



Lake Tahoe Region AIS Action Plan

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Creative
Resource
Strategies



Lake Tahoe

- Outstanding National Resource Water
- Aquatic Invasive Species
 - Eurasian watermilfoil
 - Curlyleaf pondweed
 - Asian clams
 - Warm water fishes
 - Bullfrogs
 - Aquatic invertebrates





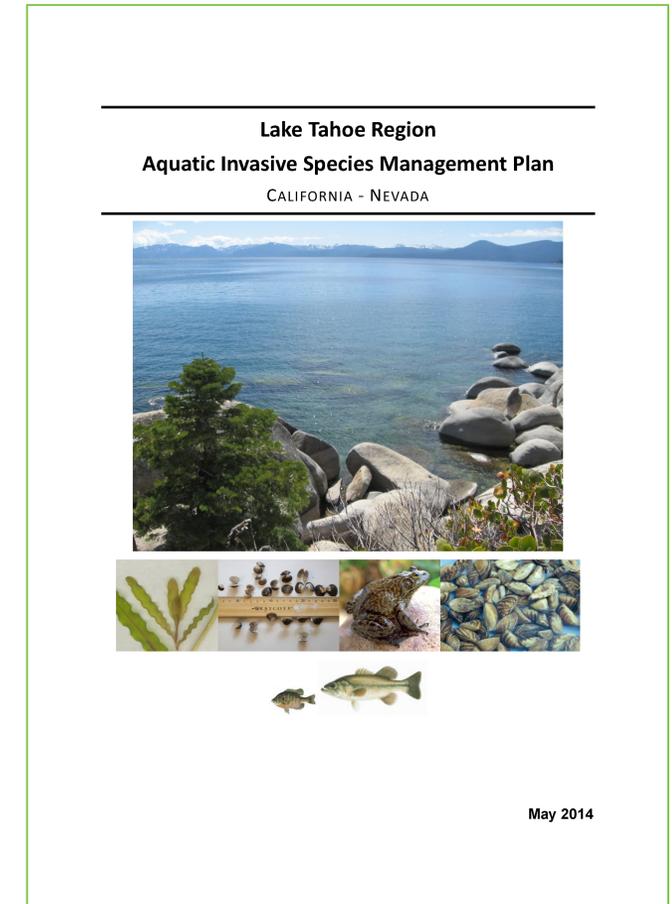
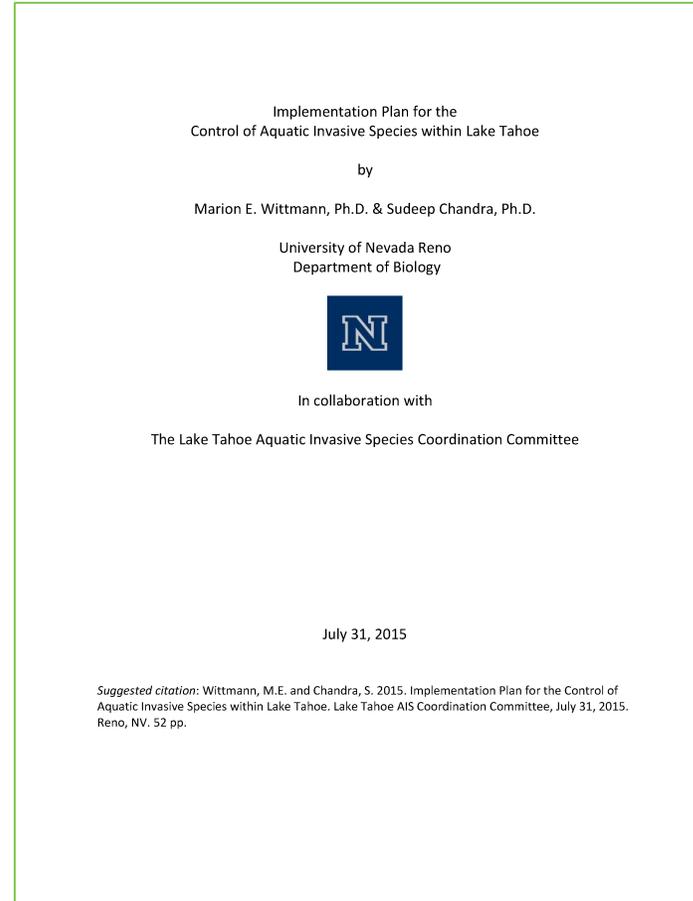
- Prevent new introductions of AIS to Lake Tahoe Region
- Limit the spread of existing AIS populations in the Lake Tahoe Region, by employing strategies that minimize threats to native species, and extirpate existing AIS populations when possible
- Abate harmful ecological, economic, social and public health impacts resulting from AIS

Lake Tahoe AIS Program

The Lake Tahoe AIS Program partnership is led by the Tahoe Regional Planning Agency with tremendous participation, support and commitment from over 40 agencies and private partners. The program has made great strides in combating invasive aquatic species for more than a decade with no new invasions and localized eradication of some plant species. The partnership recognizes the need to take the next step and build on that success by enhancing strategic planning with the development of the Action Plan. The Plan will give the partnership real measures to track success and plot a course to achieve program goals. It's development and ultimate implementation is guided by a coordinating committee of agencies and organizations with input from the science community including financial and management support from the CA Tahoe Conservancy.

FOUNDATION

- Lake Tahoe AIS Management Plan
- Lake Tahoe AIS Implementation Plan
- The third in the trilogy – Lake Tahoe AIS Action Plan



PROCESS

- Develop a work plan, process, and timeline for overall project.
 - Conduct stakeholder survey to obtain input and perspectives on how to define success, potential performance metrics, perspectives on the efficacy of control actions to date, assessment of support for funding control actions.
 - Synthesis of existing plans and documents (e.g., management plan, implementation plans, TRPA thresholds, EIP tracker metrics, water quality objectives) to ensure alignment with Action Plan actions.
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- Develop a draft Action Plan.
 - Develop two tiers of funding work groups to identify traditional and non-traditional sources of funding for Action Plan implementation.
 - Present the Action Plan and Investment Plan at the Lake Tahoe Annual Summit.

CORE ELEMENTS OF ACTION PLAN

- Defining success (survey and interviews)
 - Key gaps and challenges (e.g., no emergency fund)
 - Performance metrics that could be incorporated into the EIP tracker and better assess progress in controlling AIS – metrics based on outcomes versus effort
 - Asset management approach
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- Marina Partnership Strategy
 - Action Plan with priorities and budget
 - Permits needed

Survey Highlights

- How regional stakeholders
 - Define success
 - Evaluate the efficacy of control efforts to date
 - Describe who should be responsible for funding IS efforts
 - Evaluate progress and success through performance metrics

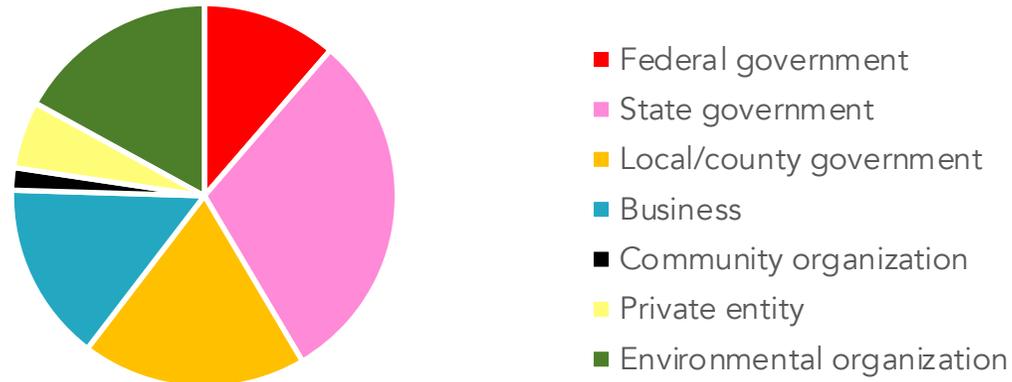
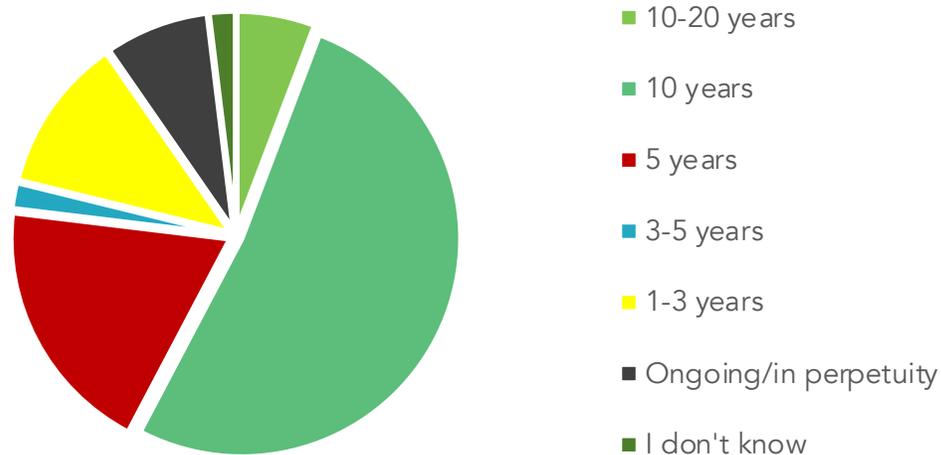


Figure 1. Entities that completed Lake Tahoe Region AIS Control survey instrument (n=54).

Defining Success



- Prevent introduction and establishment of new AIS
- Prevent the spread of existing AIS
- Control
- Conduct lake-wide monitoring
- Fund priorities, EDRR and monitoring
- Enhance partnerships with marinas
- Obtain necessary permits
- Pilot AIS technologies and strategies
- Achieve buy-in and support by public and private sector

Figure 2. Time frame to achieve success for AIS efforts in the Lake Tahoe region ranged from one year to 10–20 years (n=52).

Responsible for AIS Control

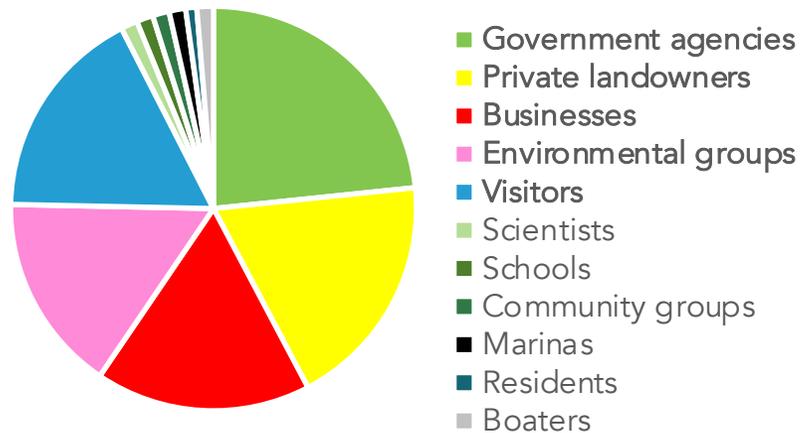


Figure 4. Entities that should be responsible for controlling AIS in the Lake Tahoe region (n=53).

Rating Effort

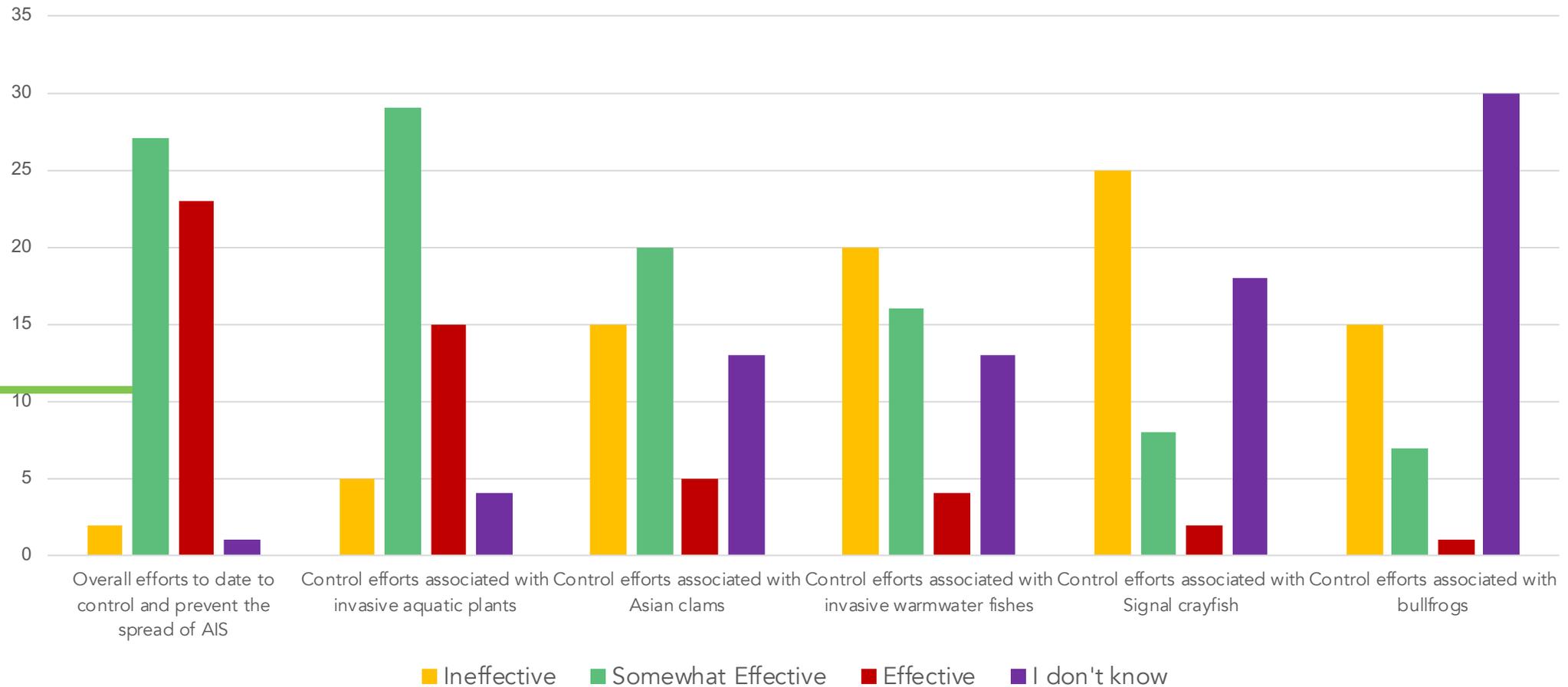


Figure 5. Ratings of efforts associated with control of AIS in the region (n=53).

Criteria to Prioritize Efforts

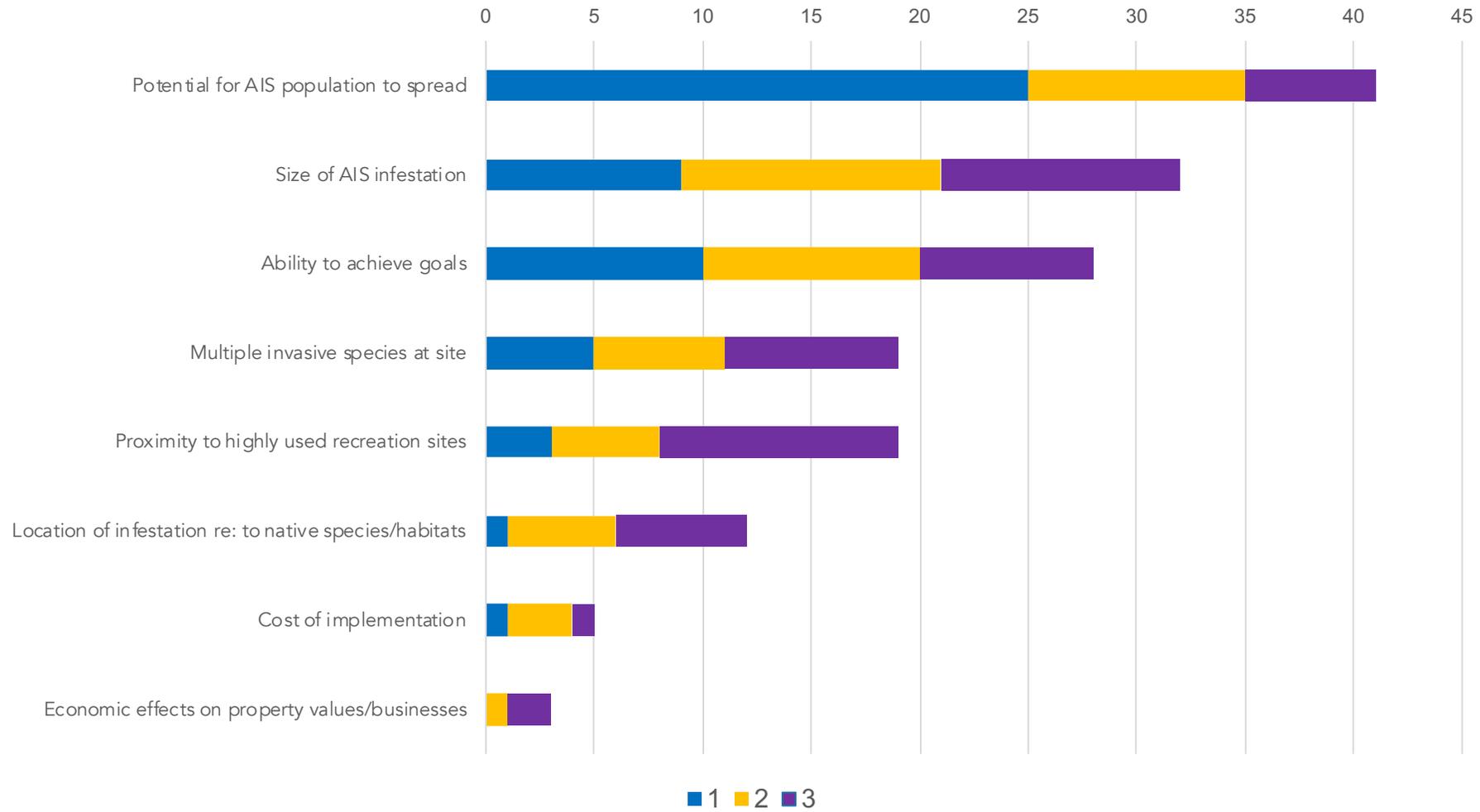


Figure 6. Criteria that should be used to prioritize AIS control efforts (n=53).

Resources Expended

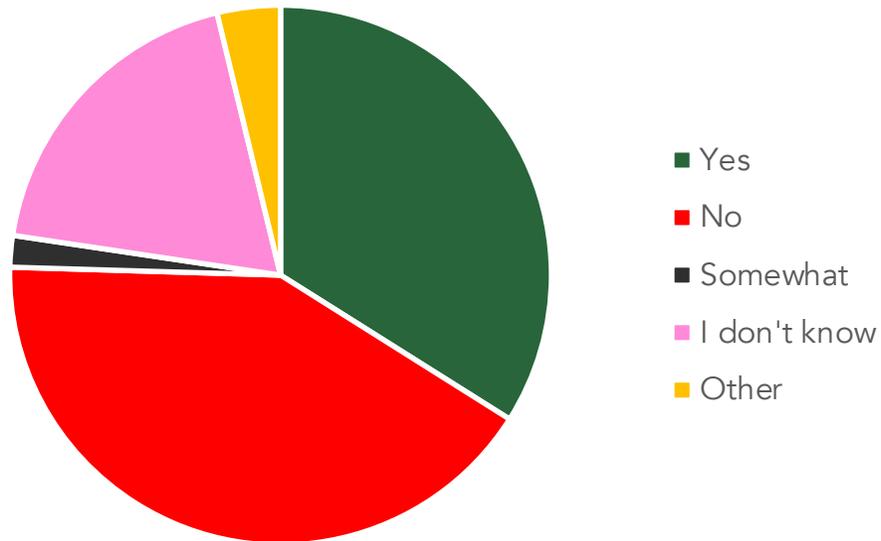


Figure 7. Satisfaction with the amount of resources that have been expended since 2010 to control AIS in the region (n=53).

Who Should Pay?

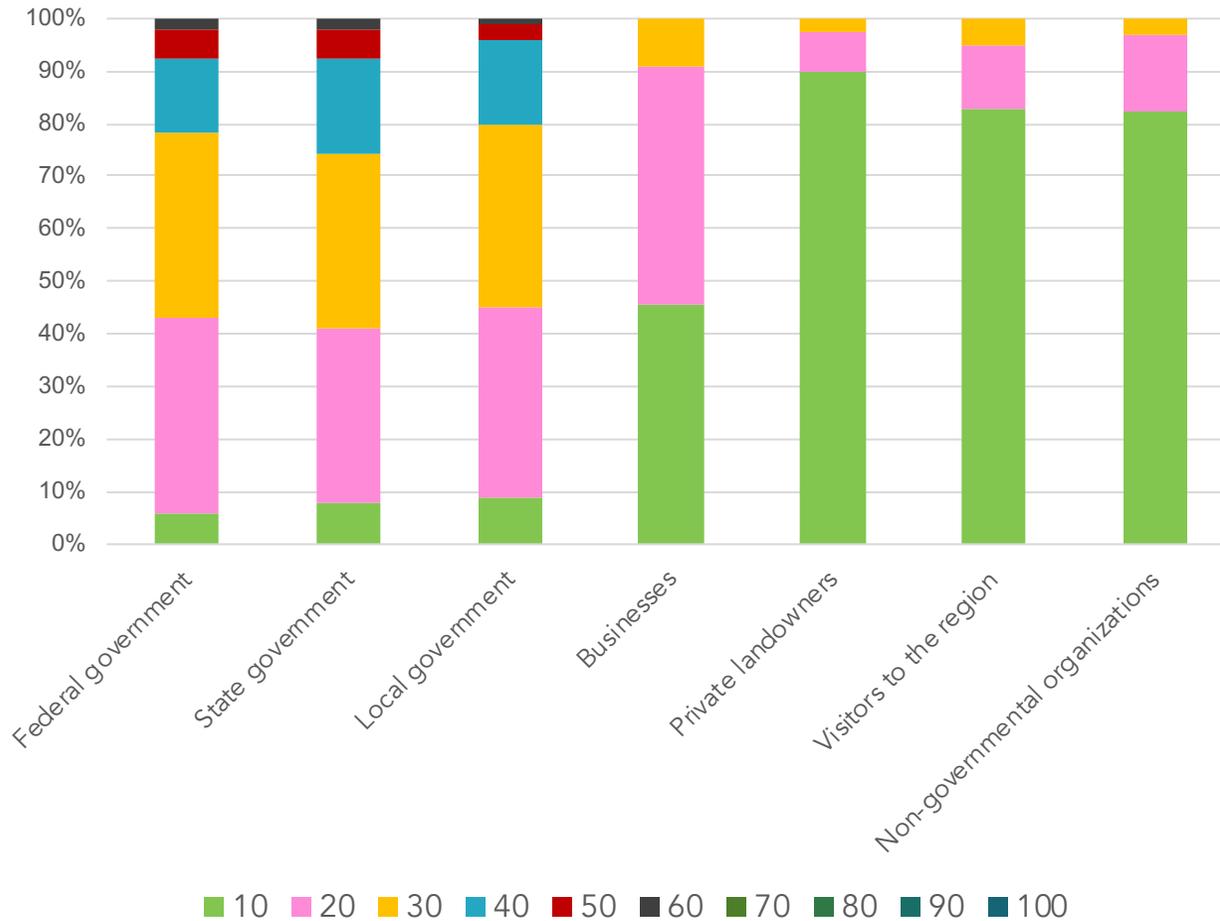


Figure 8. Percentage of funding entities should contribute to AIS in the region (n=53).

Metrics to Evaluate Success

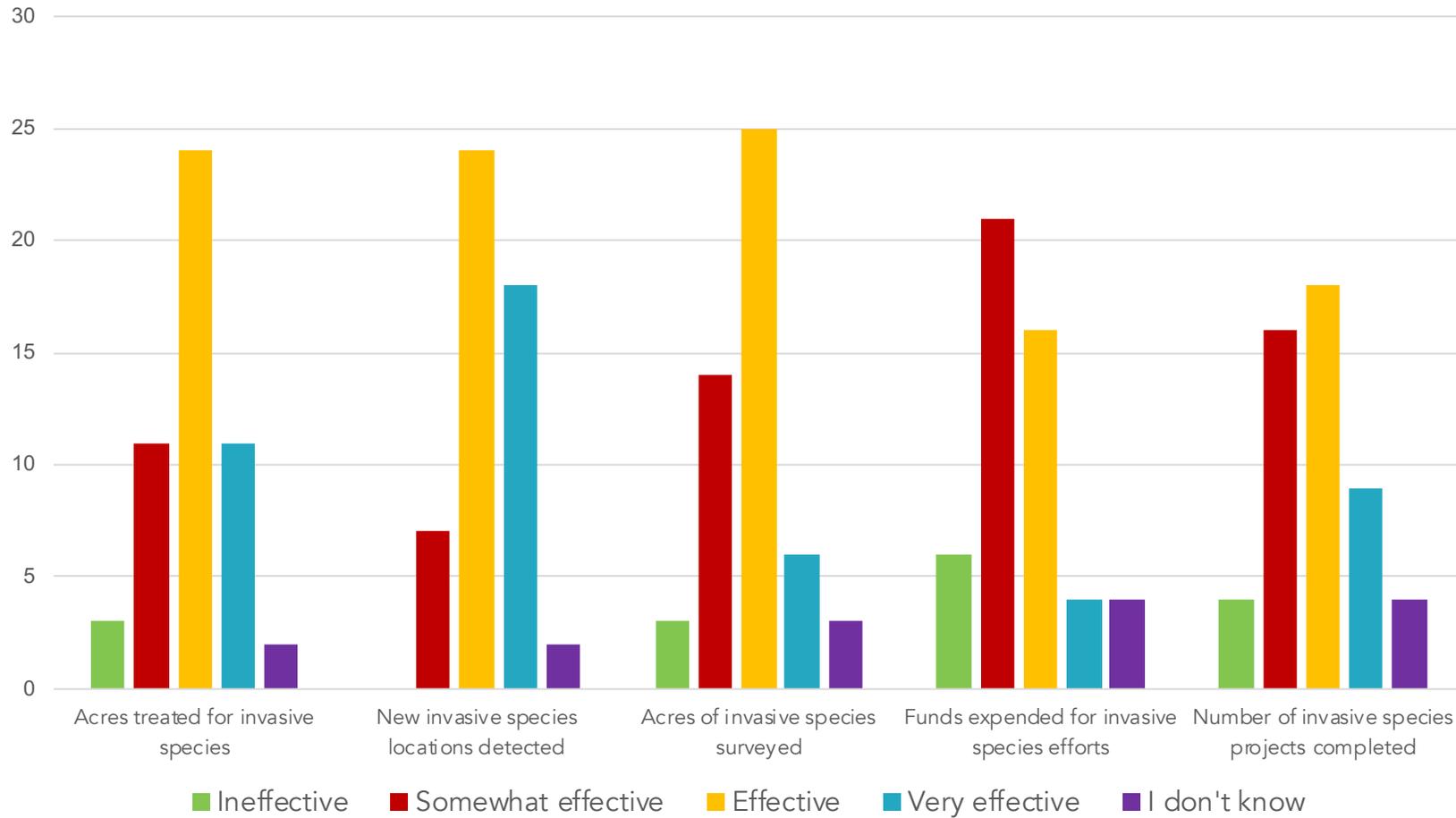


Figure 9. Rating of effectiveness of five Environmental Improvement Project performance measures relative to their ability to evaluate progress in protecting the biological diversity of the Lake Tahoe region from AIS (n=51).

New Performance Metrics

Existing Metrics – Focus on **effort**

- Acres treated
- New locations detected
- Acres surveyed
- Funds expended
- # of AIS projects completed

Proposed Metrics – Focus on **outcomes**

- % increase or decrease in infested area (acres) per species
- No new AI plant populations become established in the region
- Reductions in warm water fish biomass and size classes in regions of Lake Tahoe
- Reductions of Signal crayfish in designated regions
- Reductions of bullfrogs in designated regions

Lake Tahoe Aquatic Invasive Species Action Plan, 2021–2030.

Table 2. Administration/Management strategies, performance metrics and budget, 2021–2030. Note: Costs were based on estimated acreages and control methods (Appendix G).

I. Administration/Management												
Strategies	Desired Outcomes	Lead	Phase I Costs and Timeline					Phase II Costs and Timeline				
			2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1A. Bi-annually document high-risk invasive species that have the potential to cause the greatest ecological, economic and social harm to the region. Define pathways of introduction.	By December 2020, conduct a high-risk AIS assessment to identify potential high-risk species and pathways of introduction that pose significant environmental, economic, and/or cultural impacts to the region.	TRPA		\$60K		\$60K			\$60K		\$60K	\$60K
1B. Expand the capacity of the LTAISCC to incorporate scientists as LTAISCC members (funds flow through LTAISCC).	Fund, by 2021, a Tahoe Science Advisory Council designee to represent the scientific community at the LTAISCC meeting on a consistent basis.		\$20K	\$20K	\$20K	\$20K	\$20K	\$20K	\$20K	\$20K	\$20K	\$20K
1C. Establish an AIS partnership program at Lake Tahoe with industry, marinas and others to enhance prevention and control efforts.	By 2025, ensure 1 or more Lake Tahoe locations participates in a partnership program to advance infrastructure advancements at marinas and other lake locations.		\$2M									
1D. Establish a \$2 million Emergency Fund for the Lake Tahoe region to address new invasive species introductions to the region.	By 2025, a \$2 million Emergency Fund is established.	TRPA	\$2M									
1E. Add capacity to TRPA and Tahoe RCD to ensure adequate staffing exists to implement this Action Plan.	By 2021, staffing capacity has been added to TRPA and Tahoe RCD to administer and implement this plan.	TRPA, Tahoe RCD	\$600K	\$600K	\$600K	\$600K	\$600K	\$600K	\$600K	\$600K	\$600K	\$600K
1F. Environmental documentation for the Tahoe Keys – 2 nd round for stakeholder engagement.	Conduct a second round of environmental documentation.	TRPA			\$1.5M							
TOTALS			\$8,720,000					\$3,280,000				

Table 3. Aquatic invasive plant strategies, performance metrics and budget, 2021–2023.

I. Aquatic Invasive Plants												
Strategies	Performance Metrics	Lead	Phase I Costs and Timeline					Phase II Costs and Timeline				
			2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
<p>2A. Establish the baseline for AI plant infestation in upstream portions of the lake (to complement the lake-wide survey recently completed).</p> <p>2B. Implement a full suite of control actions, using an integrated management approach, to reduce the abundance and distribution of AIS in regional waters (see Table 3A for a prioritized list of locations and actions).</p> <p>2Ba. Lake-wide, with the exception of Tahoe Keys</p>	<p>% increase or decrease in infested area (acres) per species</p> <p># of AIS-infested acres</p> <p>By 2030, reduce by 90%, the acreage of AI plant populations in priority areas (and their upstream components) identified in the Implementation Plan as well as any additional areas that have been identified since plan creation (excluding Tahoe Keys).</p>	TRPA	\$2.5M	\$2.5M	\$2.5M	\$2.5M	\$2.5M	Maintenance of an estimated 25 acres annually x \$50,000/acre = \$1.25M annually x 5 years = \$6.25M				
2Bb. Tahoe Keys	<p><u>Tahoe Keys*</u></p> <p>By 2030, reduce by 75%, AI plant populations in the Tahoe Keys.</p>		\$1M	\$1M	\$1M	\$4M**		Estimated \$100,000/acre x 172 acres = \$17.2 M				
2C. Implement EDRR control actions to ensure no new AI plant populations become established in the region.	Annually, no new AI plant populations become established in the region.	TRPA	\$250,000/annually = \$1.25 million					\$250,000/annually = \$1.25 million				
TOTALS			\$20,750,000					\$24,700,000				

Table 4. Warm water fish, aquatic invasive invertebrate, and invasive amphibian control strategies, performance metrics and budget, 2021–2030.

I. Warm Water Fish, Aquatic Invertebrates, Bullfrogs												
Strategies	Performance Metrics	Lead	Phase I Costs and Timeline					Phase II Costs and Timeline				
			2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Warm Water Fish 3A. By 2030, reduce by 90%, warm water fish biomass (densities measured as Catch Per Unit Effort) and size classes in Tier 1 areas and Tier 2 areas via mechanical removal (electroshocking and targeted warm water fish nest control).	Reductions in warm water fish biomass and size classes in regions of Lake Tahoe.	TRPA	\$275K	\$275K	\$275K	\$275K	\$275K	\$244K	\$244K	\$244K	\$244K	\$244K
Aquatic Invasive Invertebrates 3B. Depress Signal crayfish to population levels that minimize impacts to ecosystem function in designated regions of the lake.	Reductions of Signal crayfish in designated regions (e.g., Crystal Bay) of Lake Tahoe.		\$250K	\$250K	\$250K	\$250K	\$250K	\$125K	\$125K	\$125K	\$125K	\$125K
Invasive Amphibians 3C. Depress bullfrogs to population levels that minimize impacts to ecosystems function in designated regions of the lake.	Reductions of bullfrogs in designated regions (e.g., Crystal Bay) of Lake Tahoe.											
TOTALS			\$2,625,000					\$1,845,000				

monitoring tools, such as eDNA, to enhance detection of organisms and the probability of capturing eDNA.	tools are developed to enhance organism detection.												
4B. Conduct experimental studies to determine the ability to regionally depress Signal crayfish populations.	Determine the population levels of Signal crayfish that minimize ecosystem function in regions of Lake Tahoe.												
4C. Conduct a broad spectrum nearshore-wide census every 2 years for six years, and then once every 5 years; conduct in situ diver survey transects and drone surveys at 25 priority locations during intervening years.	Description of AI plant species, abundance, and distribution in the nearshore of Lake Tahoe.						\$375K					\$400K	
	Description of AI plant species, abundance, and distribution in the nearshore, tributary, and marsh areas of Lake Tahoe by monitoring via snorkeling during summer months.	\$244K	\$244K	\$244K	\$244K	\$244K	\$244K	\$244K	\$244K	\$244K	\$244K	\$244K	
4D. Conduct monitoring to assess the distribution, abundance and population size/biomass of Signal crayfish in the Lake Tahoe region. (target breeding populations).	Description of warm water fish, Signal crayfish distribution, abundance and population size/biomass based on monthly surveys during the summer months.	\$122K	\$122K	\$122K	\$122K	\$122K	\$122K	\$122K	\$122K	\$122K	\$122K	\$122K	
4.E. Conduct annual monitoring to assess the distribution, abundance and population size/biomass of warm water fish and native fish in Lake Tahoe’s nearshore via 3-4 snorkel surveys in the littoral zone during warm summer months (Chandra et al. 2009) (target breeding populations).	Evaluate the effect of non-native fish biomass on native fish abundance and distribution.												
4F. Target monitoring: Conduct annual monitoring to assess the distribution, abundance and population size/biomass of bullfrogs in the Lake Tahoe region. (target breeding populations).	Description of bullfrog distribution, abundance and population size/biomass.	\$122K	\$122K	\$122K	\$122K	\$122K	\$122K	\$122K	\$122K	\$122K	\$122K	\$122K	
4G. Invest in new technologies that support AIS control efforts in the region.	New technologies are tested that advance AIS control efforts while minimizing negative effects to the region’s beneficial uses.	\$250K	\$250K	\$250K	\$250K	\$250K	\$250K	\$250K	\$250K	\$250K	\$250K	\$250K	
TOTALS							\$5,490,000						\$4,965,000

Table 6. Total estimated costs for administration, aquatic invasive plant control, warm water fish, aquatic invertebrate, and bullfrog control, and aquatic invasive species research and monitoring, 2021–2030.

	Phase I	Phase II
Administration	\$8,720,000	\$3,280,000
Aquatic Plants	\$20,750,000	\$24,700,000
Warm water fish, aquatic invasive invertebrates, invasive amphibians	\$2,625,000	\$1,845,000
Research and Monitoring	\$5,490,000	\$4,965,000
SUBTOTALS	\$37,585,000	\$34,790,000
TOTAL		\$72,375,000

Category	Location	Habitat*	2015 Implementation Plan Priority	2019 Action Plan Categories	EWM	CLPW	WWF	Status of Infestation	Current estimated acreage of infestation (acres)	Acreage of infestation prior to treatment	Acreage of survey area
Tier 1	Pope Marsh	M		A	X			active treatment 2019 - portion	1	1	175
	Tahoe Keys Main Lagoon (CA)	MR/E	1, 2	A	X	X	X	untreated	172	172	172
	Tahoe Keys Channels Complex	O	1,2	A	X	X	X	untreated	10	unknown	175
	Taylor (6) and Tallac (2) Creeks (CA)	M	8	A	X	X	X	untreated	8	n/a	10
	Upper Truckee Marsh (CA)	M		A	X	?	X	untreated	3	3	5
	Upper Truckee River	T	18	A	X		X	untreated			
	Edgewood Creek and Pond Complex (NV)	U		B	X	X	X	untreated	10	n/a	20
	Lakeside Beach (CA)	O	12	B			X		1.5		2
	Lakeside Marina (CA)	MR	6	B	X	X	X	active treatment 2019	1	3	1
	Meeks Marina and Creek	MR/T	3	B	X		X	active treatment 2019	3	3	3.5
	Ski Run Marina (CA)	MR	4	B	X	X	X	untreated	0.5	n/a	0.5
	Ski Run Channel (CA)	O	4	B	X	X	X	untreated	3.5	n/a	5
	Baldwin Beach (offshore)	O		C	X	X	X	active treatment 2019	0.25	0.25	20
	Camp Richardson Pier	O	18	C	X		X	active treatment 2019	0.25	0.25	6
	Elk Point Marina	MR	15	C	X	X	X	active treatment 2019	0.5	0.5	0.75
Timber Cove Pier	O	14	C	X	X	X	active treatment 2019	0.25	0.25	1	
Tier 2	Elk Point and Round Hill rock cribs shoreline	E			X			active treatment 2019	3	3	18
	General Creek	T			X			active treatment 2019	0.1	0.1	0.25
	Logan Shoals Marina	MR	17		X			untreated	1.75	1.75	2
	Lower Truckee river below dam	T			X			active treatment 2019	17	20	25
	Regan Beach	O	7					unknown-not surveyed in 2018	0.1	0.1	10
	Tahoe Beach Club (NV beach)	T			X			active treatment 2019	0.3	0.3	0.5
	Wevoka Estate Marina	MR			X			active treatment 2019	0.1	0.1	0.25
EDRR Sites	Boatworks/Tahoe City Marina	MR	18	All of these sites are priority sites for EDRR.			X	no plants present 2018	0	unknown	15
	Burke Creek (NV beach)	T			X			surveillance mode	0	0.1	0.5
	Crystal Shores East (NV)	MR			x		X	surveillance mode	0	0.5	0.5
	Crystal Shores Villas (NV)	MR			x		X	surveillance mode	0	0.5	0.5
	Crystal Shores West (NV)	MR	9		x		X	surveillance mode	0	n/a	0.5
	Emerald Bay, Avalanche Beach, Vikingsholm, and Parson's Rock	O	18		X	X	X	surveillance mode	<0.1	6	30
	Fleur du Lac Marina	MR			X			surveillance mode	0	0.5	2.5
	Glenbrook	O			X			surveillance mode	0	0.1	7
	Nevada Beach	O	16					no plants present 2018	0	unknown	15
	Star Harbor	MR/E						surveillance mode	0	unknown	2
	Sunnyside Marina	MR	18				X	no plants present 2018	0	unknown	1
	Tahoe City Dam	O/T	5		x		X	surveillance mode	<0.10 acre	0.2	2
	Tahoe Tavern	O	13					no plants present 2018	0	unknown	0.25
Tahoe Vista boat ramp	MR		X			surveillance mode	0	0.2	0.5		
Zephyr Cove	O					surveillance mode	0	unknown			

Next Steps

- Finalize the prioritized “battle plan” from 2021-2030, identifying specific locations, acreages and treatments on an annual basis – include budgets (June 2019)
- Form a two-tier Lake Tahoe Restoration Initiative Strategic Investment Group (TRISIG) to identify potential sources of funding to implement Action Plan (July and August 2019)
- Finalize plan with Investment Strategy (August 2019)
- Meet with marinas to form a marina partnership strategy – 2020.