of sensitive wildlife species and their habitats.

The results of the 2015 assessment are summarized in Table 8-2. The table summarizes the status and trend of standards in the wildlife reporting categories for special interest species and habitats of special significance today as well as the results from the 2011 Threshold Evaluation Report to facilitate comparison. A key to the symbols used to communicate status, trends, and confidence is provided in Figure 8-1, and a detailed description of each is provided in the methodology section. The indicator sheets that follow contain more detailed assessment of the status and trend of each indicator and provide descriptions of the methods used and recommendations for modification of the standard or analytic approach used to assess the standard.

**Table 8-2:** Summary of status and trend of wildlife indicator reporting categories from the 2011 and 2015 Threshold Evaluation Reports.




Standard	2011	2015
<b>Special Interest Species</b>		
Northern Goshawk Population Sites		
Osprey Population Sites		
Wintering Bald Eagle Population Sites		
Nesting Bald Eagle Population Sites		
Golden Eagle Population Sites		
Peregrine Falcon Population Sites		

Standard	2011	2015
Waterfowl Population Sites		
Deer		
Disturbance Free Zones Management Standards		
<b>Habitats of Special Significance</b>		
Riparian Habitat		



*Figure 8-1: A key to the symbols used to assess status, trends, and confidence levels.*

**Table 8-3.** Key to the reporting icon used to characterize the implementation status of management standards and policy statements.

Status Category	Description	Reporting Icon
<b>Implemented</b>	The management standard or policy statement has been integrated into the Regional Plan and is consistently applied to a project design or as a condition of project approval as a result of project review process. Examples of programs or actions can be identified to support the management standard’s implementation. Adopted programs or actions support all aspects of the management standard or policy statement’s implementation, or address all major threats to implementation.	
<b>Partially Implemented</b>	The management standard or policy statement has been integrated into the Regional Plan, but is not consistently applied during the project review process. No more than two examples of programs or actions can be identified to support the management standard’s implementation and/or adopted programs or actions support some aspects of the management standard or policy statement’s implementation, or address some major threats to implementation.	
<b>Not Implemented</b>	The management standard or policy statement has not been integrated into the Regional Plan and is not applied during the project review process. No examples of programs or actions can be identified to support implementation.	

## Special Interest Species

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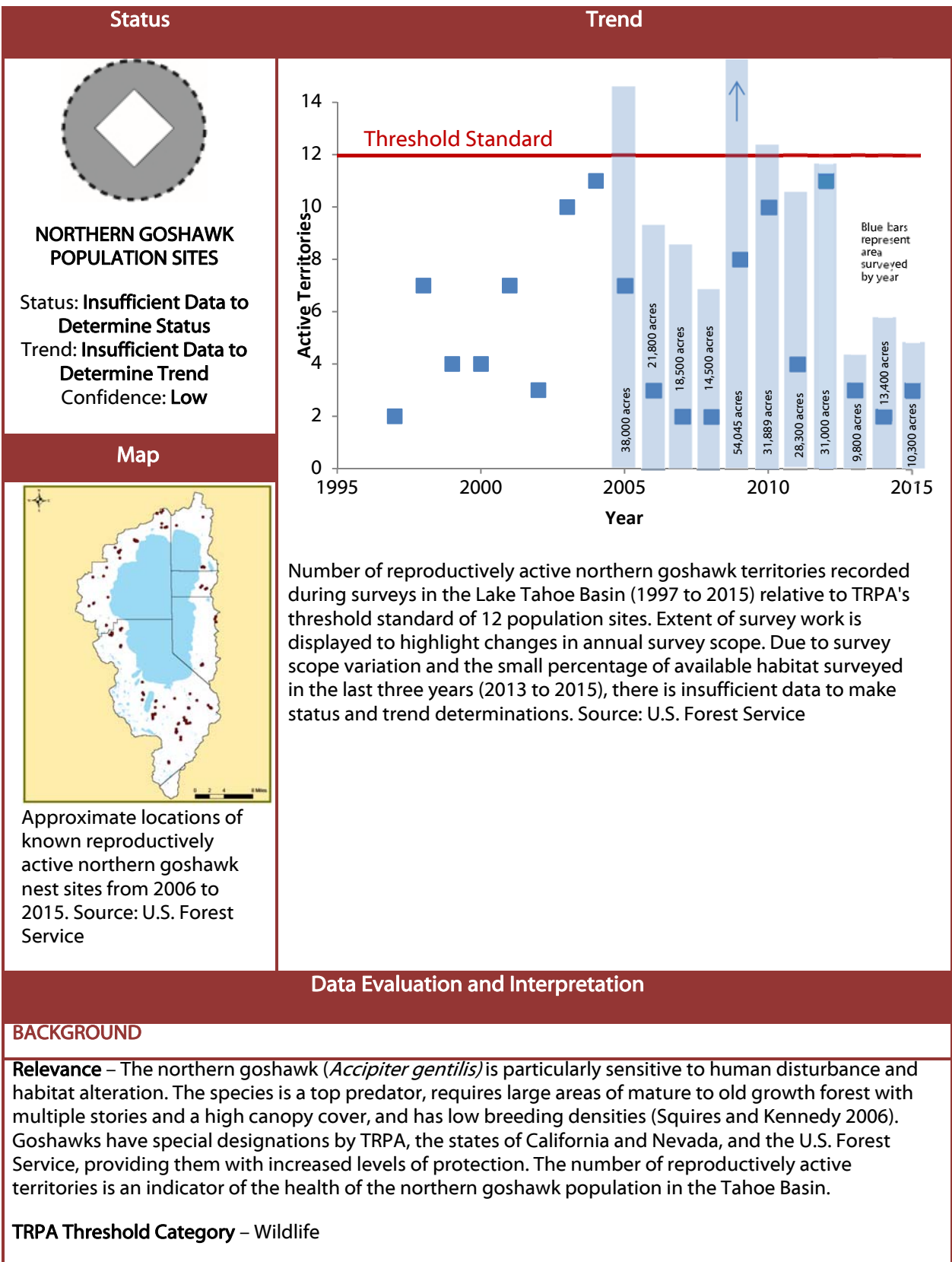
The foundation of the special interest species threshold category is the protection of native wildlife species that are aesthetically pleasing to residents and visitors, and/or are especially vulnerable to extirpation. The special interest species indicator reporting category has both numerical and management components to the standard as it identifies the minimum number of population sites for each species (or group of species, such as waterfowl) that must be maintained and an area around each population site that must be appropriately managed to protect the species or species group.

The management component of the threshold standard relates to providing disturbance free buffer zones for special interest species and was evaluated using qualitative criteria. Attainment requires evidence that activities that could disturb special status species are restricted within the disturbance zones. The evaluation indicates TRPA and partner agencies have protected disturbance zones according to prescriptions identified in the threshold standard, through the implementation of policies, regulations, and management actions consistent with the direction provided by the management standard.

The habitats of special significance management standard were established to protect riparian habitats (meadows, marshes, and deciduous riparian areas) because they provide habitat for a diverse assemblage of wildlife species in the Region. A qualitative assessment of policies and management actions, as well as a quantitative assessment of actions taken under the Environmental Improvement Program (EIP), found the Regional Plan ordinances related to stream environment zone protection and restoration actions have been implemented and TRPA continues to uphold the intent of the management standard.

Seven numerical indicators are evaluated in relation to TRPA standards to characterize the overall status and trend of the special interest species indicator reporting category: northern goshawk, osprey, wintering bald eagle, nesting bald eagle, golden eagle, peregrine falcon, and waterfowl. Three species (osprey, peregrine falcon, and wintering bald eagle) are determined to be considerably better than target, and one species (nesting bald eagle) is determined to be at or somewhat better than target. There is insufficient population data available to determine the status of golden eagles and northern goshawk, although it is determined that the sites originally identified for their protection remain intact and secure from disturbance. Waterfowl are determined to be somewhat worse than target due to continued recreation impacts in wetland areas. Deer populations have been assessed in the past, but are presented in Appendix F of this report because there is no established standard for deer populations.

## Special Interest Species: Northern Goshawk Population Sites



**TRPA Threshold Indicator Reporting Category – Special Interest Species**

**Adopted Standards** – Maintain 12 northern goshawk population sites

**Type of Standard** – Numerical

**Indicator (Unit of Measure)** – The total number of reproductively active northern goshawk territories recorded each year.

**Human & Environmental Drivers** – Northern goshawk populations can exhibit cyclical changes in reproductive success in response to changes in the abundance of prey populations (Doyle and Smith 1994; Salafsky, Reynolds, and Noon 2005; Wiens, Noon, and Reynolds 2006). Northern goshawk reproduction can vary in response to weather and pine cone production, which provides food for prey species (Keane, Morrison, and Fry 2006). Northern goshawks are also dependent on mature to old growth forest types. Northern goshawk habitat suitability can also be impacted by forestry activities, large fires, roads, and other human activities (Squires and Kennedy 2006; Keane, Morrison, and Fry 2006).

**MONITORING AND ANALYSIS**

**Monitoring Partners** – U.S. Forest Service, California Department of Parks and Recreation, Nevada Department of Wildlife

**Monitoring Approach** – Portions of known and potential northern goshawk habitat are surveyed following well-accepted protocols including a combination of dawn acoustic surveys, stand search surveys, and broadcast surveys. Recent survey work has been conducted in response to proposed projects and has been primarily focused at assessment of project level impacts, not assessment of population status and trends in the Tahoe Basin.

**Analytic Approach** – Status and trends are analyzed every four years based on annual survey data. Due to high inter-annual variability in survey scope and the resulting variability in number of individuals observed, trend analysis was not performed for this evaluation.

**INDICATOR STATE**

**Status** – Insufficient data to determine status. The threshold standard of 12 population sites, defined as reproductively active territories, has not been attained since the standard was adopted. In the most recent reporting period (2012 to 2015), three of the four years involved low survey scope relative to overall available habitat and compared to past monitoring. This is because U.S. Forest Service monitoring work focused mostly on assessing site-specific project impacts, not habitat-wide population monitoring. Therefore, a status of insufficient data was determined.

For the 2011 Threshold Evaluation Report, a broader scope of monitoring data was available and a status of somewhat worse than target was determined based on the 10 active territories that were found in 2010. For 2015, the most recent data year, the total number of reproductively active territories was three, which is 25 percent of the target (U.S. Forest Service 2015a). The result is based on a 10,000-acre survey, only a small fraction of northern goshawk habitat in the Tahoe Basin. In the most extensive survey in the current reporting period (2012 surveyed 30,000 acres), 11 reproductively active territories were found. While the survey did not include all likely northern goshawk habitat, the 2012 data year more closely represents the likely population status of northern goshawk in the Tahoe Basin. However, because of the known cyclical variations in northern goshawk reproduction, it is not possible to make a status judgement based on one year of good data. It is noted that all suitable habitat has never been surveyed in one given year, therefore there are likely several more nest sites than reported (Zanetti 2015).

**Trend** – Insufficient data to determine trend. Over the past 19 years (1997 through 2015), the number of reproductively active territories observed has varied between two and 11 per year (U.S. Forest Service 2015a). The long-term trend appears to exhibit cyclical variations which are common in northern



goshawk populations (Keane, Morrison, and Fry 2006). However, the observed data may be a function of variation in annual survey scope. Due to the variable survey scope, a determination of insufficient data to determine trend is made. Based on past survey work, there is no indication that the breeding population is declining or increasing. While the trend in population cannot be determined based on the data, the number of sites protected has increased since the threshold standard was adopted in 1982 because known northern goshawk territories (regardless of current occupancy) are protected unless a stand-replacing event such as a wildfire occurs.

**Confidence –**

**Status –** Low. There is a high degree of confidence in the quality of the data collected because it is collected by qualified biologists following well-established protocols. However, recent survey work has been performed in response to proposed projects and has been primarily focused at assessment of project level impacts, not assessment of population health basin-wide (Zanetti 2015). This reduces confidence in evaluating the indicator status relative to the threshold standard. For example, in 2012, over 30,000 acres were surveyed, and 11 active territories were found (Zanetti 2015). Less than one-third of that territory was surveyed in 2013 to 2015, and less than one-third of the active territories were found in those years. Therefore, the confidence in the status is low.

**Trend –** Low. Confidence in the trend is low because of the large differences in survey scope each year.

**Overall –** Low.

**IMPLEMENTATION AND EFFECTIVENESS**

**Programs and Actions Implemented to Improve Conditions –** TRPA does not permit projects that would impact nesting northern goshawks or their habitat within a 0.25-mile buffer zone surrounding current and historic nest sites, or within the 500 acres of the best suitable habitat surrounding those sites (TRPA 2012b). Additional measures that provide indirect benefits to nesting northern goshawks are found in the TRPA Goals and Policies and the Code of Ordinances, as well as other state and federal laws.

**Effectiveness of Programs and Actions –** The existing programs have provided protection for nesting northern goshawks. Additional measures that provide indirect benefits to northern goshawks, including the protection of old growth forests, are found in the TRPA Goals and Policies and Code of Ordinances, as well as other state and federal laws. As fuels reduction activities continue to play a large role in the Tahoe Basin, it will be important for proper northern goshawk surveys to be completed prior to project construction to ensure disturbance does not occur. Nest abandonment due to fuels reduction activities has been documented in the Tahoe Basin, highlighting the need for proper pre-project surveys and coinciding protection of nesting northern goshawks from disturbance (Slauson and Zielinski 2008).

**Interim Target –** Because of the high variability in the data, it is not possible to set a reliable interim target.

**Target Attainment Date –** Because of the high variability in the data, it is not possible to set a reliable target attainment date.

**RECOMMENDATIONS**

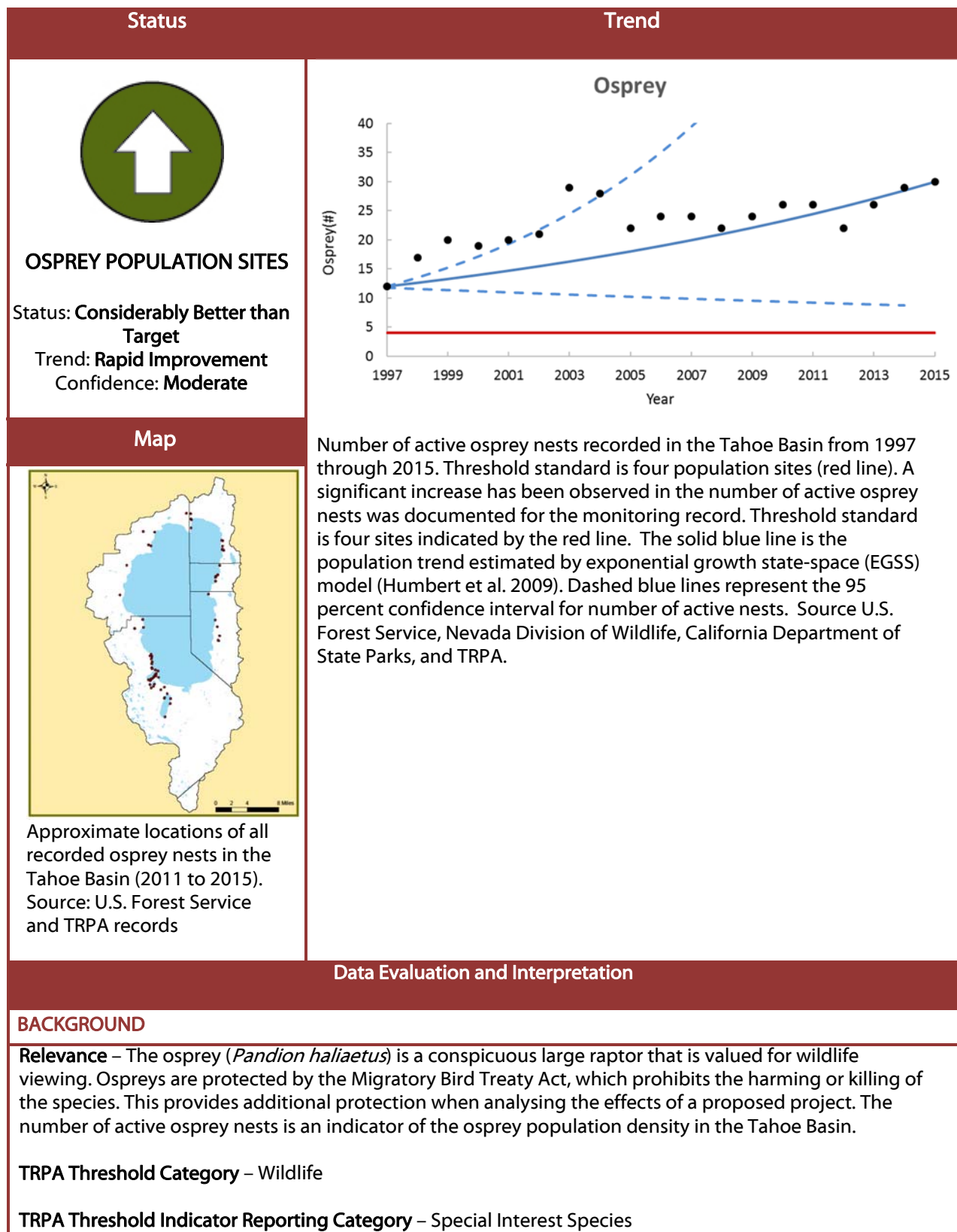
**Analytic Approach –** Given the fluctuating nature of species population dynamics, the numerous factors that influence reproductive success, and the low population target, future reports should consider evaluating attainment based on the average number of successful reproductive nests observed during the analysis period. Alternatively, attainment could be based on the number of territories that were reproductively active at least once during each four-year monitoring period.

**Monitoring Approach –** Understanding the population dynamics of the species in the Region would require more consistent survey work scope with a focus on population determination. A probabilistic sampling regime may provide a cost effective alternative to estimating populations if funding limitations preclude complete survey effort.

**Modification of the Threshold Standard or Indicator** – Standard evaluation relies on interpretation of the term “population site” which is not defined. This evaluation follows the convention of previous threshold evaluation reports and defines a “population sites” as “reproductively active territories.” While this evaluation follows that convention, TRPA recognizes that other interpretations are possible and are used to evaluate the term “population site” as it pertains to other avian species in this evaluation. In establishing the threshold standard it was noted that not all nest sites may be occupied in a given year (TRPA 1982a; TRPA 1982b), and that the goal of the standard is to protect 12 nest sites regardless of activity. If the threshold standard is interpreted as the protection of 12 nest sites, then the 30 mapped territories around historic nest sites currently protected by measures outlined in the TRPA Regional Plan (250 percent of the standard) would warrant a determination of “considerably better than target.”

**Attain or Maintain Threshold** – No changes recommended.

## Special Interest Species: Osprey Population Sites



**Adopted Standards** – Provide a minimum of four population sites

**Type of Standard** – Numerical

**Indicator (Unit of Measure)** – The number of active osprey nests detected based on an annual survey.

**Human & Environmental Drivers** – Human disturbance near nesting and foraging areas can impact osprey breeding success. Osprey may be able to habituate to human activity depending on the timing, type, and consistency of the activity (J. Shane Romsos 2000b; Ewins 1997). Osprey populations could be limited by the number of large nest trees near water and open areas, or competition with bald eagles or other species (Ewins 1997). However, given the limited number of bald eagles present during the breeding season, and the existing protections for large trees, these are not likely to be major limiting factors in the basin. Osprey that breed in the basin likely migrate to Central or South America for the winter (Martell et al. 2001; J. Shane Romsos 2000b). Osprey breeding in the basin may be affected by a variety of factors in their wintering areas or along migration routes, including contamination from organochlorines (e.g. DDT), which is still used in parts of their wintering grounds (J. Shane Romsos 2000b).

#### MONITORING AND ANALYSIS

**Monitoring Partners** – U.S. Forest Service, California Department of Parks and Recreation, Tahoe Regional Planning Agency, Nevada Department of Wildlife

**Monitoring Approach** – A shoreline survey is conducted by boat monthly during spring and summer months following standard protocols. Additional surveys are conducted at historic and likely nest sites at other lakes and upland areas.

**Analytic Approach** – Population trend estimated using an exponential growth state-space (EGSS) model, that accounts for both process noise and observation error (Humbert et al. 2009). Process noise refers to differences in observed population abundance that result from environmental variability. Observation error refers to errors introduced in the data itself because monitoring may not be able to provide a perfect population census.

#### INDICATOR STATE

**Status** – Considerably better than target. Over the past 19 years (1997 through 2015), the number of active osprey nests has steadily increased from 12 to 31 (TRPA 2015b). The number of nests has always exceeded the threshold standard of four population sites. The number of active nests is currently 775 percent of the threshold standard, and therefore a status of considerably better than target is determined.

**Trend** – Rapid improvement. The point estimate for osprey nesting in the Region, suggest a five percent/year increase in the number of nests. Since 1997, the number of active osprey nests has grown by approximately 15 percent per year in relation to the standard of four nests (TRPA 2015b). Therefore, a trend of rapid improvement is determined. The increasing trend is consistent with a reported global increase in the abundance of the species (NatureServe 2011).

**Confidence** –

**Status** – High. Qualified biologists used well established protocols to annually survey the lake.

**Trend** – Moderate. The point estimate suggests that the number of nests is increasing by five percent a year., and the upper 95 percent confidence interval suggests well over 50 nests. However, the lower 95 percent confidence interval estimate indicates a small decline in population.

**Overall** – Moderate. Overall confidence takes the lower of the two confidence determinations.

#### IMPLEMENTATION AND EFFECTIVENESS

**Programs and Actions Implemented to Improve Conditions** – TRPA does not permit projects that would disturb nesting osprey or their habitat within 0.25-miles of known nests. TRPA also limits the removal of

large trees that could provide nesting habitat. Additional measures that provide indirect benefits to osprey are found in the TRPA Goals and Policies and Code of Ordinances, as well as other state and federal laws.

**Effectiveness of Programs and Actions** – Existing programs appear to have maintained appropriate nesting habitat structure and have reduced direct impacts on nesting pairs. As fuels reduction activities continue to play a large role in the Tahoe Basin, it will be important for osprey surveys to be completed prior to project implementation to ensure disturbance does not occur.

**Interim Target** – None, target is in attainment.

**Target Attainment Date** – None, target is in attainment.

#### **RECOMMENDATIONS**

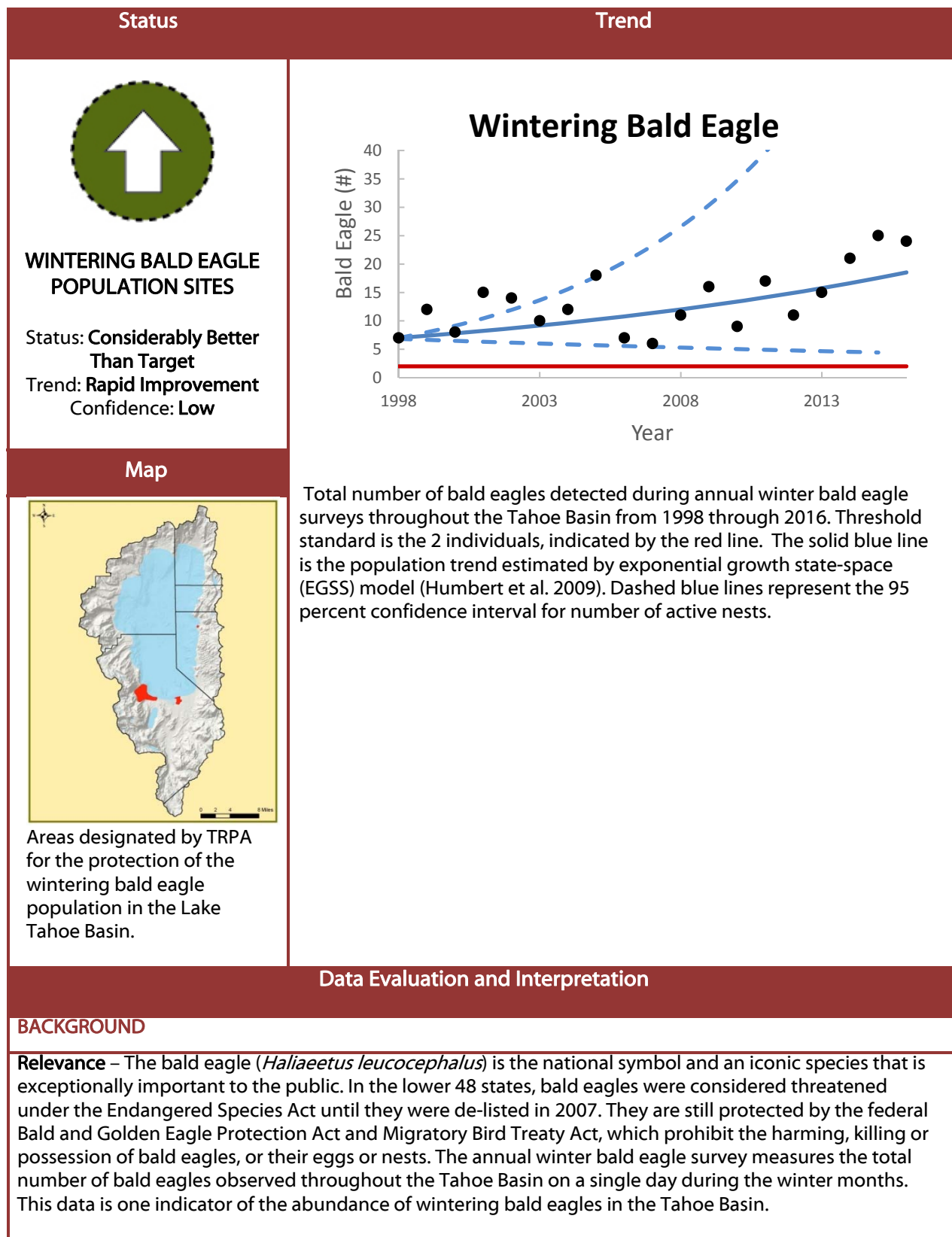
**Analytic Approach** – A multi-year average of population sites should be considered so changes in the current status reporting are less vulnerable to annual variation.

**Monitoring Approach** – The consistently strong status and trend of the osprey population may warrant reconsideration of the annual monitoring approach (current method). In addition, it has been suggested that population estimates based on the EGSS method are robust to missing data, and that population estimates may be improved by increasing focus on survey quality, rather than attempting to ensure survey effort in every year (Humbert et al. 2009).

**Modification of the Threshold Standard or Indicator** – Standard evaluation relies on interpretation of the term “population site” which is not defined. Variations in the interpretation of the term “population site” could include any active nest (regardless of reproductive success) or only nests that are reproductively successful, among others. Review and revise the threshold standard to clarify the standard’s objective and ensure the standard reflects the best available science.

**Attain or Maintain Threshold** – No changes recommended.

## Special Interest Species: Wintering Bald Eagle Population Sites



**TRPA Threshold Category – Wildlife**

**TRPA Threshold Indicator Reporting Category – Special Interest Species**

**Adopted Standards** – Provide a minimum of two population sites.

**Type of Standard** – Numerical

**Indicator (Unit of Measure)** – Presence of protected wintering areas and total number of bald eagles detected during annual winter survey.

**Human & Environmental Drivers** – Many bald eagles wintering in the Tahoe Basin have likely migrated from other breeding areas (J. Shane Romsos 2000a; Linthicum et al. 2007). Their winter abundance in the Tahoe Basin can be influenced by a variety of factors in their breeding areas or along their dispersal routes. The availability of spawning Kokanee salmon in Tahoe’s tributaries, or other food sources, may affect the abundance of wintering bald eagles (Laves and Romsos 2000; Reed 1979). The intensity and location of recreational activities can affect wintering bald eagles, although resident eagles may become habituated to regular recreational activities (Laves and Romsos 2000; Brown and Stevens 1997; Buehler et al. 1991). In other areas, the structure of wintering habitat, including the size, location, and number of suitable perch trees has been shown to affect wintering bald eagle abundance (Stohlgren 1993). Finally, abnormally warm winter temperatures have shown in studies to entice more eagles to overwinter in higher elevation areas, which may account in part for the recent significant upward trend in total individuals observed (Kaltenecker 2000).

**MONITORING AND ANALYSIS**

**Monitoring Partners** – Since 2012, the Tahoe Institute for Natural Sciences coordinates the survey and data management for the annual bald eagle winter survey. Prior to 2012, it was led by the U.S. Forest Service. Numerous agencies and volunteers provide in-kind support.

**Monitoring Approach** – Professional and volunteer biologists stationed at a series of observation points surrounding Lake Tahoe record all observed eagles over the same four-hour period once a year following protocols developed by the National Wildlife Federation.

**Analytic Approach** – Population trend was estimated using an exponential growth state-space (EGSS) model, that accounts for both process noise and observation error (Humbert et al. 2009). Process noise refers to differences in the observed population abundance that result from environmental variability. Observation error refers to errors introduced in the data itself because monitoring may not be able to provide a perfect population census.

**INDICATOR STATE**

**Status** – Considerably better than target. Currently, there are three mapped areas designated for the protection of wintering bald eagles. The threshold is currently in attainment of maintaining at least two population sites. Additionally, the original TRPA Threshold Study that established the standards noted the baseline population for wintering bald eagles was six to 12 individuals (TRPA 1982a). For the most current year of data (2016) there were 24 bald eagles detected (Tahoe Institute for Natural Sciences 2016). Using either the number of wintering individuals or the number of areas protected for wintering habitat, the threshold is in attainment. Using the total number of wintering individuals detected in relation to even the high estimate of the baseline population of 12 bald eagles, the status is greater than 125 percent of the target. Therefore, a status of considerably better than target was determined.

**Trend** – Rapid improvement. Since 1998, the long term trend line shows a 5.1 percent increase per year in relation to the high estimate for baseline population of 12 individuals. Therefore, a trend of rapid improvement was determined. Data prior to 1998 was not used because it did not adjust for bald eagles that were double-counted during the survey.

## Confidence

**Status** – Moderate. The survey data has been collected for 19 years following accepted protocols developed by the National Wildlife Federation. It represents a brief snapshot (four hours) that may not accurately represent bald eagle abundance. Additionally, weather at the time of the survey may influence total number of bald eagles detected (Richardson 2015).

**Trend** – Low. The point estimate for the lower 95 percent confidence is a slight decline in bald eagles.

**Overall** – Low. Overall confidence takes the lower of the two confidences.

## IMPLEMENTATION AND EFFECTIVENESS

**Programs and Actions Implemented to Improve Conditions** – TRPA does not permit projects that would degrade habitat within known wintering areas. Additional measures that provide indirect benefits to wintering bald eagles are found in the TRPA Goals and Policies and Code of Ordinances, as well as other state and federal laws.

**Effectiveness of Programs and Actions** – Existing programs have prevented the degradation of wintering habitat structure. Recreational activities, including cross-country skiing and dog-walking, may continue to impact wintering bald eagles, especially migrant individuals that have not become habituated to this level of human use.

**Interim Target** – No interim target is needed. The minimum number of population sites has been met.

**Target Attainment Date** – No target date is needed. The minimum number of population sites has been met.

## RECOMMENDATIONS

**Analytic Approach** – A multi-year average of population sites should be considered so changes in the current status reporting are less vulnerable to annual variation.

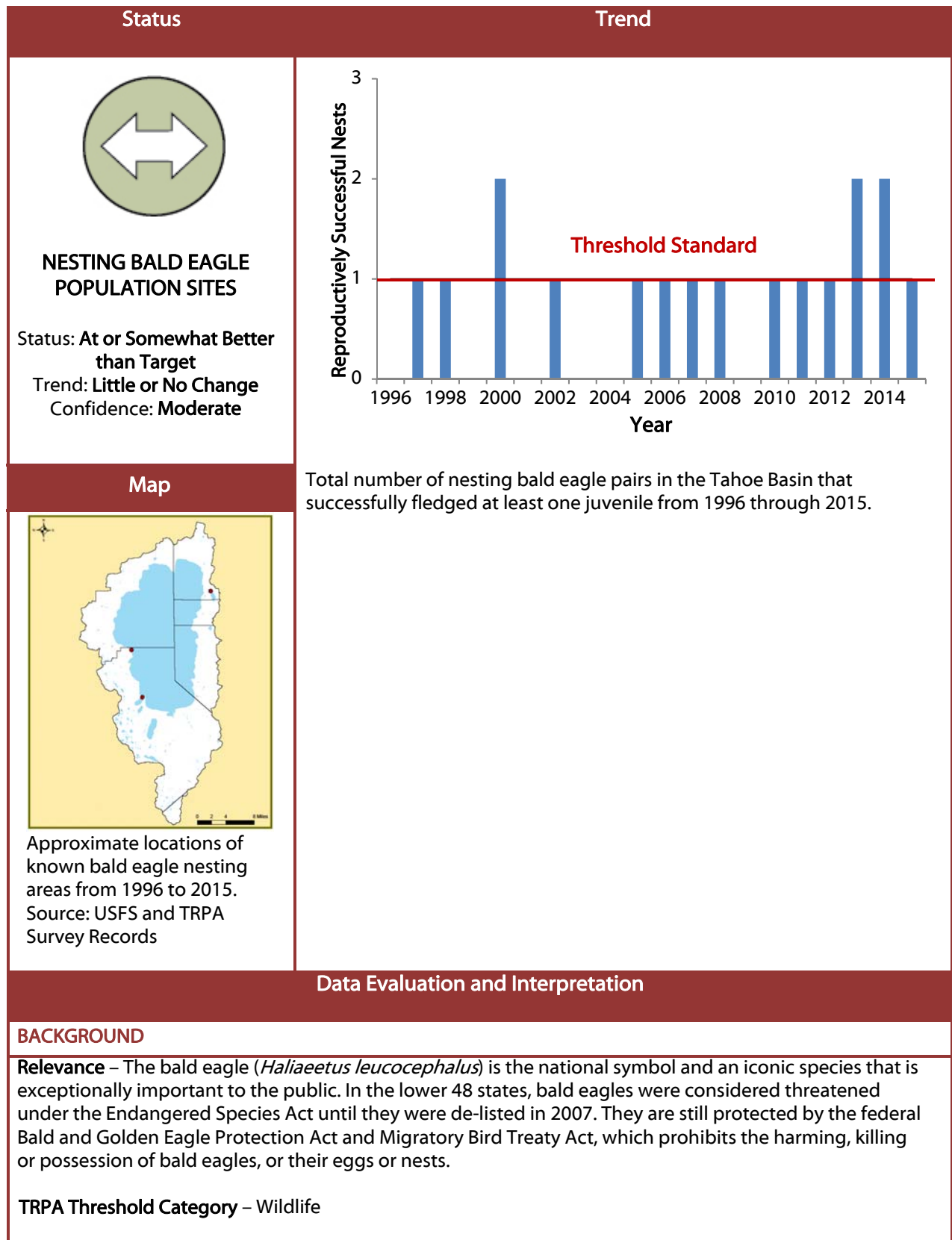
**Monitoring Approach** – Consider a dual frame sampling design (for additional detail see Haines and Pollock 1998; U.S. Fish and Wildlife Service 2009).

**Modification of the Threshold Standard or Indicator** – Standard evaluation relies on interpretation of the term “population site” which is not defined. Review and revise the threshold standard to clarify the standard objective and ensure the standard reflects the best available science. In a departure from the methods of the 2011 Threshold Evaluation Report which reported the status as “unknown”, the standard was determined to be in attainment based on the number of population sites protected and the total number of bald eagles detected during the winter survey. The areas mapped as wintering bald eagle habitat should be reviewed to ensure that mapped areas continue to reflect the best available science.

**Attain or Maintain Threshold** – No changes recommended.



## Special Interest Species: Nesting Bald Eagle Population Sites



**TRPA Threshold Indicator Reporting Category – Special Interest Species**

**Adopted Standard** – Provide a minimum of one population site

**Type of Standard** – Numeric

**Indicator (Unit of Measure)** – The number of nesting bald eagle pairs that successfully fledge at least one juvenile.

**Human & Environmental Drivers** – Bald eagle reproductive success in the Tahoe Basin may be affected by human activity such as boat access or other recreational uses in nesting territories (Laves and Romsos 2000), and the loss of nesting habitat including large trees in close proximity to surface water (Laves and Romsos 2000). TRPA’s Code of Ordinances and enforcement limit disturbance in buffers surrounding nest sites. Fish mortality from spawning, disease, or catch and release fishing can impact the amount of available carrion, which can affect nesting bald eagles (Jackman, Hunt, and Hutchins 2007; Beauchamp et al. 1994). In other areas, weather conditions affect reproductive success (Gende, Wilson, and Jacobsen 1997), although it is unknown to what degree weather affects nesting success in the Tahoe Basin.

**MONITORING AND ANALYSIS**

**Monitoring Partners** – California Department of Parks and Recreation, Nevada Department of Wildlife, U.S. Forest Service, Tahoe Regional Planning Agency.

**Monitoring Approach** – Known nest sites are visited regularly during the incubation and fledging periods to determine reproductive success. Monthly boat surveys during non-winter months are conducted to identify any new nest sites surrounding Lake Tahoe, and ad-hoc surveys are conducted in other areas in support of environmental assessments for proposed projects.

**Analytic Approach** – Status and trends are analyzed every four years based on annual survey data using simple linear regression.

**INDICATOR STATE**

**Status** – At or somewhat better than target. The threshold standard has been in attainment in each of the last five years (2011 through 2015). Over the past 19 years (1996 through 2015), the number of reproductively successful nests has met or exceeded the threshold standard of one population site 14 times, or 70 percent of the time. Between 1996 and 2010, one pair of bald eagles has generally nested within the Tahoe Basin. However, each year since 2013 three complete nests have been observed, although they have not always been active or reproductively successful (TRPA 2015a). Therefore, the indicator is at or somewhat better than the target.

**Trend** – Little or no change. Since 1996, the number of reproductively successful nests has fluctuated between zero and two. The recent increase in the number of observed nests suggests the trend could be improving. However, whether these nests become consistently reproductively successful or not will determine the overall trend. Therefore, the overall trend is little or no change. Bald eagle populations in California (and nationally) increased greatly between 1990 and 2006 (USFWS 2015). Data after 2006 is missing from most states after annual surveys were deemed no longer necessary as a consequent of ESA de-listing.

**Confidence** –

**Status** – High. There is a high degree of confidence in the status because all known nests are intensively monitored by qualified wildlife biologists. In addition, bald eagle nests are relatively easy to find, and formal boat survey and walk-in surveys are conducted monthly during non-winter months to identify any new nests.

**Trend** – Low. There is no statistically significant trend ( $P = 0.78$ ,  $R^2 = 0.1745$ ), therefore confidence is low.

**Overall** – Moderate. Overall confidence takes the middle of the two confidence determinations

when high and low.

#### IMPLEMENTATION AND EFFECTIVENESS

**Programs and Actions Implemented to Improve Conditions** – TRPA does not permit projects that would disturb nesting bald eagles within 0.5 miles of known nests, and TRPA limits the removal of large trees that could provide nesting habitat. Additional measures that provide indirect benefits to nesting bald eagles are found in the TRPA Goals and Policies and Code of Ordinances, as well as other state and federal laws.

**Effectiveness of Programs and Actions** – Existing programs have maintained appropriate nesting habitat structure and have reduced direct impacts on nesting pairs. Recreational activities such as boat and beach use near nests can be difficult to control, and may continue to impact nesting bald eagles.

**Interim Target** – None, indicator is currently in compliance with adopted threshold standard.

**Target Attainment Date** – None, indicator is currently in compliance with adopted threshold standard.

#### RECOMMENDATIONS

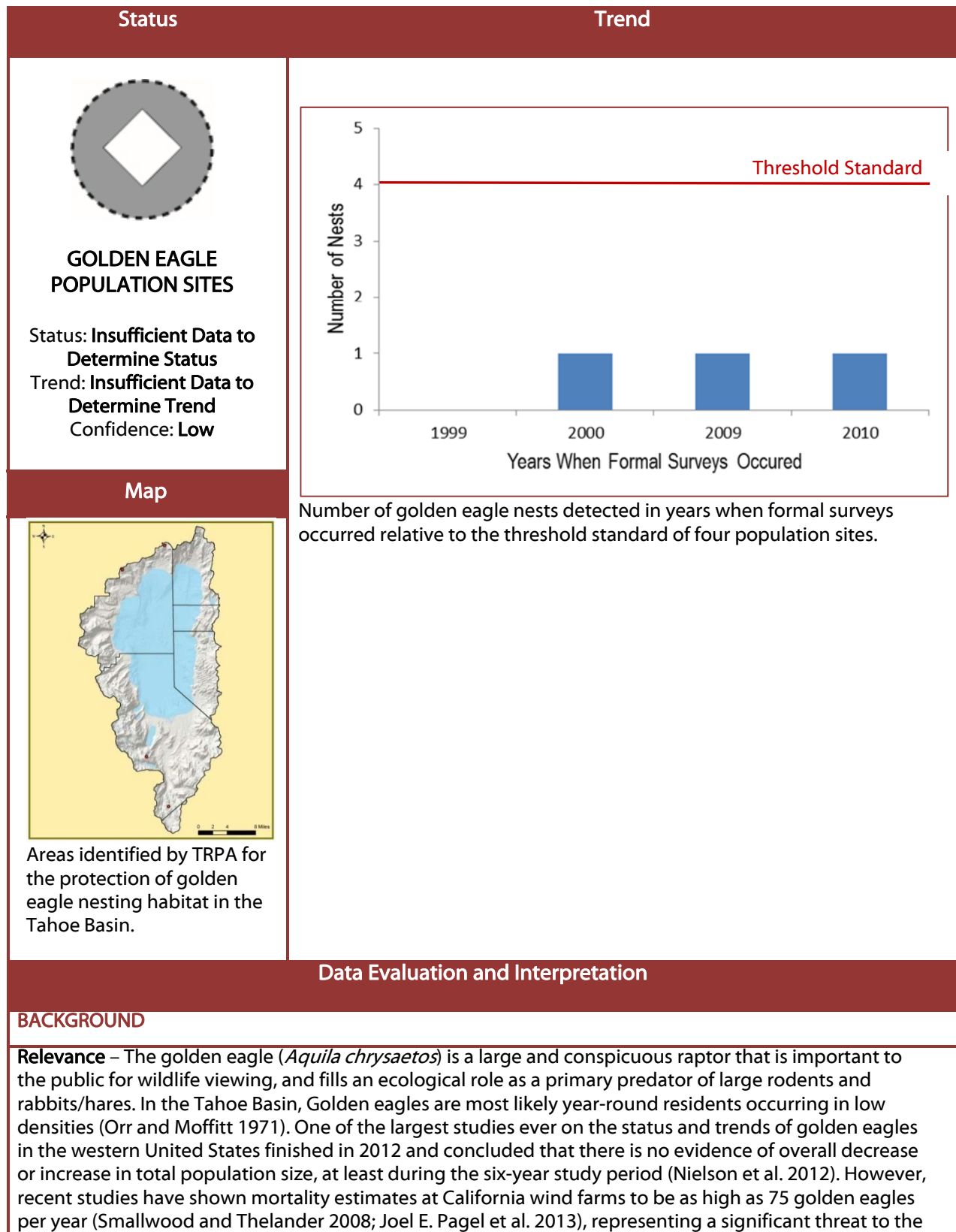
**Analytic Approach** – Given the fluctuating nature of species population dynamics, the numerous factors that influence reproductive success, and the low population target, future reports should consider evaluating the attainment based on the average number of successful reproductive nests observed over a period longer than a single year.

**Monitoring Approach** – Consider a dual frame sampling design (for additional detail see Haines and Pollock 1998; U.S. Fish and Wildlife Service 2009).

**Modification of the Threshold Standard or Indicator** – Standard evaluation relies on interpretation of the term “population site” which is not defined. To maintain consistency over time, this evaluation follows the convention of previous threshold evaluation reports and defines a “population site” as “nesting bald eagle pairs in the Tahoe Basin that successfully fledged at least one juvenile.” It is unclear why only reproductively successful nests for bald eagles have been counted in the past, while status determination for all other special interest species rely only on the presence of an active nest, not reproductive success. This standard should be considered and clarified or changed.

**Attain or Maintain Threshold** – No changes recommended.

## Species Interest Species: Golden Eagle Population Sites



population. They are protected by both federal and state law, including the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act, which prohibit the harming, killing or possession of golden eagles, or their eggs or nests.

**TRPA Threshold Category** – Wildlife

**TRPA Threshold Indicator Reporting Category** – Special Interest Species

**Adopted Standards** – Provide a minimum of four population sites

**Type of Standard** – Numerical

**Indicator (Unit of Measure)** – The number of active golden eagle nests detected each year.

**Human & Environmental Drivers** – The Tahoe Basin experiences a significant amount of recreational use, which can result in nest abandonment or stress that reduces a golden eagle’s chances of survival (J.E. Pagel, Whittington, and Allen 2010; Boeker and Ray 1971). Golden eagle prey species’ populations can experience significant annual variability, which can affect Golden eagle reproductive productivity (Steenhoff, Kochert, and McDonald 1997; Kochert and Steenhoff 2002). Weather conditions, such as severe winters or unusually hot spring days can also reduce the reproductive success of golden eagles (Steenhoff, Kochert, and McDonald 1997). While wind energy is not present in the Tahoe Basin, recent studies have shown mortality at California wind farms to be as high as 75 golden eagles per year (Smallwood and Thelander 2008).

#### **MONITORING AND ANALYSIS**

**Monitoring Partners** – Monitoring data collected by the U.S. Forest Service, Nevada Department of Wildlife, and California State Parks informed past threshold evaluations. Since 2010 there have been no formal surveys.

**Monitoring Approach** – Since 2010 there have been no formal surveys as a result of cutbacks to the U.S. Forest Service wildlife monitoring program.

**Analytic Approach** – There is insufficient data to analyze the indicator.

#### **INDICATOR STATE**

**Status** – Insufficient data to determine status. Due to cutbacks to the U.S. Forest Service wildlife monitoring program, no surveys have been conducted since 2010, hence there is insufficient data to make a status determination. Formal golden eagle surveys were conducted in selected areas of suitable nesting habitat in four of the past 16 years, with no surveys conducted since 2010 (U.S. Forest Service 2011). These surveys never resulted in the detection of more than one active nest. However, the most recent surveys only covered two to three areas of potential nesting habitat per year. Other potential nesting habitat exists and was not surveyed, making it impossible to know whether the threshold standard would have been met if more comprehensive surveys were conducted. However, because golden eagles are conspicuous and many professional and volunteer biologists are active “birders” in the Tahoe Basin, it is very unlikely the target is being met.

Four mapped areas based on historic nesting sites have been identified by TRPA for the protection of the golden eagle population (see above map). Since 2011, at least 17 incidental sightings have been recorded by volunteer and professional observers within the Tahoe Basin (eBird 2015). However, due to their large home ranges, it is not possible to make a determination of their nest site locations based on these incidental sightings alone.

**Trend** – Insufficient data to determine trend.

**Confidence –**

**Status –** Low. There is low confidence in the ability to determine status as formal surveys for nesting golden eagles have only been conducted in four of the last 16 years (most recently in 2010), and these surveys did not include all potential nesting habitat within the Tahoe Basin.

**Trend –** Low. Golden eagle populations have shown cyclical fluctuations in response to prey populations (Kochert and Steenhoff 2002; Steenhoff, Kochert, and McDonald 1997), which could confuse the evaluation of trends based on a limited number of years.

**Overall –** Low.

**IMPLEMENTATION AND EFFECTIVENESS**

**Programs and Actions Implemented to Improve Conditions –** TRPA does not permit projects that would disturb nesting golden eagles or their habitat within 0.25-miles of known nests. Additional measures that provide indirect benefits to golden eagles are found in the TRPA Goals and Police, and Code of Ordinances, as well as other state and federal laws.

**Effectiveness of Programs and Actions –** There is insufficient information to empirically evaluate the effectiveness of programs and actions intended to protect golden eagles, although the use of buffers to protect sensitive species is well supported in the scientific literature.

**Interim Target –** Due to limited data, an interim target for this indicator cannot be set.

**Target Attainment Date –** Due to limited data, a target date for this indicator cannot be set.

**RECOMMENDATIONS**

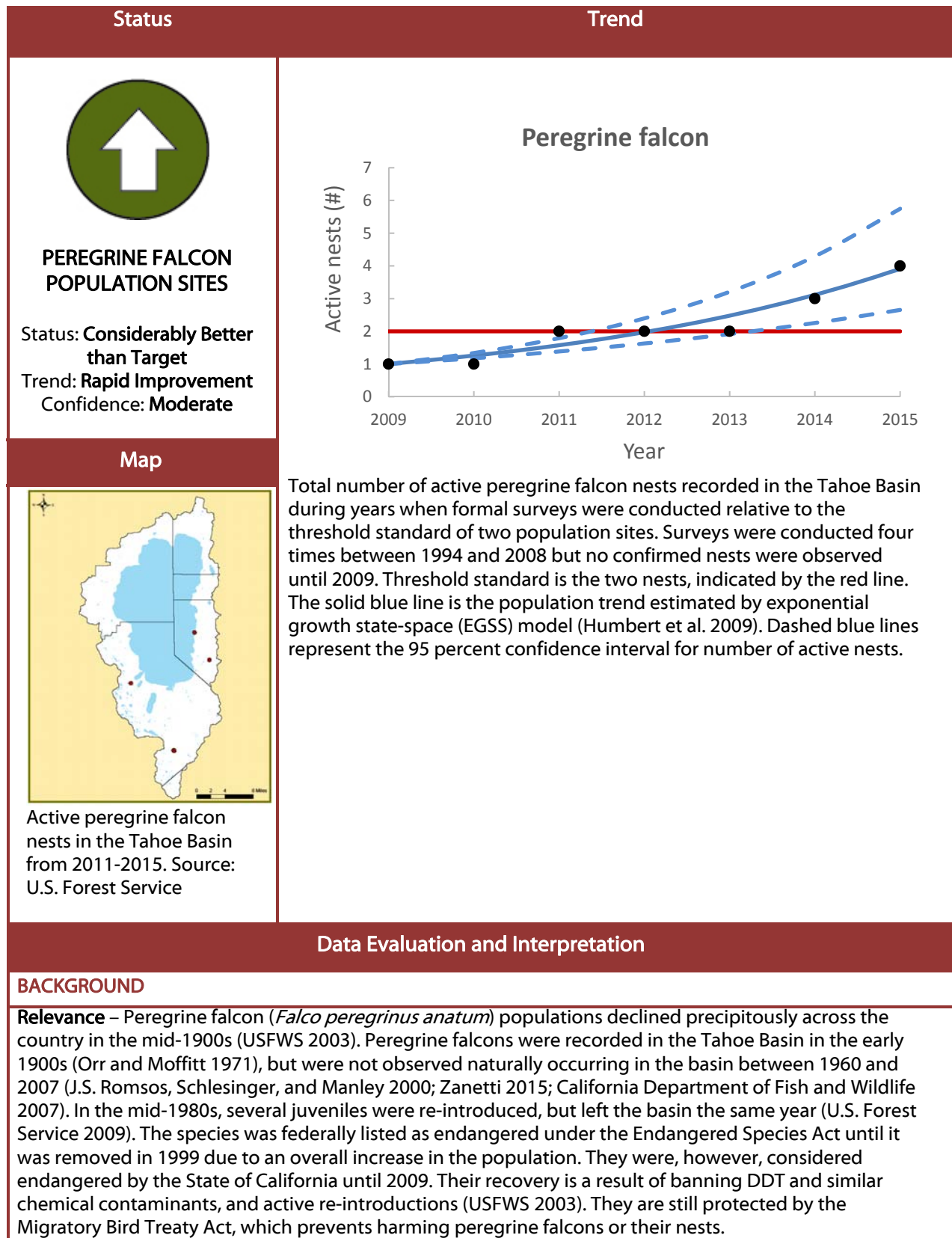
**Analytic Approach –** No changes recommended.

**Monitoring Approach –** Several years of monitoring all suitable nesting habitats are needed to evaluate the status of nesting golden eagles, and to determine if the available habitat could support the threshold standard of four active nests. Consider a dual frame sampling design (for additional detail see Haines and Pollock 1998; U.S. Fish and Wildlife Service 2009).

**Modification of the Threshold Standard or Indicator –** The threshold standard should be reviewed to ensure it is an achievable target consistent with the best available science. Monitoring of suitable habitats may be needed as the basis for modifying the standard. Additionally, what constitutes a “population site” is not well-defined and should be clarified.

**Attain or Maintain Threshold –** No changes recommended.

## Special Interest Species: Peregrine Falcon Population Sites



**TRPA Threshold Category** – Wildlife

**TRPA Threshold Indicator Reporting Category** – Special Interest Species

**Adopted Standards** – Provide a minimum of two population sites

**Type of Standard** – Numeric

**Indicator (Unit of Measure)** – The number of active peregrine falcon nests detected each year.

**Human & Environmental Drivers** – In some areas peregrine falcons have shown reduced reproductive success when nesting cliffs are used by rock climbers (Mearns and Newton 1988; Cade, Enderson, and Linthicum 1996). Within the Tahoe Basin, some of the cliffs with nests are used by rock climbers, which could affect nesting success. However, at the two sites in the basin with rock climbing activity, the species has successfully reproduced every year since 2011, suggesting that these birds are not disturbed by the current rock climbing activity (U.S. Forest Service 2015b). An evaluation of potential peregrine falcon habitat in the basin concluded that potential nesting habitat exists, but it is of marginal quality, which may limit the total number of active nests the Region can support (Boyce and White 1980). Some peregrine falcons nesting in the basin may migrate to Central or South America for the winter, where they could be affected by contamination from organochlorine pesticides (e.g. DDT) (USFWS 2003).

#### **MONITORING AND ANALYSIS**

**Monitoring Partners** – U.S. Forest Service, Tahoe Regional Planning Agency

**Monitoring Approach** – Biologists observe historic or potential nest sites for a minimum of four hours per month, April through August following standard U.S. Forest Service protocol. Incidental sightings are used to help focus surveys on likely nest locations.

**Analytic Approach** – Population trend estimated using an exponential growth state-space (EGSS) model, that accounts for both process noise and observation error (Humbert et al. 2009). Process noise refers to differences in observed population abundance that result from environmental variability. Observation error refers to errors introduced in the data itself because monitoring may not be able to provide a perfect population census.

#### **INDICATOR STATE**

**Status** – Considerably better than target. In the most recent year data is available (2015), four active peregrine falcon nests were observed which is 200 percent of the threshold standard. Therefore, a status of considerably better than the target is determined. Previous habitat evaluations concluded that the Tahoe Basin contains less than ideal nesting habitat (Boyce and White 1980), and prior reintroduction efforts were not successful (U.S. Forest Service 2009). As a result, peregrine falcons were not expected to nest within the Tahoe Basin and nest surveys were only conducted sporadically. In 2007, several biologists reported seeing peregrine falcons within the basin, and the U.S. Forest Service began conducting annual nest surveys in 2008. One active nest was confirmed in 2009 and 2010. From 2011 through 2013, two active nests were confirmed. In 2014 and 2015, one additional nest was discovered each year, in addition to successful breeding pairs at previously known sites (U.S. Forest Service 2015b).

**Trend** –Rapid improvement. Since 2008, the year before the first active nest was confirmed within the Tahoe Basin, there is a significant upward trend in the number of nests (U.S. Forest Service 2015b). Since 2008, the estimated increase is more than 20 percent annually. Therefore, a trend of rapid improvement is determined. Additionally, at least 20 juveniles have fledged within the basin since 2008 (U.S. Forest Service 2015b). The trend is consistent with an increase in peregrine falcon abundance nationally and across California (Linthicum 2006).



**Confidence –**

**Status –** High. The lower 95 percent confidence interval suggest that the number of nests in the region is above two, suggesting there is high confidence that the standard is in attainment.

**Trend –** Moderate. The lower 95 percent confidence interval suggests that the number of active nests in the region has at least doubled in the past five years.

**Overall –** Moderate. Overall confidence takes the lower of the two confidence determinations.

**IMPLEMENTATION AND EFFECTIVENESS**

**Programs and Actions Implemented to Improve Conditions –** TRPA does not permit projects that would disturb nesting peregrine falcon or their habitat within 0.25 miles of known nests. The U.S. Forest Service has initiated public outreach in collaboration with local rock climbers to limit the use of rock climbing routes near active nests. Additional measures that provide indirect benefits to peregrine falcon are found in the TRPA Goals and Polices and the Code of Ordinances, as well as other state and federal laws.

**Effectiveness of Programs and Actions –** It is too early to evaluate the effectiveness of specific programs to protect peregrine falcon as they were only recently implemented after the detection of nests within the Tahoe Basin. The number of peregrine falcon nests has increased and recently attained the threshold standard, indicating that recent management activities have not resulted in major impediments to the species.

**Interim Target –** None. Threshold standard is in attainment.

**Target Attainment Date –** None. Threshold standard is in attainment.

**RECOMMENDATIONS**

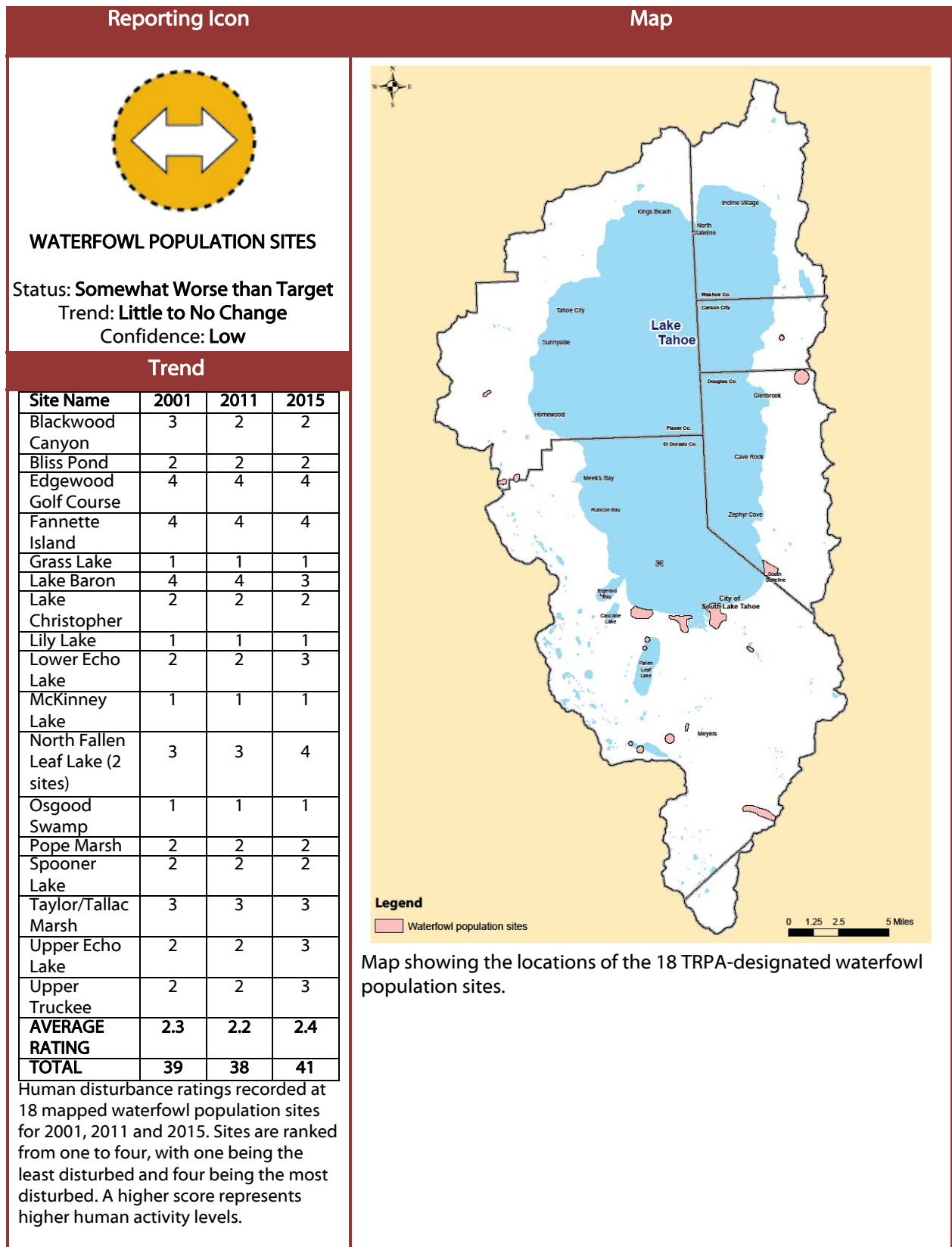
**Analytic Approach –** Consider the use of a multi-year average of population sites or the trend line estimate to assess indicator status relative to the standard, to minimize the influence of process error.

**Monitoring Approach –** Consider a dual frame sampling design (for additional detail see Haines and Pollock 1998; U.S. Fish and Wildlife Service 2009).

**Modification of the Threshold Standard or Indicator –** Standard evaluation relies on interpretation of the term “population site” which is not defined. This evaluation follows the convention of previous threshold evaluation reports and defines a “population site” as “active nests.” While this evaluation follows that convention it is recognized that other interpretations are possible, and are used to evaluate the term “population site” as it pertains to other avian species in this evaluation. Review and revise threshold standard to clarify target and reflect best available science.

**Attain or Maintain Threshold –** No changes recommended.

## Special Interest Species: Waterfowl Population Sites



## Data Evaluation and Interpretation

### BACKGROUND

**Relevance** –The TRPA definition of special interest waterfowl includes species in the *Anatidae* (i.e., ducks and geese), Ardeidae (e.g., herons), and Sternidae (i.e., terns) families (TRPA 1982b). Protecting habitat for waterfowl also protects habitat for other water birds such as the eared grebe, marsh wren, and Virginia rail (TRPA 2007). The Tahoe Basin supports breeding waterfowl and serves as a stopover for waterfowl migrating along the Pacific Flyway. Many waterfowl species are valued for wildlife viewing and hunting, and collectively they are an important component of functioning wetland ecosystems. Waterfowl are dependent on various biological, chemical, and physical aspects of wetlands for their survival, so their use of a site can serve as an indicator of the biological integrity or relative value of a site for providing a functioning wetland ecosystem.

**TRPA Threshold Category** – Wildlife

**TRPA Threshold Indicator Reporting Category** – Special Interest Species

**Adopted Standards** – Provide a minimum number of 18 population sites

**Type of Standard** – Numeric (minimum number of population sites)

**Indicator (Unit of Measure)** – Number of mapped population sites maintained as waterfowl habitat (number of sites). Habitat conditions at each waterfowl site are also assessed using a human activity rating system established in 2001 (TRPA 2001).

**Human and Environmental Drivers** – Many of the mapped waterfowl population sites coincide with recreation destinations (e.g., beaches, golf courses, community parks, and off-highway vehicle and hiking trails). Recreational uses have been demonstrated to reduce reproductive success by causing nest abandonment, decreased hatching success, and reduced survivorship of hatchlings; and can cause mortality by increasing energy expenditures and reducing foraging success (Korschgen and Dahlgren 1992; Knight and Gutzwiller 1995). Physical habitat conditions, such as the type and configuration of vegetation communities and area of open water are good predictors of bird species richness within the basin (Schlesinger and Romsos 2000), so alterations to these physical characteristics could affect waterfowl use of a site. Habitat requirements vary by waterfowl species, but the amount, diversity, and level of alterations to wetlands may be a driver of waterfowl populations (Batt et al. 1992). Historic land uses, such as the filling of large portions of the Upper Truckee Marsh for construction of the Tahoe Keys in the 1960s, has also greatly reduced the amount of waterfowl habitat within the Tahoe Basin. Waterfowl populations in the basin may also be affected by annual and seasonal changes in the availability of food at local, regional and national scales, which can be influenced by weather (e.g., drought). Temporary food scarcity can reduce reproductive success or cause waterfowl to use other areas with more available food resources (Batt et al. 1992).

### MONITORING AND ANALYSIS

**Monitoring Partners** – California Tahoe Conservancy, U.S. Forest Service, TRPA

**Monitoring Approach** – The methodologies and indicators used by TRPA to evaluate the attainment status of the waterfowl standard has varied over time. The 2001 Threshold Evaluation Report used observed bird species richness and diversity along with the human activity rating system to gauge threshold standard attainment status (TRPA 2001). The 2006 Threshold Evaluation Report used observation of bird species richness and diversity as well as an assessment of detrimental or non-native species, but did not use the human disturbance rating system that was used in 2001. The 2011 Threshold Evaluation Report used only a human disturbance rating system as a means to measure status (TRPA 2012a). Similar to the 2011 Threshold Evaluation Report, the 2015 assessment is based on field observations and human activity levels at mapped waterfowl population sites. The 2015 survey was a rapid assessment where no formal

waterfowl surveys were conducted. For the human disturbance rating evaluation, each site was visited by a qualified wildlife biologist at least once during the non-breeding season, between August 1, 2015 and September 30, 2015. For each waterfowl site, multiple locations around the perimeter and sometimes within the interior of the site were established for observation, mapped with GPS, and photographed. Locations established for observation were not obscured by vegetation or topography, allowing for a large majority of the site to be viewed. At the conclusion of a waterfowl population site visit, a human activity rating value was assigned to the site according to the system established by TRPA along with other observations (e.g., wildlife observations, anthropogenic features). Variation in the methodologies and indicators used to evaluate the attainment status of the waterfowl standard is likely a result of ambiguity of the adopted threshold standard for waterfowl. Since standard adoption in Resolution 82-11, there have been no firmly established specific baseline habitat conditions or performance measures or methodologies to determine attainment status for waterfowl population sites.

**Analysis Approach** – To assess status, field observations at each mapped waterfowl population site were used to confirm the presence or absence of wetland/waterfowl habitat. To assess trend, 2015 human activity ratings and other observations of wetland conditions were organized into a spreadsheet and the total and average magnitude of change in human activity rating scores across populations sites was compared to 2011 and 2001 human activity ratings (see table in Trend section above). In addition, the change in the number of waterfowl population sites was assessed.

#### INDICATOR STATE

**Status** – Somewhat worse than target. Waterfowl population sites have been assessed using a human activity rating since 2001. In 2001, the waterfowl threshold was determined to be out of attainment mostly due to increased recreation impacts (TRPA 2001). Due to similar impacts, the threshold was determined to be “somewhat worse than target” in 2011 (TRPA 2012a). Since 2001 and 2011, recreation and general human disturbance have increased based on human activity ratings; therefore, the status of somewhat worse than target still applies in 2015.

Due to ambiguity in what constitutes a “waterfowl population site,” and because only human activity and presence/absence of wetland habitat was measured in mapped disturbance zones, a status of “insufficient data” would also have been possible, but was not determined here in order to ensure consistency with past threshold evaluations. All 18 sites mapped by TRPA as waterfowl disturbance zones continue to support waterfowl habitat (i.e., marsh, open water, wet meadow, fen, etc.) indicating that the Region is meeting the adopted standard when interpreted simply with reference to available habitat, regardless of condition. These sites have not been developed or removed as a result of TRPA permitting activities. In addition to mapped waterfowl sites, the Region continues to support more than 300 small lakes and ponds other than those designated by TRPA for threshold evaluation purposes. These other lakes provide habitat for a variety of waterfowl and wetland associated bird species. TRPA regulations related to stream environment zones and the non-degradation threshold management standard for riparian areas also protect these other lakes, ponds, and riparian zones from adverse impacts.

The relative condition of mapped waterfowl sites as assessed using the human activity rating system (TRPA 2001) indicates that the amount of human disturbance at some sites have increased since the 2011 and 2001 assessments. Recreational activity is the most common source of human activity at TRPA designated waterfowl areas. These impacts are difficult to manage because many of them have required no official permit. Land management agencies for some sites, such as the U.S. Forest Service at Taylor Creek Marsh, the California Tahoe Conservancy at Upper Truckee Marsh, and Nevada State Parks at Spooner Lake, have taken steps to manage recreational impacts through trail maintenance and signage. The effectiveness of these recreation management efforts on waterfowl habitat suitability at these sites is unknown, but the actions taken are likely to improve conditions (Korschgen and Dahlgren 1992; Batt et al. 1992).

**Trend** – Little to no change. The summed human activity score for all sites was 39 (mean = 2.3) in 2001, 38 in 2011 (mean = 2.2), and 41 (mean = 2.4) in 2015. In all cases, declines in condition ratings were associated with the level of human activities observed during the 2015 site visits and are not attributed to new

development or permanent changes to the physical habitat characteristics. Overall, the human activity rating has worsened by 0.36 percent per year in relation to the baseline human activity ratings of 2001. Therefore, a trend of little to no change is determined. All sites originally designated by TRPA for waterfowl continue to provide habitat of varying quality; no site has been developed or removed as a result of TRPA permitting activities. When assessed from this perspective, there has been no change in the number of mapped waterfowl sites or the protection of the sites. Relative to 2011, the 2015 assessment of waterfowl habitat condition base on the human activity rating system and indicated that one site improved, 13 sites remained the same, and four sites had a higher human activity.

**Confidence –**

**Status –** Moderate. There is high confidence that all TRPA mapped waterfowl sites still provide some sort of waterfowl habitat regardless of human activity conditions as all sites have been visited by a qualified biologist at least once per threshold evaluation cycle to confirm wetland habitat presence. However, there is low confidence in the measure of habitat condition based on the human activity rating system (TRPA 2001) because (a) the relationship between the rating system and measures of waterfowl habitat use has not been established for the Region, and (b) the 2015 human activity rating was based on a single observation. As a result, observations made in 2015 do not necessarily reflect the full range of human activity at the sites. No comprehensive surveys have been conducted to judge waterfowl’s use of mapped areas since the 2006 Threshold Evaluation Report.

**Trend –** Low. Because of the issues explained in the previous paragraph, confidence in the current monitoring approach to waterfowl habitat to detect trend is low.

**Overall –** Low. Overall confidence takes the lower of the two confidence determinations.

**IMPLEMENTATION AND EFFECTIVENESS**

**Programs and Actions Implemented to Improve Conditions –** TRPA does not permit projects that would impact breeding or migrating waterfowl within mapped waterfowl areas. Additional measures that provide indirect benefits to waterfowl are found in the TRPA Goals and Polices and Code of Ordinances, as well as other local, state and federal laws. A habitat restoration project is planned for the Upper Truckee Marsh by the California Tahoe Conservancy and for Tallac Creek by the U.S. Forest which should enhance habitat conditions at these waterfowl population sites. Annually, the California Tahoe Conservancy closes the Upper Truckee Marsh to dogs during the breeding season. A major environmental improvement project occurred at the Edgewood Golf Course site as part of the Edgewood Lodge project. However, while water quality was improved through the project, potential improvement to waterfowl habitat was not assessed.

**Effectiveness of Programs and Actions –** No formal waterfowl assessments have been completed to evaluate the effects of programs and actions intended to improve wetland/waterfowl habitat conditions. Existing TRPA regulations prevent new projects from directly degrading wetland and riparian habitats, including mapped waterfowl population sites (Code of Ordinances Section 62.3.3). However, several waterfowl population sites coincide with recreation destinations, such as Fannette Island, Fallen Leaf Lake, Lake Baron, and Edgewood Golf Course, which are used extensively for recreational activities and could reduce their suitability to waterfowl for breeding, feeding and resting (Korschgen and Dahlgren 1992).

**Interim Target –** Due to ambiguous standards, it is not possible to set an interim target.

**Target Attainment Date –** Due to ambiguous standards, it is not possible to set a target attainment date.

**RECOMMENDATIONS**

**Analytical Approach –** With improved waterfowl indicators and standards, field observations or remotely-sensed data could be compared to past measurements to establish status and trends (See “Monitoring Approach” below). New research could be valuable for understanding the effectiveness of different recreation management options for reducing impacts at designated sites or otherwise understanding the magnitude of impact resulting from human incursions into population sites.

**Monitoring Approach** – The design of a monitoring approach depends on the set of monitoring questions that an agency desires to answer. Thus, before recommendations can be forwarded to improve TRPA monitoring of waterfowl population sites, it is recommended that desired conditions for waterfowl be documented first, followed by a list of monitoring questions. Once established, performance measures can be identified. Existing data and literature may be available to help establish baseline or reference conditions, from which proposed standards can be recommended for further policy consideration. As a final step, a monitoring plan should be established that can be used to consistently guide monitoring, analysis, and reporting procedures.

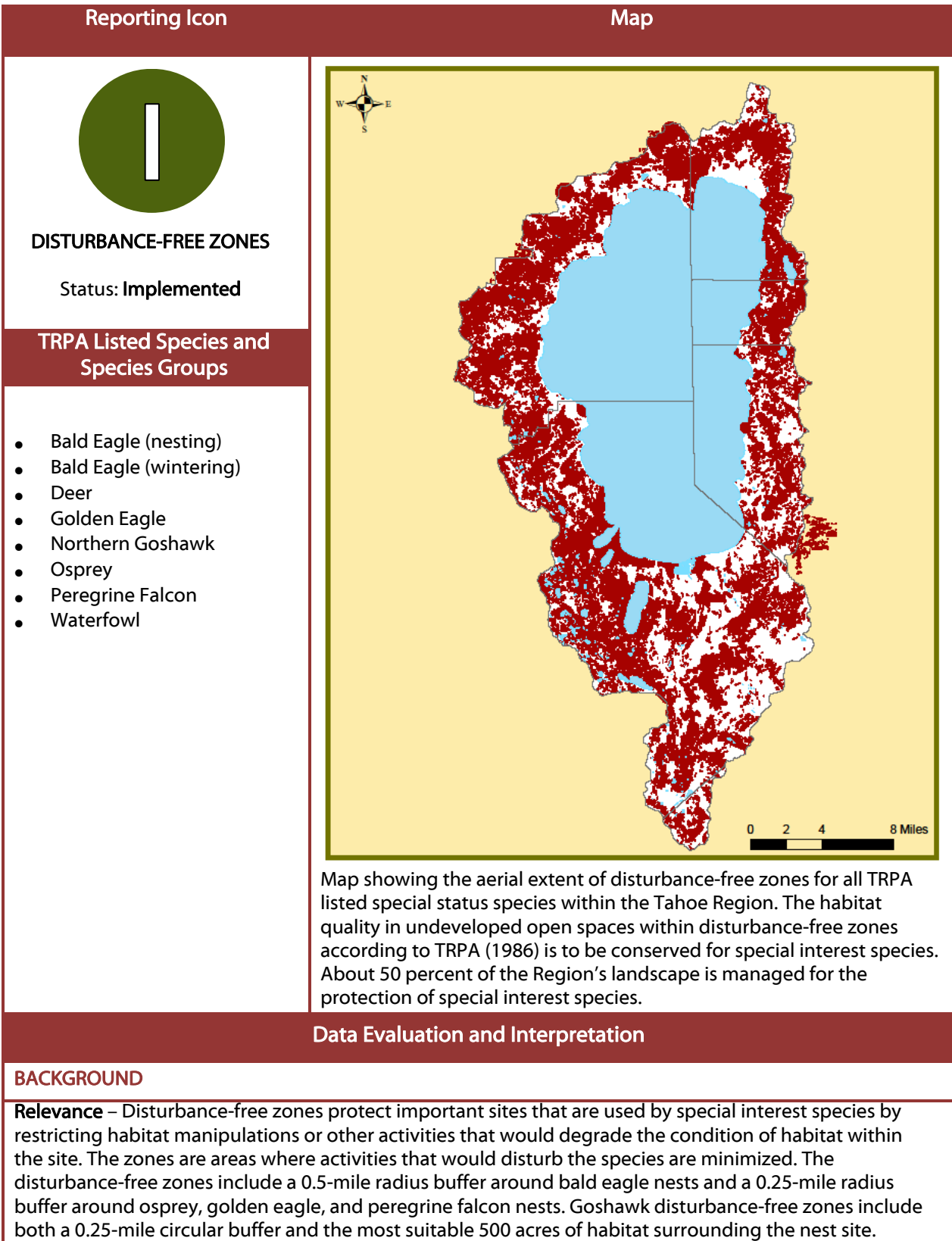
**Modification of Threshold Standard of Indicator** – The current TRPA threshold standard established for waterfowl population sites is ambiguous, which has allowed for attainment status to be interpreted in different ways over time. Objective evaluation of waterfowl habitat would require clearly defining what a population sites is. Evaluation for the threshold standard is further complicated by the fact that “waterfowl” as defined by TRPA are a diverse group of species (TRPA 1982b), within which the response to human disturbance varies significantly (Korschgen and Dahlgren 1992). The representation of a suite of species is unique among TRPA threshold standards for species of special interest, which otherwise focus on a single species. Revision of the standard should consider clarifying its intention. Potential options include one or any combination of the following: place based protection of specific sites; functional protection for areas that serve as waterfowl habitat; or population based targets for individual or multiple waterfowl species. Finally, existing areas that are mapped and adopted for protection of waterfowl are not necessarily the best waterfowl sites in the basin, and updating the maps should be considered. At the time the standard was adopted, it was estimated that 1,640 acres of waterfowl habitat existed within the basin. The currently mapped sites include 2,461 acres.

In general, to improve the robustness on attainment status determinations, TRPA may consider establishing desired conditions for waterfowl and associated habitat as a first step followed by the identification of performance measures and targets for a select set of waterfowl species and/or habitat conditions for the Region. The frequency of indicator/metric measurement would largely depend on the rate at which the parameter of interest changes. For example, for measurements of a focal waterfowl species breeding activity (e.g., number of individuals observed within breeding season), measurements would most appropriately be collected annually, during the breeding season, while measures of vegetation cover may take longer to detect a meaningful change and thus a repeat assessment may occur only over longer periods, such as every four or five years.

**Attain or Maintain Threshold** – TRPA currently maintains several non-degradation policies and regulations that overall provide a framework for protecting wetlands and riparian areas that support waterfowl within the Region. Observations of mapped waterfowl population sites indicate that new development has not impacted these sites, but instead recreational activities are likely a primary factor impacting the suitability of these sites for waterfowl. Additional measures may be considered to reduce the impact of trails, roads, and recreation activities in waterfowl population sites and buffer wetland areas from adverse human activities. Land managers may additionally consider further establishing native vegetation buffers around population sites and providing signage to discourage use during breeding season, encourage users to stay “on-trail,” and keep dogs on leash in sensitive areas.



## Special Interest Species: Disturbance-Free Zones



Specific areas are mapped for wintering bald eagle, mule deer, and waterfowl. A disturbance-free zone also applies to mapped areas of waterfowl habitat, but this management standard is evaluated separately in combination with the numerical standard for waterfowl. These special interest species receive protection because they are locally important due to their rarity and/or exceptional public interest for wildlife viewing.

**TRPA Threshold Category** – Wildlife

**TRPA Threshold Indicator Reporting Category** – Special Interest Species

**Adopted Standards** – Provide disturbance-free zones around population sites or mapped areas for species of special interest.

**Type of Standard** – Management

**Indicator (Unit of Measure)** – Whether or not the TRPA Goals and Policies continue to support the maintenance of disturbance-free zones.

**Human and Environmental Drivers** – The suitability of habitat within disturbance-free zones can be affected by construction, and recreational or commercial uses including dog walking, biking, off road vehicle use, or boating. The impacts of these activities vary with their timing, duration, intensity, frequency, and location (Knight and Gutzwiller 1995; Liddle 1997). Some special interest species are more sensitive to these activities than others, but in general, these types of disturbance can cause animals to vacate an area, be unsuccessful at breeding, or otherwise reduce their chances of survival by increasing energy expenditures associated with avoiding the disturbance and reducing foraging time (Liddle 1997; Knight and Gutzwiller 1995).

#### **MONITORING AND ANALYSIS**

**Management Partners** – The U.S. Forest Service, Nevada Department of Wildlife, California Tahoe Conservancy, California Department of Parks and Recreation, as well as local jurisdictions, all contribute to the management of disturbance-free zones for special interest species.

**Monitoring Approach** – No active monitoring was conducted as this standard has been implemented.

**Analysis Approach** – Determination was based on evidence that the TRPA Goals and Policies continue to support the maintenance of disturbance-free zones.

#### **INDICATOR STATE**

**Status** – Implemented. The management standard has been implemented by TRPA and other partner agencies. As described below, significant regulations are in place to protect disturbance-free zones from formal uses that would degrade their condition. The TRPA Code of Ordinances describes disturbance-free zones for northern goshawk, bald eagle, osprey, peregrine falcon, and golden eagles; prohibits actions that would significantly impact their habitat or lead to the local extirpation or displacement of a population; and authorizes TRPA to require special conditions to mitigate or avoid impacts to special interest species (TRPA 2012c). A land capability system is implemented through the TRPA Code of Ordinances, which significantly limits development or other disturbance in low capability lands (TRPA 2012b). These low capability lands coincide with mapped areas of mule deer fawning habitat, providing protection for fawning habitat. TRPA also requires a formal environmental review including consideration of alternatives and mitigation measures when a project may have a significant impact on special interest species or other thresholds (TRPA 2012c). Prior to approving any project, TRPA must make specific findings demonstrating that the project is consistent with the Code of Ordinances and will not exceed any threshold standards, including requirements for the protection of disturbance-free zones for special interest species (TRPA 2012c). Code Chapter 13.5.3.5 attempts to minimize light pollution in project design to minimize impacts while providing adequate lighting for public safety (TRPA 2012c).



## IMPLEMENTATION AND EFFECTIVENESS

**Programs and Actions Implemented to Improve Conditions** – Significant regulatory protections exist in the TRPA Code of Ordinances that prohibits human-caused habitat degradation within disturbance-free zones. In the current reporting period where data is available (2011 through 2014), approximately 1,433 acres of wildlife habitat have been enhanced or restored, 116 acres of wildlife habitat have been protected, six acres of environmentally sensitive lands have been acquired, 131 acres of wetland and stream environment zones have been restored, and 13,594 acres of forested lands have been treated for fuels reduction and improved forest health (TRPA 2016). These projects have been designed to benefit a number of natural resources including improving habitat conditions for special interest species. Northern goshawks and bald eagles are also considered sensitive species by the U.S. Forest Service, and they receive additional consideration in all management decisions affecting Forest Service lands.

**Effectiveness of Programs and Actions** – Existing regulations have protected the habitat structure for special interest species within disturbance-free zones, and have protected species within these zones from direct impacts associated with construction projects or resource management actions. Environmental Improvement Program projects have expanded key habitat types, such as wet meadows, and have treated forested areas to promote late seral stands, which can be beneficial to several special interest species. However, recent research has indicated that recreational use is impacting the suitability of habitat for at least one special interest species (Morrison et al. 2011), and other species groups such as waterfowl may also be affected by dispersed recreational uses (Liddle 1997; Knight and Gutzwiller 1995).

## RECOMMENDATIONS


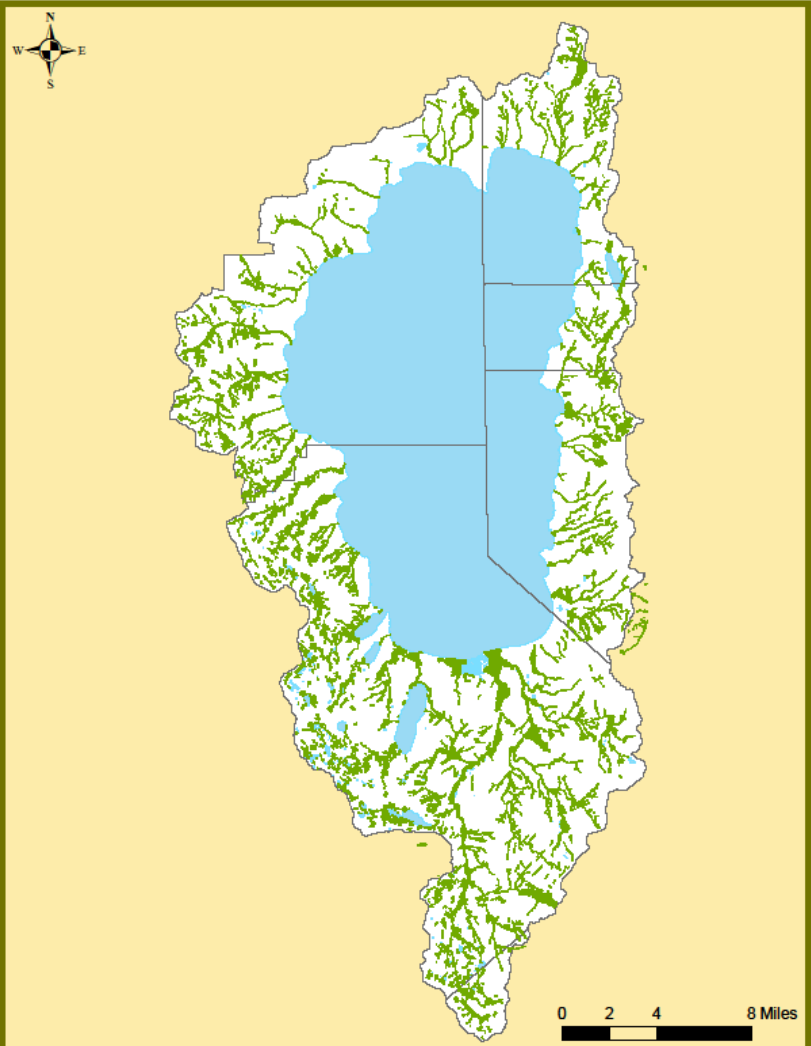

**Analytical Approach** – No changes recommended.

**Monitoring Approach** – No changes recommended.

**Modification of Threshold Standard of Indicator** – No changes recommended.

**Attain or Maintain Threshold** – No changes recommended.

## Habitats of Special Significance: Riparian Habitat

Reporting Icon	Map
 <p data-bbox="289 562 511 592"><b>RIPARIAN HABITAT</b></p> <p data-bbox="279 625 521 655">Status: <b>Implemented</b></p>	
<p data-bbox="357 688 451 718"><b>Photos</b></p> 	<p data-bbox="620 1396 1421 1486"><b>Above:</b> Map showing the extent and distribution of riparian areas (green) protected by the habitats of special significance management standard and other policies.</p> <p data-bbox="620 1522 1372 1579"><b>Left:</b> Images of representative riparian areas protected by TRPA's habitats of special significance management standard.</p>
Data Evaluation and Interpretation	
<p data-bbox="219 1675 393 1705"><b>BACKGROUND</b></p> <p data-bbox="219 1722 1421 1875"><b>Relevance</b> – Riparian and wetland areas contain a mosaic of vegetation communities, moisture gradients, and microclimates that make them some of the most diverse and productive terrestrial areas for wildlife (Kondolf et al. 1996). Riparian and wetland areas occupy a small percentage of lands within the basin, but they support more wildlife species than any other vegetation types (Kattleman and Embury, 1996). For example, in an area with similar environmental conditions in the nearby Inyo National</p>	

Forest, riparian and wetland areas occupied less than one percent of the land area but were important to 75 percent of the local wildlife species (Kondolf et al. 1987). The same areas are desirable for human-related uses, which have resulted in the degradation of 75 percent of all marshes and 50 percent of all meadows within the basin (Kattleman, R and Embury, M 1996)(Manley et al. 2000). Since riparian and wetland areas are relatively rare and important compared to other vegetation types, even small modifications to these areas can have a greater impact on wildlife species than modifications in other areas (Lindstrom, Rucks, and Wigand 2000; Elliot-Fisk et al. 1996).

**TRPA Threshold Category – Wildlife**

**TRPA Threshold Indicator Reporting Category – Habitats of Special Significance**

**Adopted Standards – TRPA:** *"A nondegradation standard shall apply to significant wildlife habitat consisting of deciduous trees, wetlands, and meadows while providing for opportunities to increase the acreage of such riparian associations."* The U.S. Forest Service and state agencies also implement applicable management standards that protect riparian areas.

**Type of Standard – Management**

**Indicator (Unit of Measure) –** Whether TRPA Goals and Policies continue to support the protection of "wildlife habitat consisting of deciduous trees, wetlands, and meadows."

**Human and Environmental Drivers –** The condition of riparian and wetland areas within the Tahoe basin is in large part a result of past land uses. The functions of wetlands, streams and surrounding riparian areas have been degraded through historic logging, grazing, and direct manipulation of channels. These past land uses reduced the extent, health, and natural function of Tahoe's riparian and wetland areas, and their suitability for many wildlife species (Lindstrom, Rucks, and Wigand 2000; Elliot-Fisk et al. 1996). Ongoing restoration programs are a primary factor affecting the condition of riparian and wetland areas (Elliot-Fisk et al. 1996). These restoration projects may temporarily degrade habitat quality during and immediately following construction, but they result in a long-term increase in the extent and health of riparian and wetland vegetation, and improved habitat conditions for multiple species. Other factors affecting the suitability of riparian and wetland areas include weather fluctuations and climate change, influences of non-native species (e.g. brown-headed cowbird or noxious weeds), and disturbance from recreational uses (Kondolf et al. 1996; Kattleman, R and Embury, M 1996; Manley, P.N. et al. 2000).

**MONITORING AND ANALYSIS**

**Management Partners –** The U.S. Forest Service, Nevada Division of State Lands, California Tahoe Conservancy, Nevada Division of State Parks, and California Department of Parks and Recreation.

**Monitoring Approach –** No active monitoring was conducted as this standard has been implemented.

**Analysis Approach –**Qualitative assessment of whether there is evidence of TRPA support for the management standard.

**INDICATOR STATE**

**Status –** Implemented. The Region is in attainment with this management standard. Regulations are in place to protect riparian and wetland areas from permanent disturbance such as residential and commercial development, and a restoration program has been underway to actively expand and restore riparian areas. The TRPA Code of Ordinances implements a land capability system that significantly limits development in riparian or wetland areas and provides incentives to relocate existing development from these areas to upland areas (TRPA 2012c). With few exceptions, the TRPA Code of Ordinances prohibits the manipulation of vegetation that would permanently impact riparian or wetland integrity (TRPA 2012c). TRPA is required to conduct a formal environmental review, including consideration of alternatives and mitigation measures, when a project may have a significant impact on habitats of special significance or other threshold standards (TRPA 2012c). Prior to approving any project, TRPA

must make specific findings demonstrating that the project is consistent with the Code of Ordinances and will not exceed any threshold standards, including requirements for protecting the integrity of riparian and wetland areas (TRPA 2012c). TRPA administers the interagency Environmental Improvement Program which implements projects to restore, protect, enhance and expand riparian and wetland areas.

#### **IMPLEMENTATION AND EFFECTIVENESS**

**Programs and Actions Implemented to Improve Conditions** – Significant regulatory protections exist in the TRPA Code of Ordinances, which prohibit habitat degradation within riparian and wetland areas. In the current reporting period where data is available (2011 through 2014), the Environmental Improvement Program has helped protect and expand habitats of special significance. This includes protecting 74 acres of aspen habitat, as well as restoring or enhancing 294 acres of aspen habitat, 285 acres of wetlands and wet meadows, and 263 acres of stream environment zones (TRPA 2016). Land management agencies have redirected potentially detrimental recreational uses away from riparian areas through projects such as the High Meadows Restoration or the Eagle Rock Trail re-alignment. In addition, the U.S. Forest Service and other agencies have actively removed conifers that have encroached into aspen stands and meadows in order to maintain and re-establish riparian areas.

**Effectiveness of Programs and Actions** – Since the adoption of the 1987 TRPA Regional Plan, TRPA's application of regulations has protected the integrity of riparian and wetland habitat structure (Raumann and Cablk 2008), which in turn has protected riparian- and wetland-dependent species from direct impacts associated with construction projects or resource management actions. These protections were carried forward in the Regional Plan update in 2012 (TRPA 2012b). Environmental improvement projects have expanded the extent of, and improved conditions within, riparian and wetland areas. Other projects have routed recreational access away from riparian and wetland areas.

#### **RECOMMENDATIONS**

**Analytical Approach** – No changes recommended.

**Monitoring Approach** – No changes recommended.

**Modification of Threshold Standard of Indicator** – No changes recommended.

**Attain or Maintain Threshold** – Continue to support projects that restore or enhance riparian and wetland areas, reconnect streams to flood plains, and stop conifers from encroaching into riparian areas as a result of fire suppression.

## Chapter 8 Wildlife References

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