COMMITTEE STAFF SUMMARY FOR SEPTEMBER 15, 2022 WRC

10. BULLFROGS AND NON-NATIVE TURTLES

Today's Item **Information ☒** **Action ☐**

Receive options for potential future actions and discuss preliminary results and analysis from the American Bullfrog and Non-native Turtles Stakeholder Engagement Project.

Summary of Previous/Future Actions

- Project referred to WRC — Dec 12-13, 2018; Oceanside
- Discussed preliminary project results — Jan 13, 2022; WRC, Webinar/Teleconference
- Discussion of draft staff analysis — May 19, 2022; WRC, Redding
- **Today's discussion of staff recommendations** — **Sep 15, 2022; WRC, Arcadia**

Background

In Dec 2018, FGC referred to WRC a stakeholder engagement plan to track progress in addressing issues around non-native American bullfrogs and turtles that are imported into California for food and the pet trade. The plan involves three independent groups developing situation analyses and strategies for addressing the threats, challenges, and opportunities posed by bullfrogs and non-native turtles and their impacts on native wildlife. The fourth group identified in the plan is the California State Legislature, which will be engaged in the process now that the work of the three groups is mostly complete. WRC has received regular progress updates throughout 2020, 2021 and 2022.

For the situation analyses and strategies work, the independent groups were formed and composed of representatives from three different spheres of California society that have a vested interest in bullfrog and non-native turtle concerns. The first group was composed of representatives from local, state, and federal government agencies, the second from environmental and animal welfare groups, and the third from various commercial sector and industry groups.

The groups met separately and worked on the same task (in parallel) to analyze: (1) threats to California's environment posed by bullfrogs and non-native turtles, (2) benefits and cultural values of bullfrogs and turtles in California's communities and other intersections with human well-being values, (3) knowledge gaps in our understanding of the relevant systems and operative biological processes, and (4) opportunities for progress in addressing the issues posed by invasive bullfrogs and non-native turtles in California's environment. The three groups used a flexible, comprehensive process called the *Open Standards for the Practice of Conservation* (see https://conservationstandards.org/about/ for more information) to guide their analyses.

Previously, staff presented an account of the stakeholder process results (Exhibit 1) and various analyses of that information (Exhibit 2) to support WRC discussion. Since the May 2022 WRC meeting, staff held another meeting with participants of the stakeholder process to discuss the outcomes of the three groups. Participants commented on the WRC documents,

and all participants were encouraged to participate in subsequent public dialogue. Staff sincerely thanks the many participants for their diligence and sharing their expertise.

Today, staff will present a suite of draft options and recommendations for potential FGC consideration to address the many issues surrounding bullfrogs and non-native turtles in California's environment (Exhibit 3). The draft recommendations are based on the work to date, public input, and the most recent stakeholder meetings. WRC will discuss the information provided to date and next steps to arrive at a recommendation to FGC.

Significant Public Comments (N/A)

Recommendation

Staff recommendations for the suite of draft options are provided in Exhibit 3 and will be presented verbally during the meeting.

Exhibits

1. *Preliminary Results from the Conservation Standards Work in the Bullfrog and Non-Native Turtle Stakeholder Engagement Process*, dated Jan 7, 2022
2. *Draft Staff Analysis of the Conservation Standards Work in the Bullfrog and Non-Native Turtle Stakeholder Engagement Process, dated Sep 6, 2022*
3. *Draft Staff Recommendations from the Bullfrog and Non-Native Turtle Stakeholder Engagement Process* (to be provided separately)

Committee Direction/Recommendation (N/A)

Preliminary Results from the *Conservation Standards* Work in the Bullfrog and Non-Native Turtle Stakeholder Engagement Process

January 7, 2022

Since 2018, California Fish and Game Commission (Commission) staff has led a stakeholder engagement process with three stakeholder groups to identify potential regulatory and statutory changes, funding mechanisms, and strategies for existing wild populations of American bullfrogs and non-native turtles to reduce their impacts on California's native wildlife.

In Dec 2018, the Commission referred to its Wildlife Resources Committee a stakeholder engagement plan, to track progress in implementation. The plan involves three independent groups developing situation analyses and strategies for addressing the threats, challenges, and opportunities posed by bullfrogs and non-native turtles and their impacts on native wildlife. The fourth group identified in the plan is the California State Legislature, which will be engaged in the process upon completion of the situation analyses and strategies.

For the situation analyses and strategies work, independent groups were formed, composed of representatives from three different spheres of California society that have a vested interest in bullfrog and non-native turtle concerns. The first group was composed of representatives from local, state, and federal government agencies, the second from environmental and animal welfare groups, and the third from various commercial sector and industry groups. The groups met separately and worked on the same task (in parallel) to analyze: (1) threats to California's environment posed by bullfrogs and non-native turtles, (2) benefits and cultural values of bullfrogs and turtles in California's communities and other intersections with human well-being values, (3) knowledge gaps in our understanding of the relevant systems and operative biological processes, and (4) opportunities for progress in addressing the issues posed by invasive bullfrogs and non-native turtles in California's environment. After completing their individual analyses, each group had an initial opportunity for cross-dialogue, to clarify and discuss the approaches taken by the other groups.

Group Analyses

The three groups used a flexible, comprehensive process called *Open Standards for the Practice of Conservation* (see https://conservationstandards.org/about/ for more information) to guide their analyses. This document presents a preliminary compilation of the results of that process for all three groups, embodied in:

- a conceptual diagram which lays out conservation targets that experience some level of risk, the extant threats to those targets, and various strategies that may be implemented to address those threats;
- a ranking of proximate threats performed by the agencies group, with grids that outline how those assessments were developed;
- "results chains" for all strategies that enumerate the stepwise, logical process by which those strategies may be expected to work; and
- notes that expand, clarify, and/or qualify certain elements of each assessment.

The main diagrams map the connections between various strategies, the threats they address, and conservation and human well-being targets they could be expected to affect. The results chains

illustrate the explicit mechanisms by which each strategy may be expected to influence the conservation threats and other factors, and to help confirm that strategies realistically can be implemented.

Important Remarks

- The terms “environmental” and “animal welfare” are intended to connote broad types of certain stakeholder organizations, not attitudes or philosophies inherent to any organization. It should be recognized that governmental agencies and industry groups are also concerned with the welfare of animals and with protecting California’s environment.

- Inclusion of a particular strategy in a group’s analysis is not intended to indicate that the group favors or recommends it. Sometimes a particular strategy is intended as an alternative action, or perhaps simply to analyze the consequences of non-recommended strategies that may ultimately be implemented in the future. Indeed, certain strategies within a single analysis are mutually exclusive.

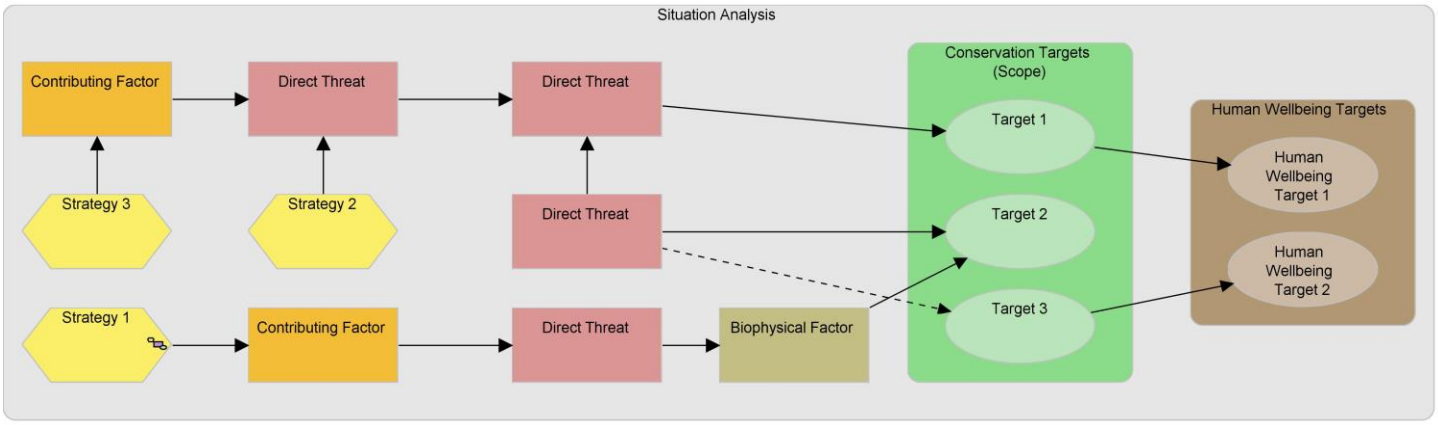
- While strategies that each group deemed generally infeasible were typically eliminated during the process of developing results chains, it should be recognized that some strategies may be more or less likely to succeed, and the actual efficacy of a particular strategy may be low or unclear.

- The diagrams are not intended to depict every single factor at play, nor every relationship between those factors; rather, they are intended to highlight the most significant and meaningful associations that are relevant to understanding and achieving the vision enumerated by each group.

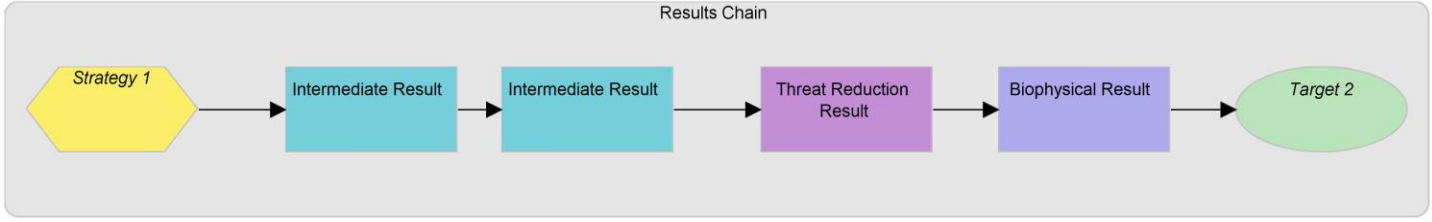
Guide to Symbols and Diagrams

Results Chain
Target
Human Wellbeing Target
Direct Threat
Contributing Factor
Intermediate Result
Threat Reduction Result
Strategy
Text Box
Group Box
Causal Linkage
Uncertain Link

Situation Analysis Diagram



Results Chain Diagram



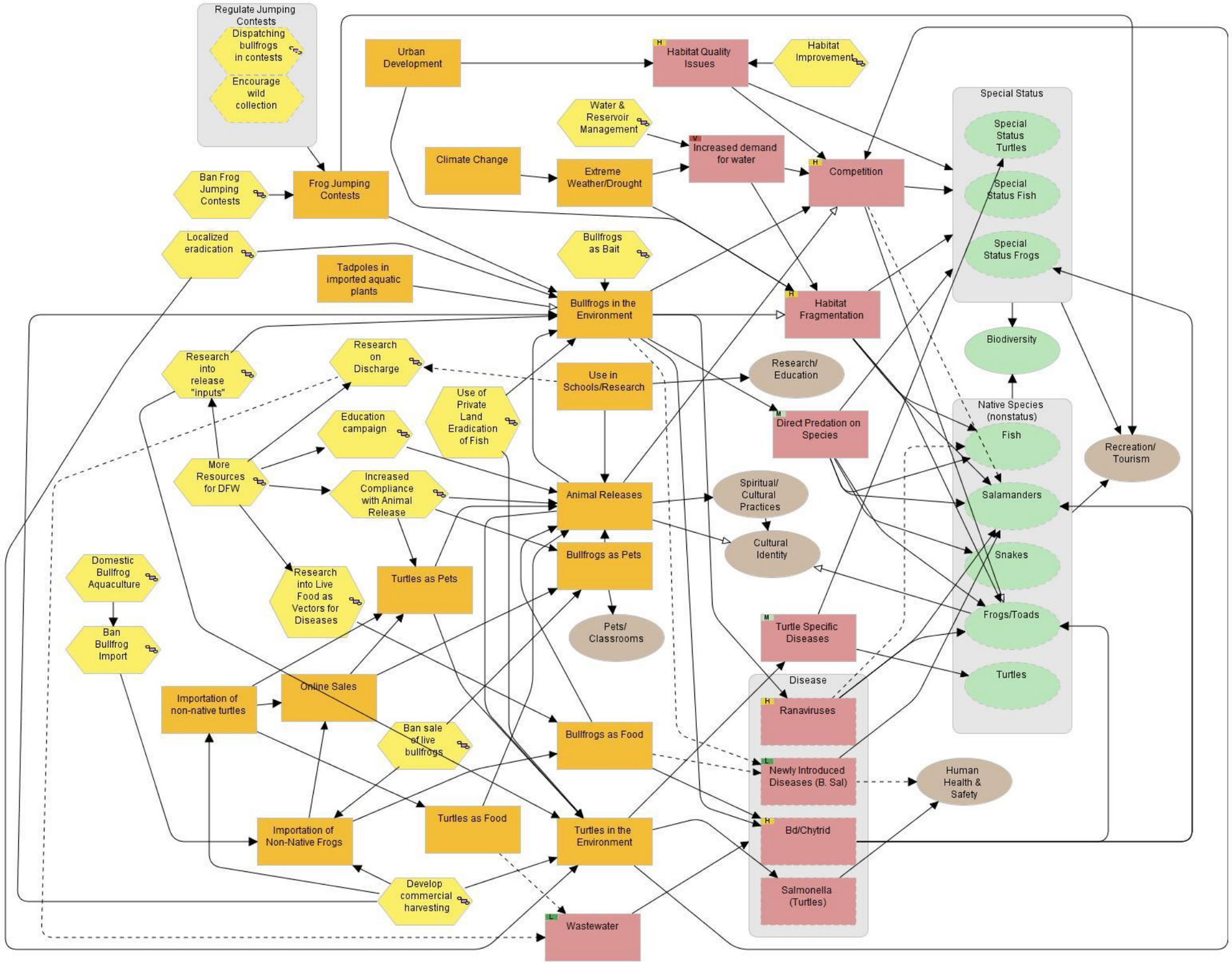
Note: During their assessments, the groups did not elect to use "biophysical factors" in the situation analysis diagrams or "biophysical results" in the results chain diagrams.

Agency Group Analysis

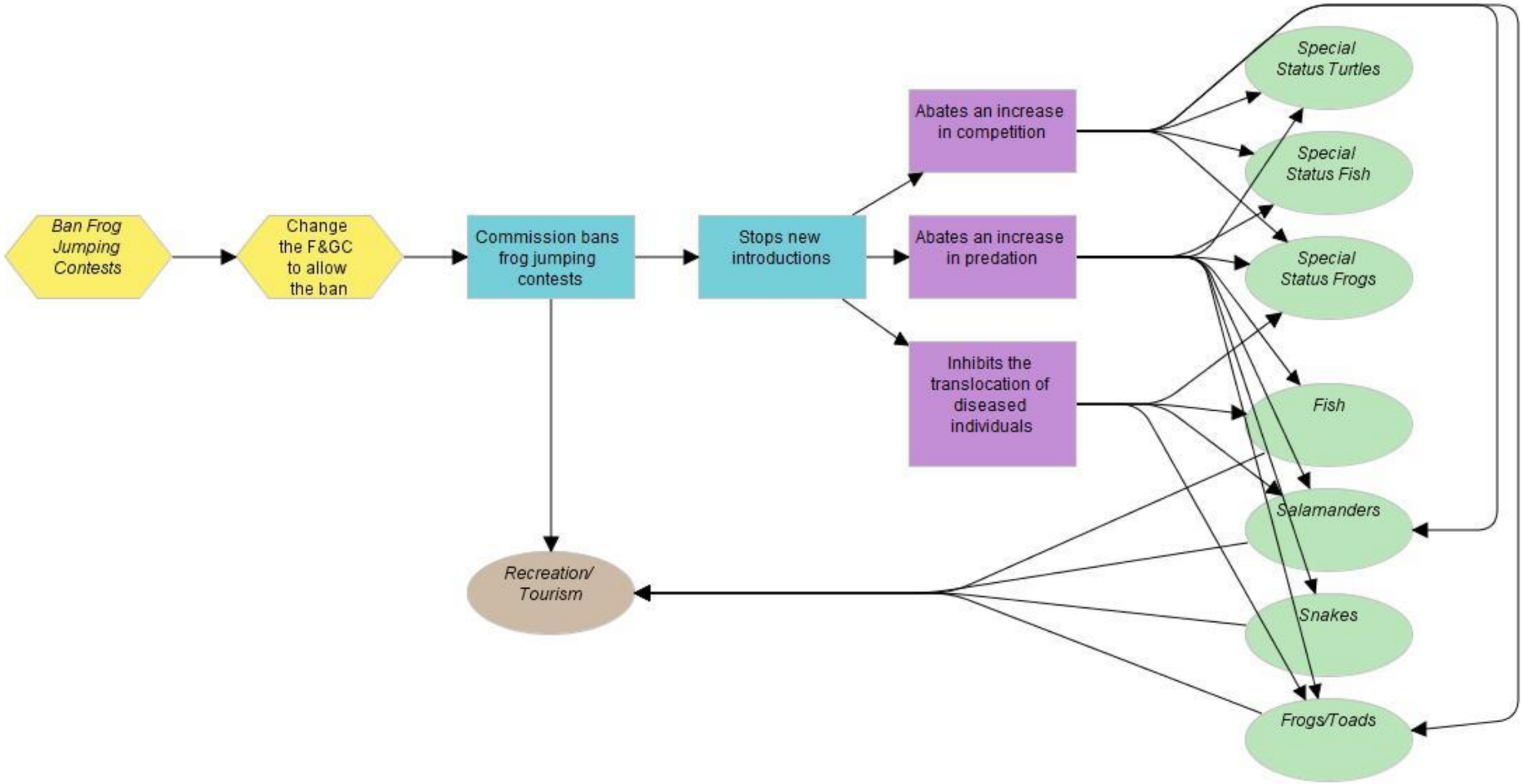
Scope and Vision

Scope/Site Name	Bullfrogs and non-native turtles in California
Vision Statement Text	To minimize the impacts to native species from bullfrog presence in California by managing, reducing, containing, controlling, regulating, and eventually eradicating them. Organizations should be provided the tools to limit populations and introductions.
Comments	There is a question as to whether or not eradication is feasible.

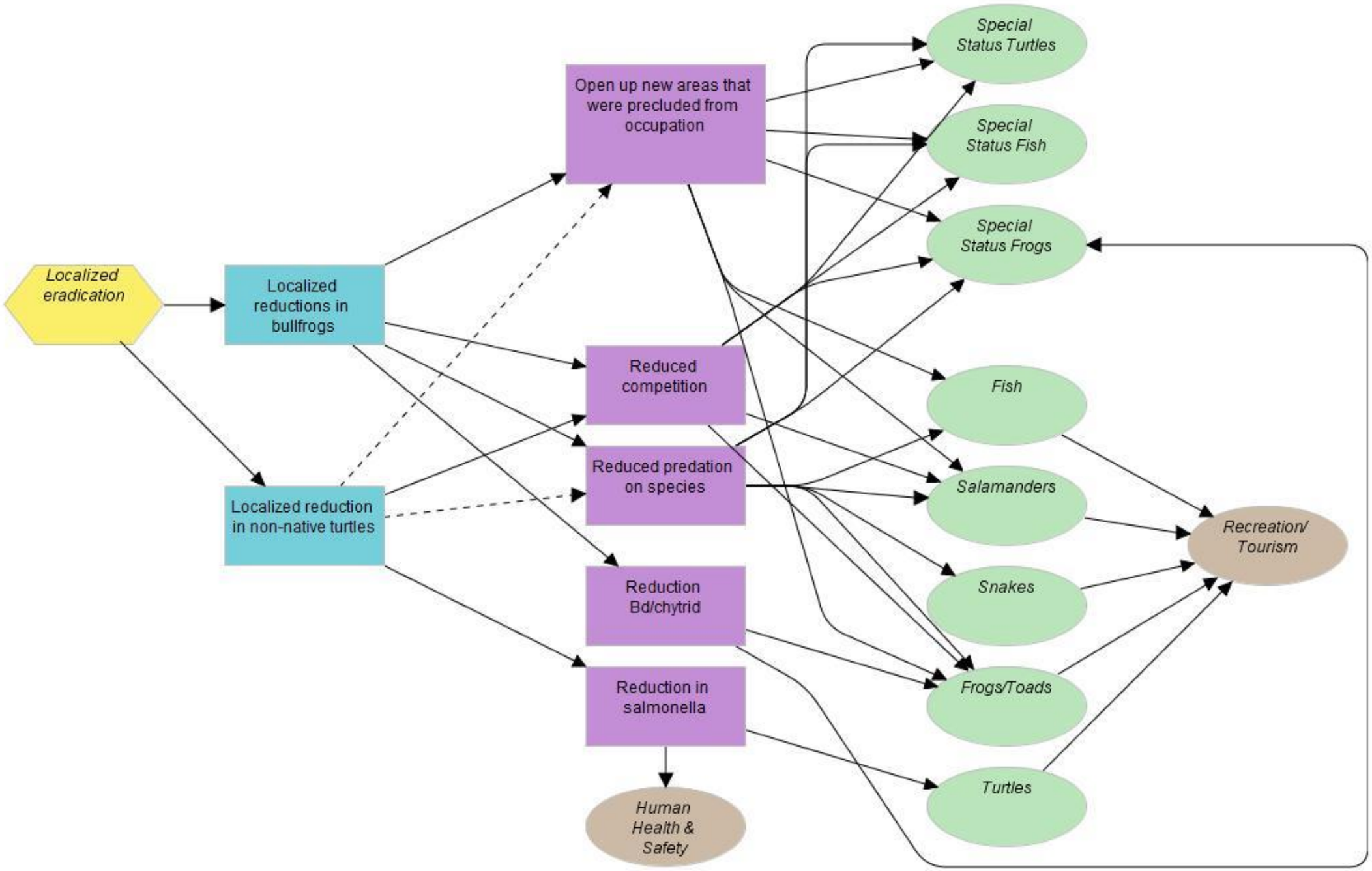
Main Diagram



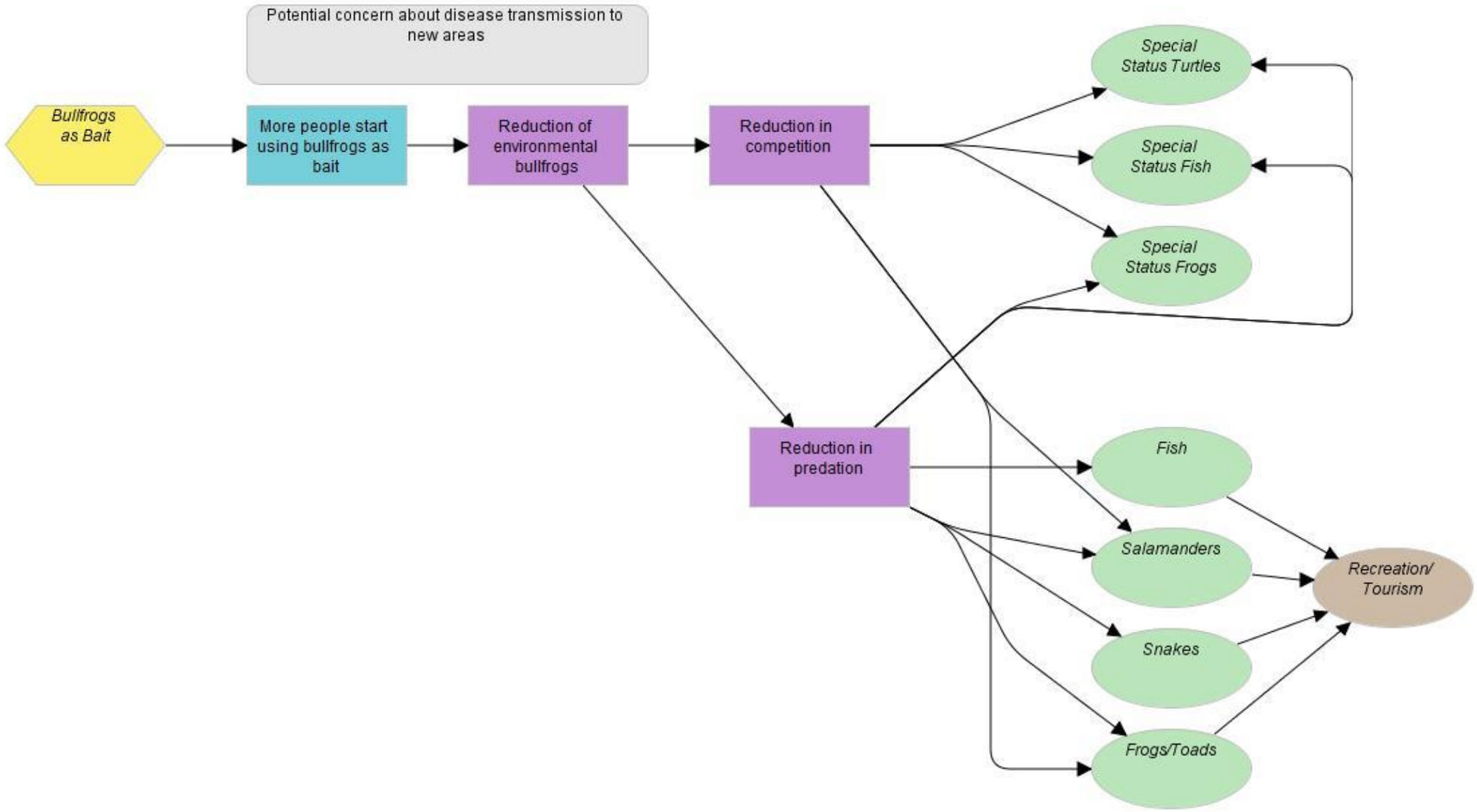
Results Chain: Ban frog jumping contests



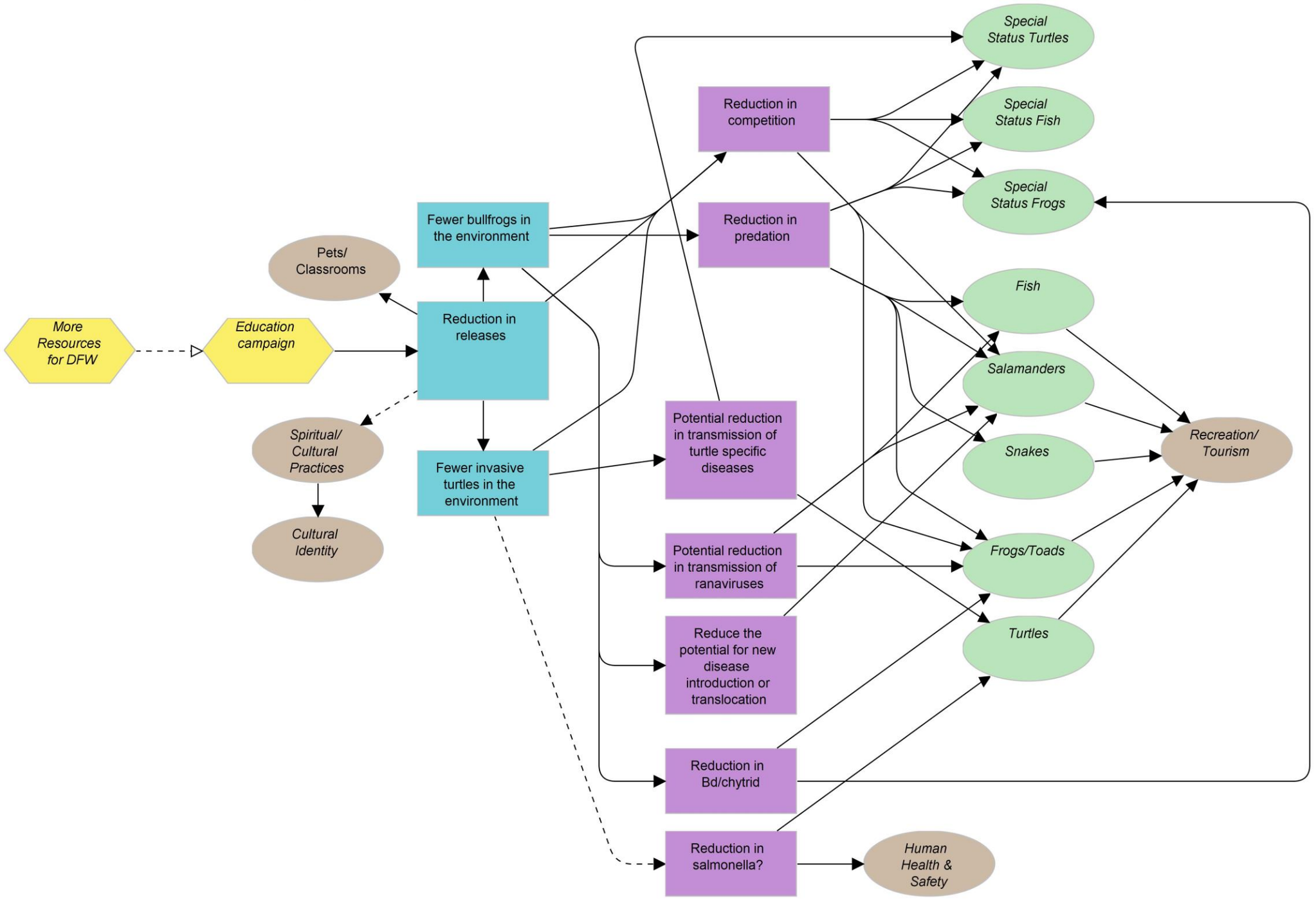
Results Chain: Localized eradication



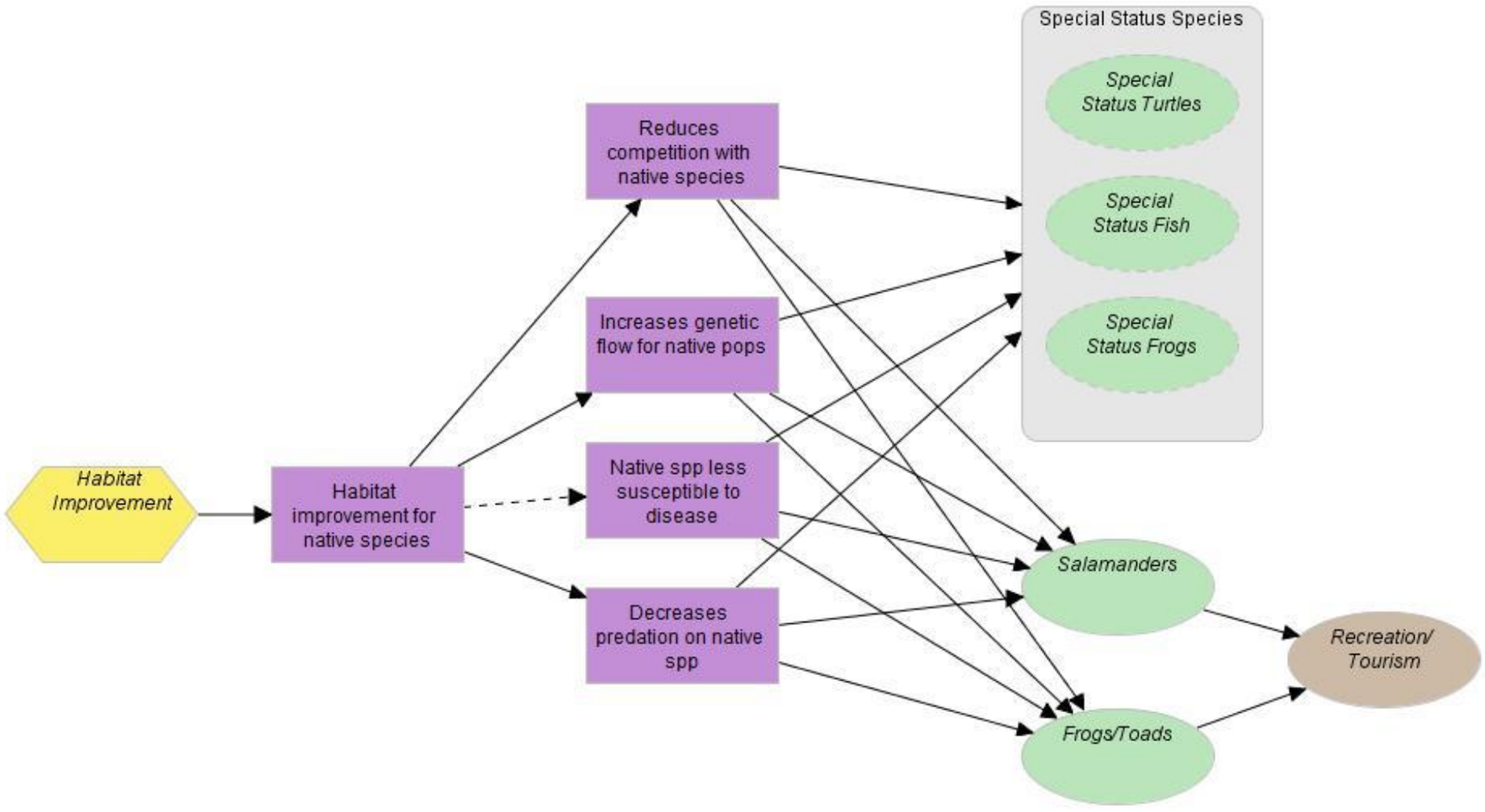
Results Chain: Bullfrogs as bait



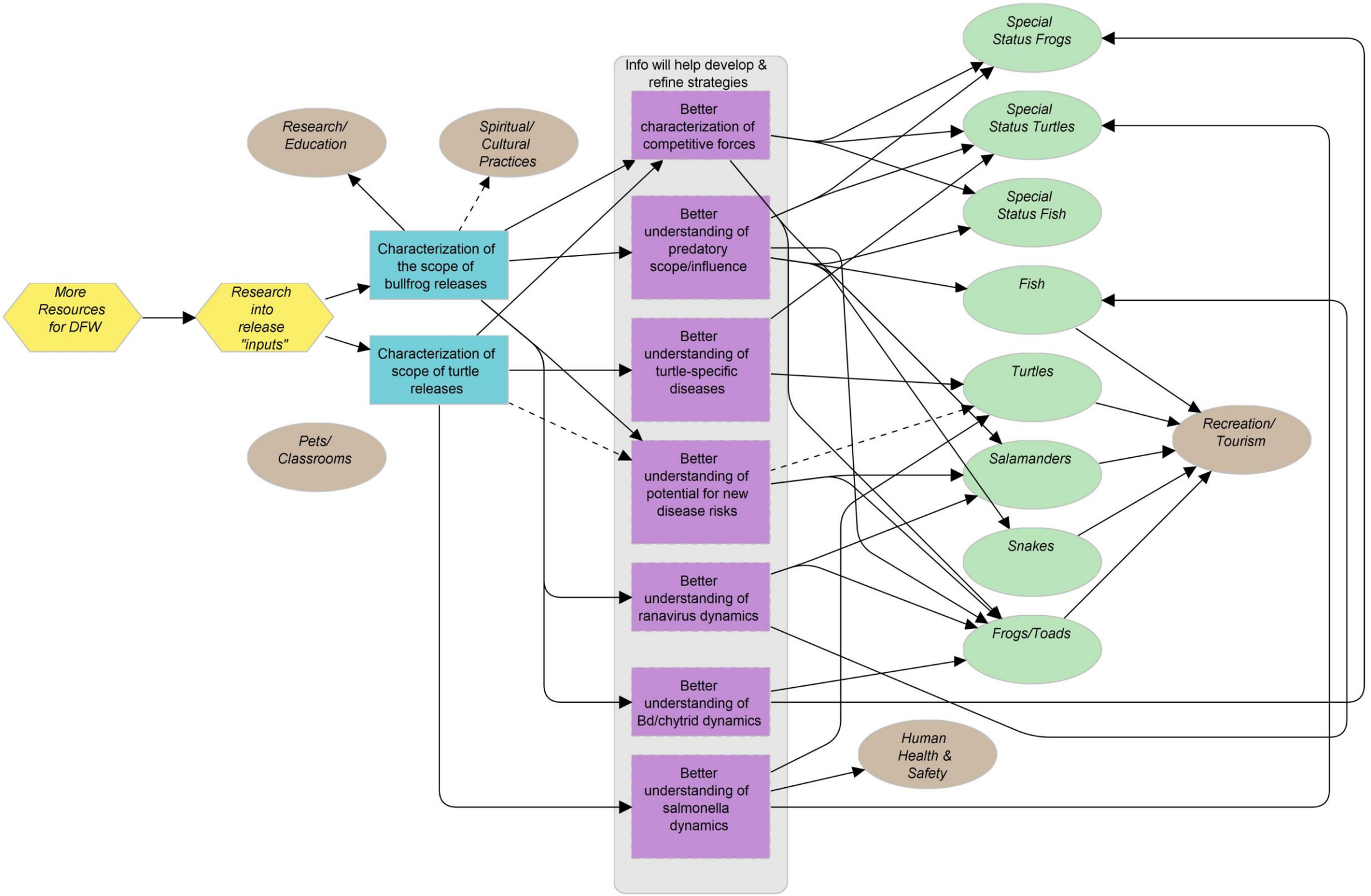
Results Chain: Education campaign



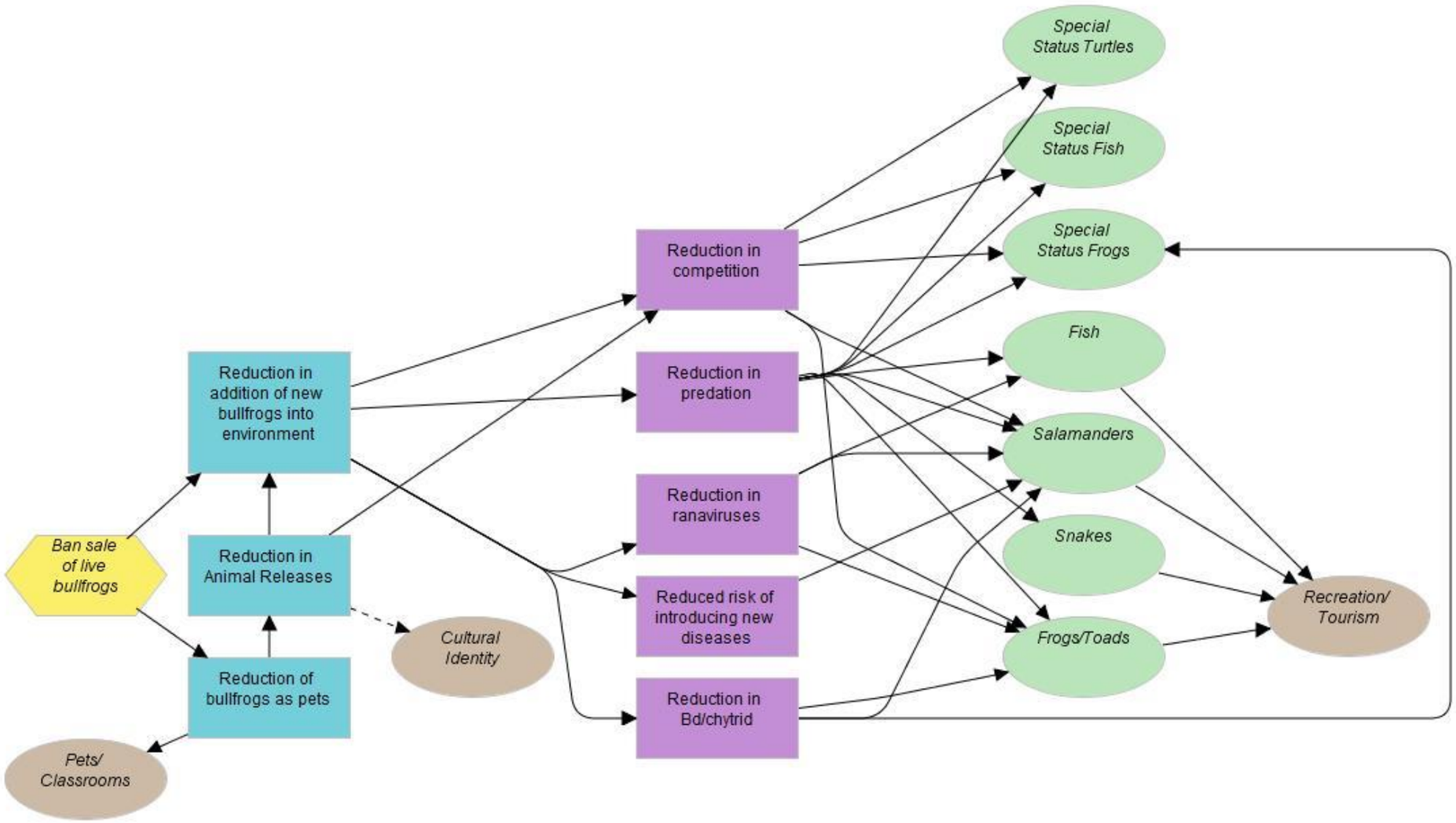
Results Chain: Habitat improvement



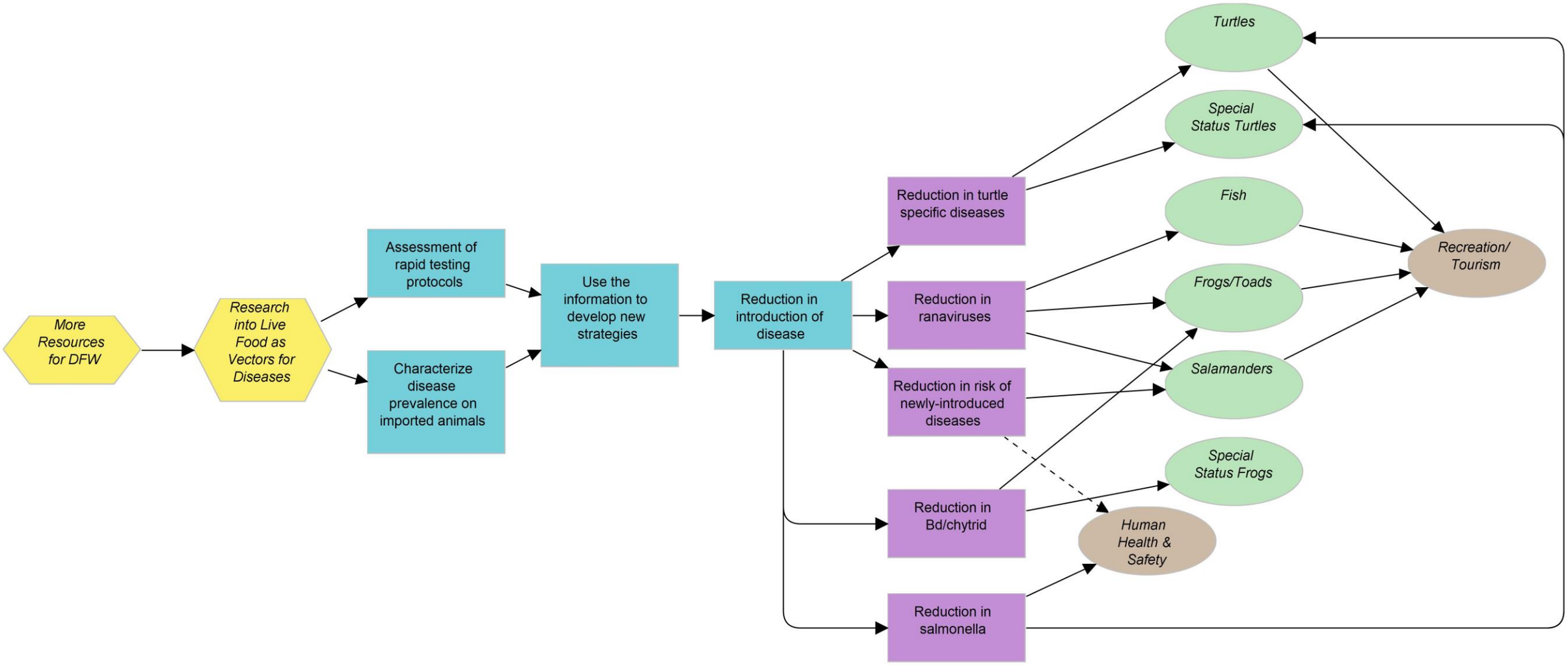
Results Chain: Research into release "inputs"



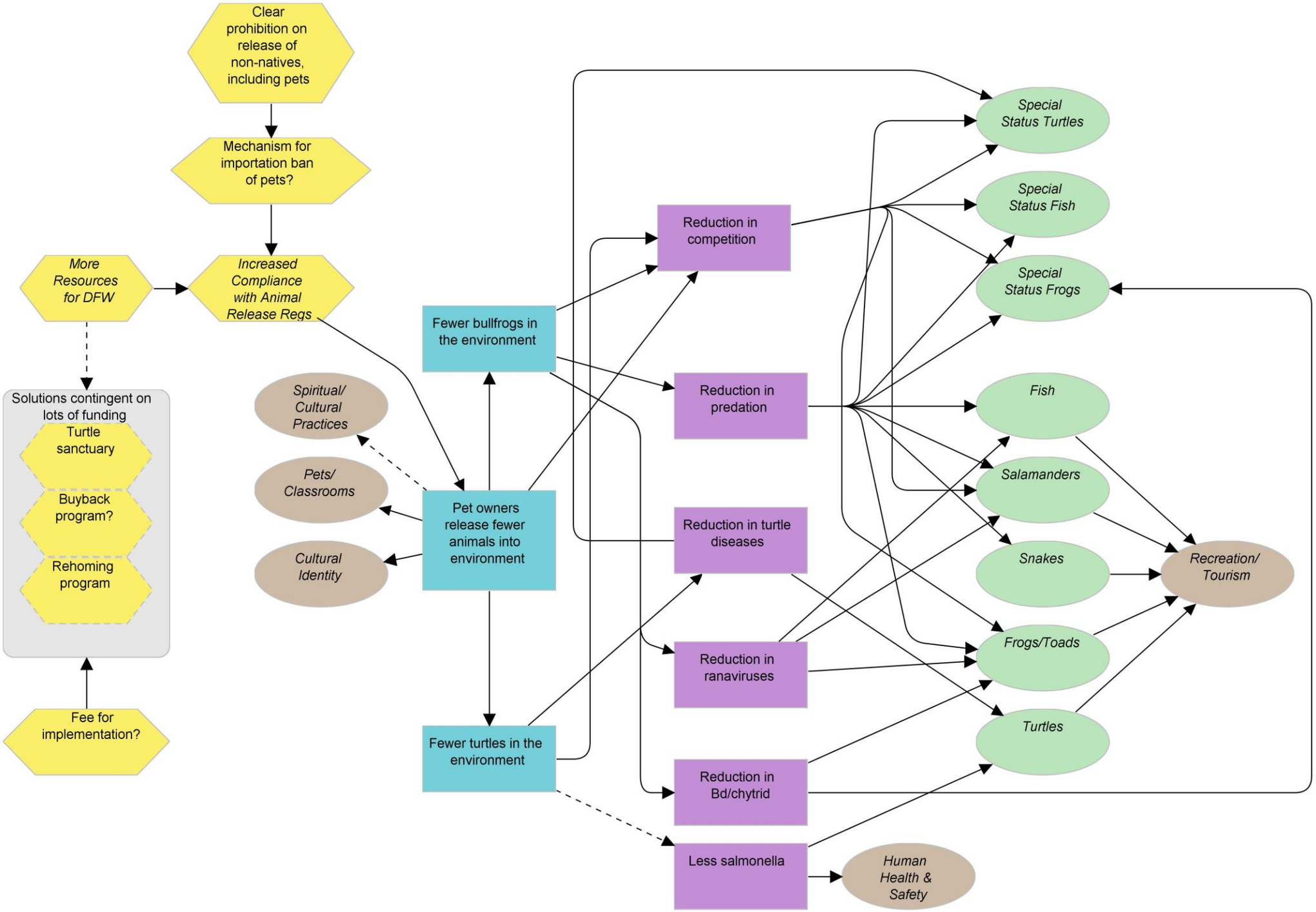
Results Chain: Ban sale of live bullfrogs



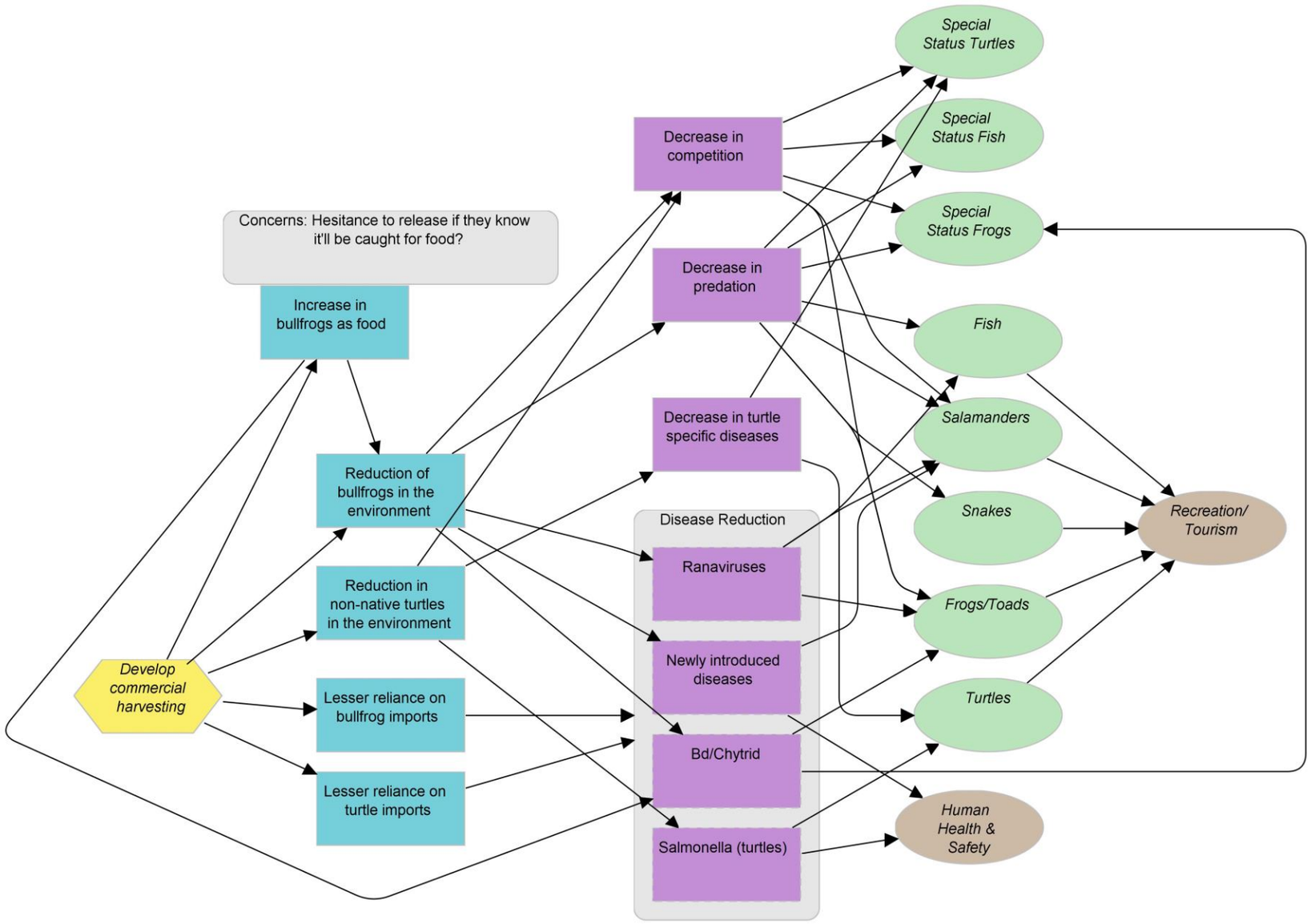
Results Chain: Research into live food as vectors for diseases



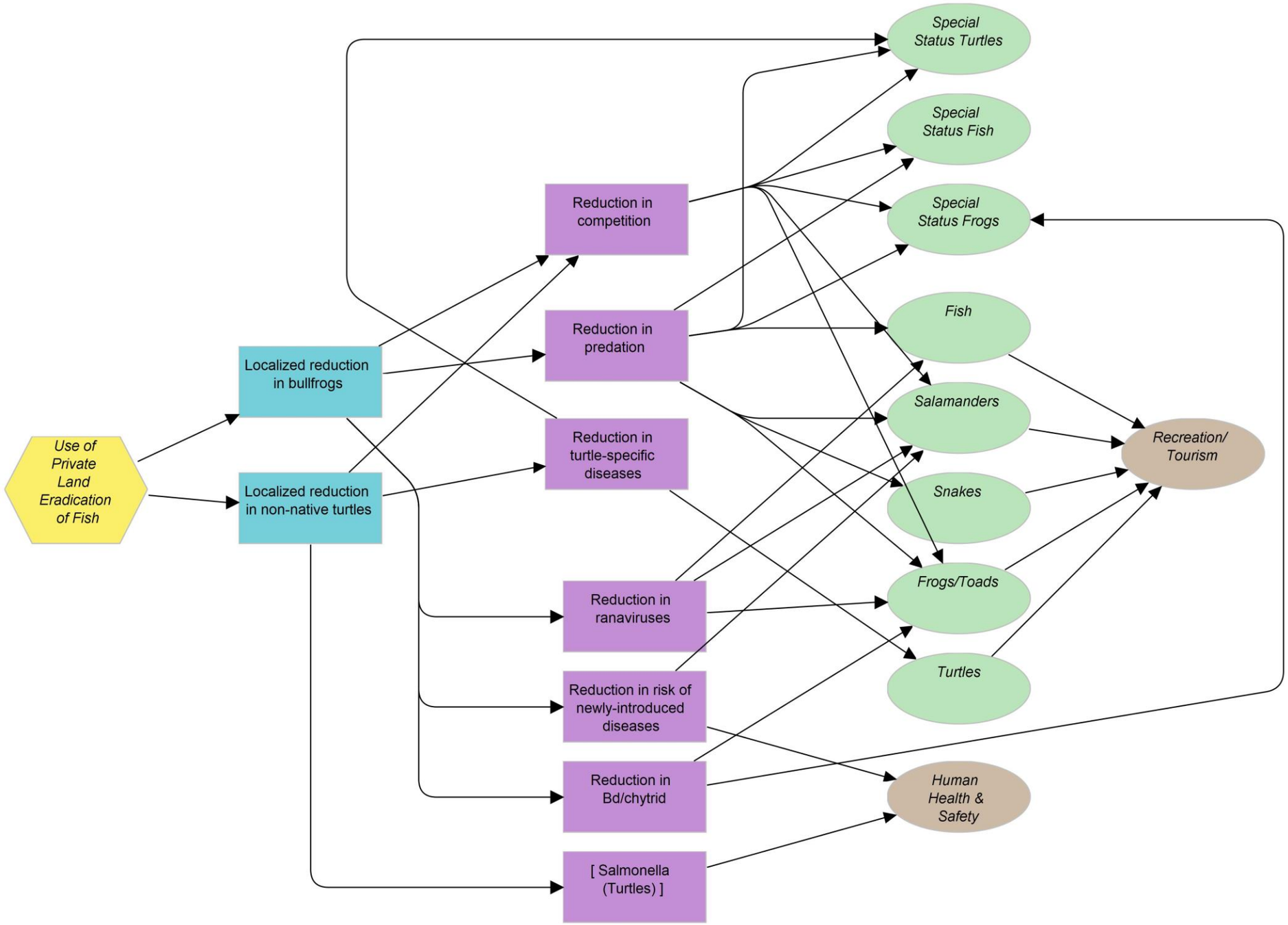
Results Chain: Increased compliance with animal release regulations



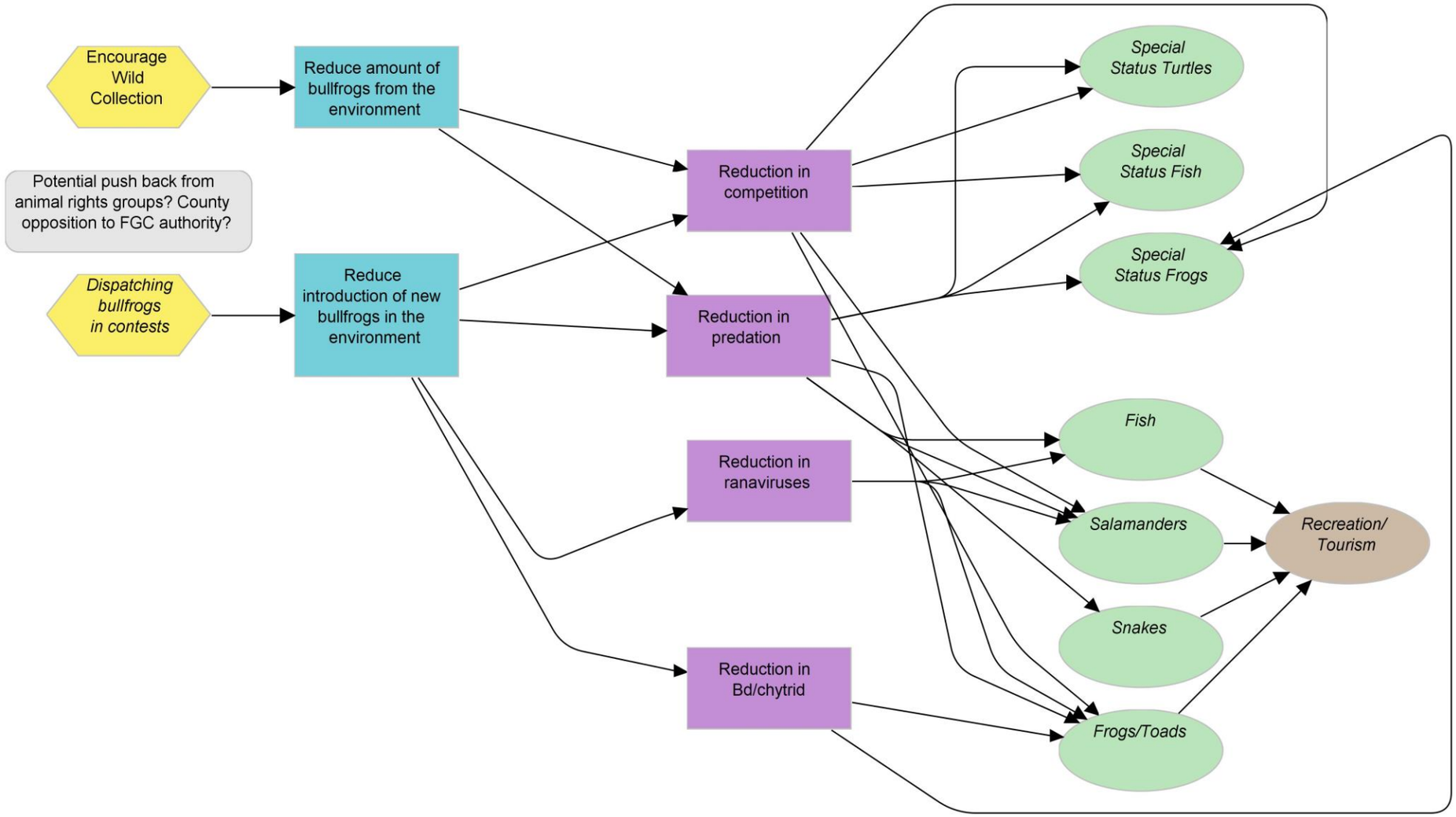
Results Chain: Develop commercial harvesting



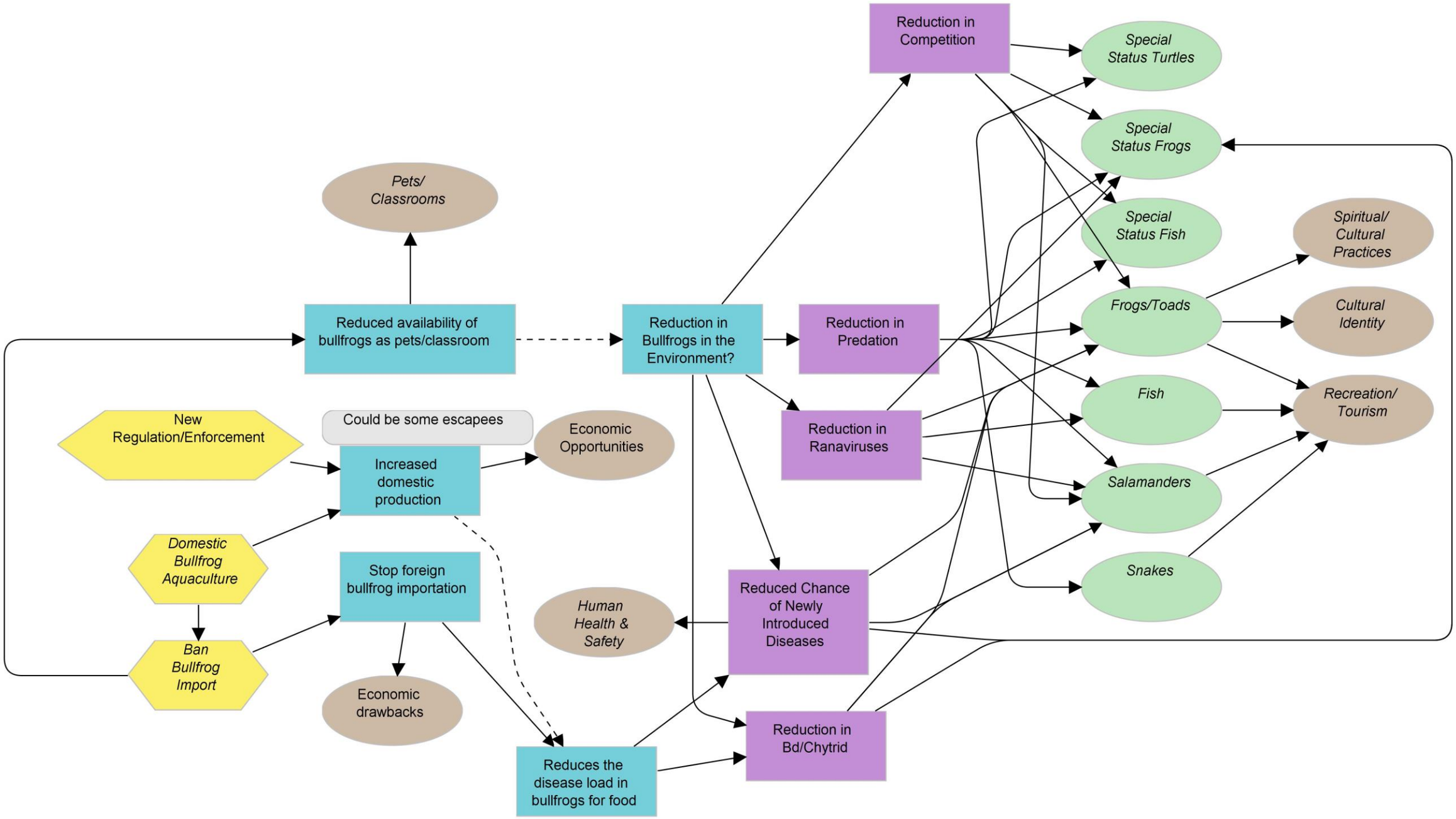
Results Chain: Use of private land eradication of fish



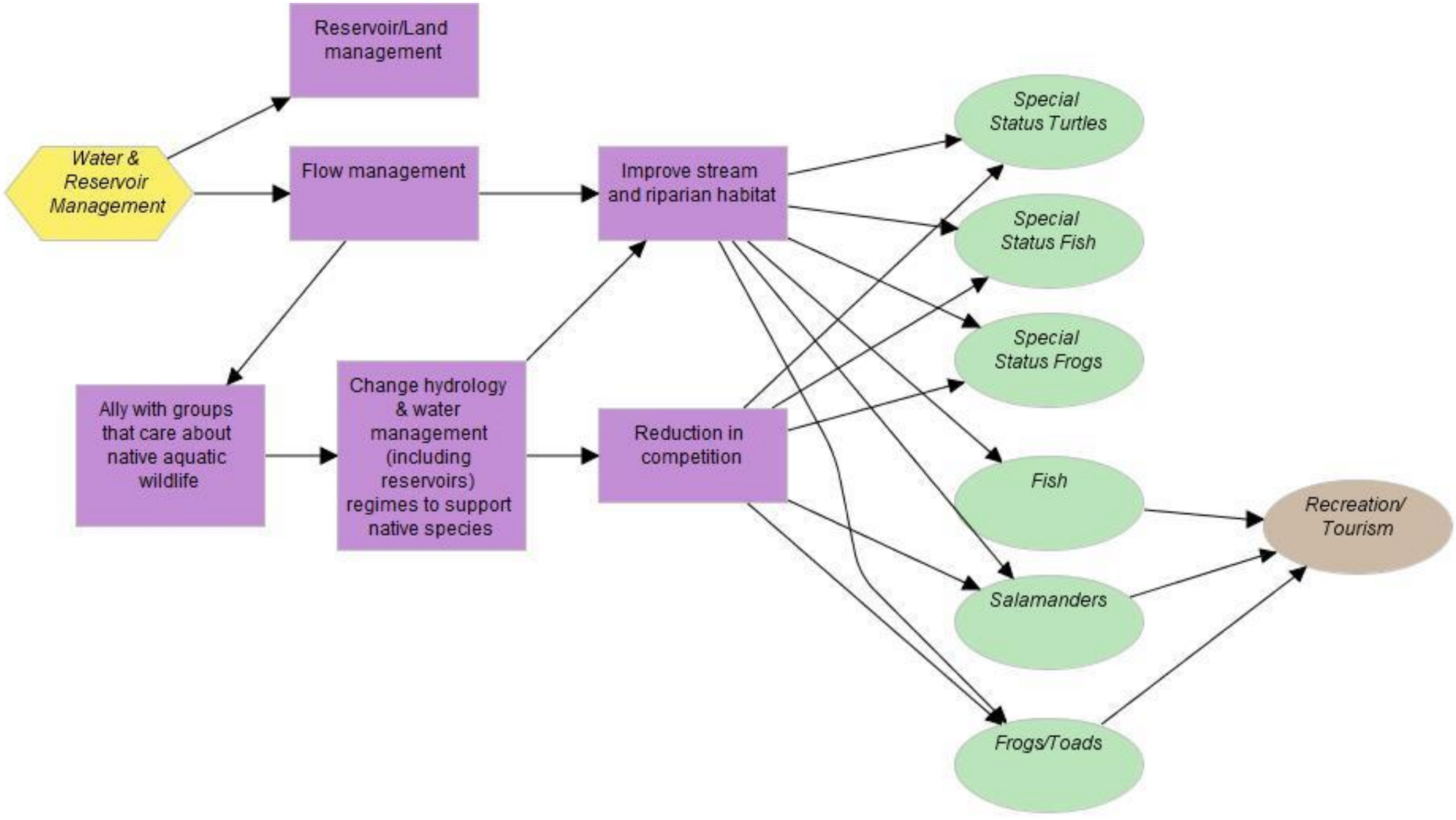
Results Chain: Jumping contest reforms



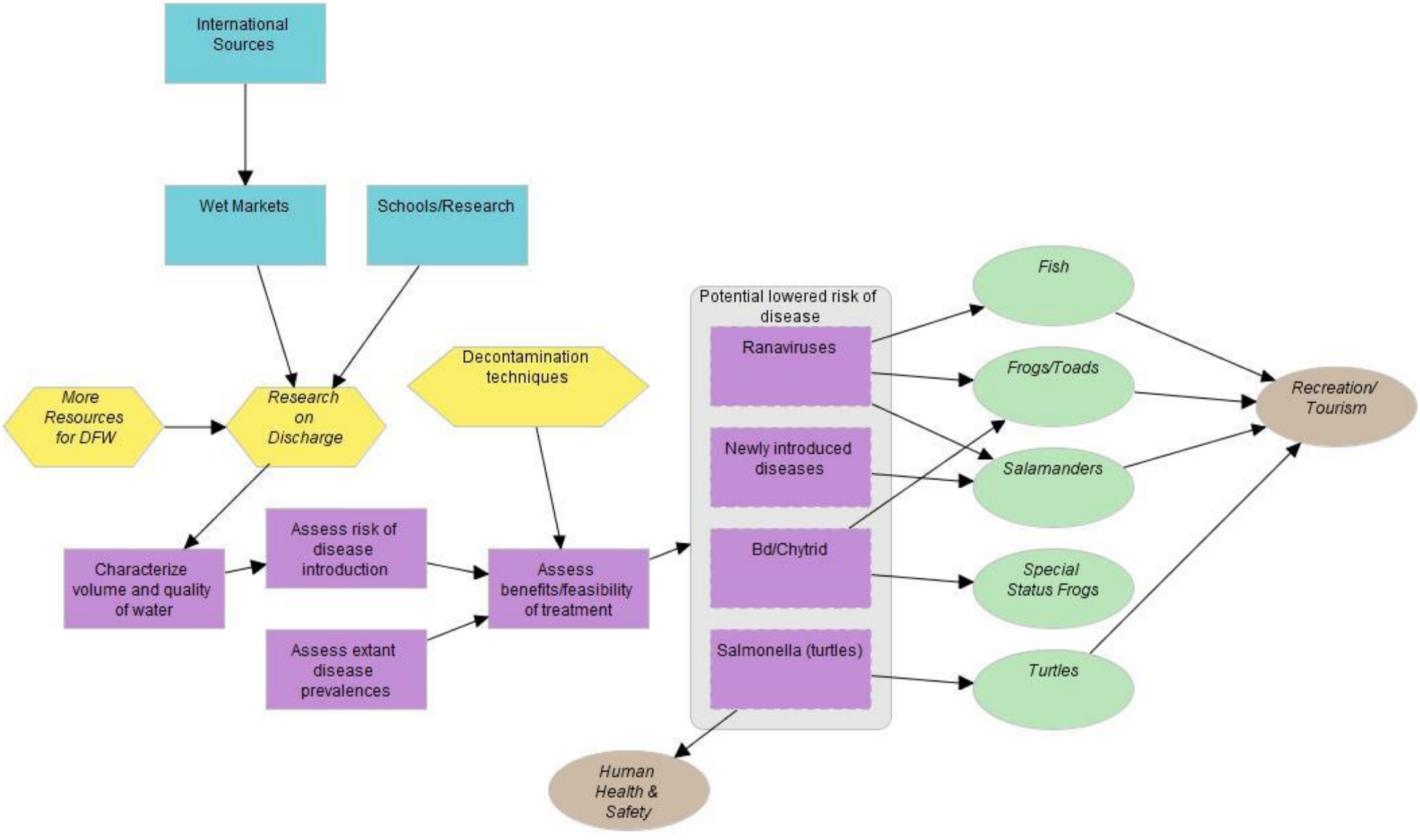
Results Chain: Ban bullfrog import



Results Chain: Water and reservoir management



Results Chain: Research on wastewater discharge



Agencies Notes

Ban bullfrog import	• Ban from anywhere outside California • Novel pathogens may not be detectable, even from other states • Other states may receive international imports
Domestic bullfrog aquaculture	• Probably unlikely to catch on unless an import ban is implemented • Growers aren't pushing for import ban
Ban sale of live bullfrogs	• Possession would still be allowed • Potentially ban of tadpoles and other avenues, not just live market • Goal: Reduce the introduction of new bullfrogs in the environment • Dead individuals/parts would be allowed • Potential conflict with commercial harvest? • Would likely need a specific carve out for frog jumping contests • Potential switching to other species in the live markets • Potential impacts to markets?
Bullfrogs as bait	• Encourage wild catch of bullfrogs and use them as bait • Don't encourage a market of importation for bait • Potentially ban sale of bullfrogs for bait but allow personal use
Develop commercial harvesting	• Economics & business model have to work out as a prerequisite • Access to property also necessary • Nexus with aquaculture? Creation of a permitting structure? Size limits to ensure accurate identification? Geographic or take limitations? • See Title 14 226.7 -- bullfrogs would need to be added. T14 651, 658, 41.7; Also see Fish & Game Code 6850-6855CDFA regs -- ok to give pets to commercial harvesters for food? Possible way to reduce releases • Permitting of harvesters? • VERY CONTEXTUAL -- HIGHLY DEPENDENT ON OVERALL STRATEGIES DEPLOYED
Education campaign	• Audience: live markets, pet owners, educational facilities, religious purposes, aquaculture facilities • Don't release animals into the environment • Collection event -- "Free 2 hour boat rental to whoever collects the most" • Educate people about the availability of bullfrog harvest? R3?
Habitat improvement	• Creating base habitat conditions that favor native species and disfavor bullfrogs • Water temperature (ex. colder water), running water, reestablish food webs, elimination of barriers
Increased compliance with animal release regs	• Illegal importation • Should leave the market dead • Release of wildlife • Important role for local ordinances • Probably mostly an education/outreach initiative, less an enforcement issue • Signage, employee training at pet store
Mechanism for importation ban of pets?	• Require pet industry to PIT tag?
Turtle sanctuary	• For pet owners that don't want their pets anymore
Dispatching bullfrogs in contests	• Kill any bullfrogs that contestants don't want to keep (driven by animal rights groups) • See F&GC Sec 6855 -- permit needed?
Encourage wild collection	• Turn the bullfrog competition into an amphibian conservation event
Commission authority to regulate contests	• Fish and Game Code addition
Jumping contests	• Dispatching of frogs • Encouraging wild collection • Working with permit holders? Outreach to event holders?
Research into release "inputs"	• What is the release rate of animals from live markets?

	• How many pets are released into the wild? • Are new influxes of diseased individuals additive to those already in the population?
Decontamination techniques	• Treatment with bleach/antifungal agent
Research on discharge	• Discharge: Any water that comes into contact with animals
Use of private land eradication of fish	• Turtles are not fish -- would need to be updated to include them • Take methods might need to be reexamined: Add gigging • Form: Fish & Game 5501 (T14 226.5, 226.7), form Fish & Game 793 • Also see Fish & Game Code 6850-6855; use 6855 as a general authority • Doesn't necessarily have to be limited to private lands
Frog jumping contests	• Sourcing bullfrogs from biological supply houses?
Bullfrogs as pets	• Probably a negligible issue
Online sales	• Education loophole?
Importation of non-native frogs	• *Xenopus sp.* (African clawed frog), cane toads
Turtles in the environment	• Red-eared sliders, painted turtles, map turtles, snapping turtles (common and alligator), softshell turtles
Turtle specific diseases	• Western pond turtle, among others Turtle shell diseases Upper respiratory diseases
→ Bullfrogs in the environment to habitat fragmentation	• Aquatic footprint contracts increases contact between bullfrogs & native spp.
→ Animal releases to competition	• Religious releases are uncertain
→ Competition to frogs/toads	• Foothill yellow-legged frog, mountain yellow-legged frog, etc.
→ Animal releases to cultural identity	• Religious animal releases
Reduced availability of bullfrogs as pets/classroom	• This is minor
Stops new introductions	• Minimizes relocation of bullfrogs, preventing redistribution
Recreation/ Tourism	• Banning contests could have negative economic effects
Reduction of bullfrogs as pets	• Reduction of bullfrogs as pets -- self-collection from the wild is the only pathway (same as OR) • Scientific collecting permit would be needed for classroom use: Title 14 Section 658. Commercial Take of Bullfrogs for sale to scientific or education institutions • New permit for classrooms would likely take Code modification
Reduction in Animal Releases	• Live market escapees • Classroom releases
Reduced risk of introducing new diseases	• High impact to this threat
More people start using bullfrogs as bait	• Effectiveness is dependent on the level of implementation/adoption • Potential side benefit of awareness
Reduction in releases	• from live markets, pet owners, educational facilities, religious purposes, aquaculture facilities
Assessment of rapid testing protocols	• APHIS?
Reservoir/Land management	• Muni code prohibiting sale • No bait, cooler inspections, signage
Flow management	• Interrupt the larval phase • More natural hydrography downstream, create sedimentation and hydrology/hydrography conducive to native species • Large scouring flow can recreate gravel bars, remove riparian vegetation,

	push bullfrog tadpoles away, increase complexity and decrease channelization, flow dehomogenization

Threat Rating Details

Participants rated each threat-target pair as high, medium, or low in scope, severity, and irreversibility.

Scope - Most commonly defined spatially as the proportion of the target that can reasonably be expected to be affected by the threat within ten years given the continuation of current circumstances and trends. For ecosystems and ecological communities, measured as the proportion of the target's occurrence. For species, measured as the proportion of the target's population.

- **Very High:** The threat is likely to be pervasive in its scope, affecting the target across all or most (71-100%) of its occurrence/population.
- **High:** The threat is likely to be widespread in its scope, affecting the target across much (31-70%) of its occurrence/population.
- **Medium:** The threat is likely to be restricted in its scope, affecting the target across some (11-30%) of its occurrence/population.
- **Low:** The threat is likely to be very narrow in its scope, affecting the target across a small proportion (1-10%) of its occurrence/population.

Severity - Within the scope, the level of damage to the target from the threat that can reasonably be expected given the continuation of current circumstances and trends. For ecosystems and ecological communities, typically measured as the degree of destruction or degradation of the target within the scope. For species, usually measured as the degree of reduction of the target population within the scope.

- **Very High:** Within the scope, the threat is likely to destroy or eliminate the target, or reduce its population by 71-100% within ten years or three generations.
- **High:** Within the scope, the threat is likely to seriously degrade/reduce the target or reduce its population by 31-70% within ten years or three generations.
- **Medium:** Within the scope, the threat is likely to moderately degrade/reduce the target or reduce its population by 11-30% within ten years or three generations.
- **Low:** Within the scope, the threat is likely to only slightly degrade/reduce the target or reduce its population by 1-10% within ten years or three generations.

Irreversibility (Permanence) - The degree to which the effects of a threat can be reversed and the target affected by the threat restored.

- **Very High:** The effects of the threat cannot be reversed and it is very unlikely the target can be restored, and/or it would take more than 100 years to achieve this (e.g., wetlands converted to a shopping center).
- **High:** The effects of the threat can technically be reversed and the target restored, but it is not practically affordable and/or it would take 21-100 years to achieve this (e.g., wetland converted to agriculture).
- **Medium:** The effects of the threat can be reversed and the target restored with a reasonable commitment of resources and/or within 6-20 years (e.g., ditching and draining of wetland).
- **Low:** The effects of the threat are easily reversible and the target can be easily restored at a relatively low cost and/or within 0-5 years (e.g., off-road vehicles trespassing in wetland).

Permanence applies to the *effects of the threat* on the target, not the threat itself. In other words, it is not a measure of how difficult it is to stop the threat, but rather to undo the stress caused by the threat on the target. It is important to note that the use of the permanence rating as specified is largely in respect to prioritizing potential threats. If a threat is looming that will cause irreversible damage, then it makes sense to try to address that threat. However, if the threat has already occurred and the irreversible damage has already taken place, then it may not make sense to prioritize that threat for action.

Threat Ratings

	Threats \ Targets	Special Status Frogs	Turtles	Fish	Salamanders	Biodiversity	Snakes	Frogs/Toads	Special Status Turtles	Special Status Fish	Summary Threat Rating
	Bd/Chytrid	High			Low	Not Specified		High			High
	Competition	High			Medium	Not Specified		High	Very High	Medium	High
	Direct Predation on Species	High		Low	Medium	Not Specified	Low	Medium	Low	Low	Medium
	Habitat Fragmentation	High		Low	Low	Not Specified		Low	High	Medium	High
	Habitat Quality Issues	High			N/A	Not Specified		Low	High	Very High	High
	Increased demand for water	Very High		High	Low	Not Specified		High	Very High	Very High	Very High
	Newly Introduced Diseases (B. Sal)				Medium	Not Specified					Low
	Ranaviruses			Medium	Not Specified	Not Specified		Very High			High
	Salmonella (Turtles)										Not Specified
	Turtle Specific Diseases		Medium			Not Specified			Medium		Medium
	Wastewater	Not Specified		Not Specified	Low	Not Specified		Low			Low
Summary Target Ratings:		Very High	Low	Medium	Medium	Not Specified	Low	Very High	Very High	Very High	Very High

Special Status Frogs

Threat	Scope	Severity	Irreversibility	Summary Threat Rating	Comments
Habitat Fragmentation	High	High	High	High	
Direct Predation on Species	High	Very High	High	High	
Habitat Quality Issues	High	High	High	High	
Competition	High	Very High	High	High	• Good habitat may help alleviate the severity
Bd/Chytrid	Very High	High	High	High	
Wastewater	Not Specified	Not Specified	Not Specified	Not Specified	
Increased demand for water	Very High	Very High	Very High	Very High	• Low flows & slower waters allow bullfrogs to flourish

Turtles

Threat	Scope	Severity	Irreversibility	Summary Threat Rating	Comments
Turtle Specific Diseases	Low	High	Very High	Medium	

Fish

Threat	Scope	Severity	Irreversibility	Summary Threat Rating	Comments
Habitat Fragmentation	Low	Medium	High	Low	• Could be some negative aspects to habitat connection, such as bullfrog expansion
Direct Predation on Species	Medium	Low	High	Low	• Questions about density, life stages, particular spp that bullfrogs are eating • Sticklebacks
Wastewater	Not Specified	Not Specified	Not Specified	Not Specified	
Increased demand for water	High	High	High	High	
Ranaviruses	Low	Medium	Very High	Medium	• Particularly bullfrogs as a vector

Salamanders

Threat	Scope	Severity	Irreversibility	Summary Threat Rating	Comments
Habitat Fragmentation	Low	Low	High	Low	
Direct Predation on Species	Medium	Medium	High	Medium	• Mostly predation on larvae
Habitat Quality Issues	Not Specified	Not Specified	Not Specified	Not Specified	
Competition	Medium	Medium	High	Medium	• Primarily aquatic

Threat	Scope	Severity	Irreversibility	Summary Threat Rating	Comments
					• Baseline is already degraded severely, so incremental damages may be underestimated
Bd/Chytrid	Low	Medium	High	Low	
Newly Introduced Diseases (B. Sal)	Low	Low	Very High	Medium	• No documented cases in CA. US? High risk if introduced
Wastewater	Low	Low	Medium	Low	• Wastewater to environment - unknown, could be concentrated in some areas • Main concern is dumping untreated water down direct to water • Unknown effectiveness of water treatment on diseases
Increased demand for water	Low	Very High	High	Low	• Full years of incomplete breeding due to desiccation -- how much is due to water demand?
Ranaviruses	Low	Not Specified	Not Specified	Not Specified	

Snakes

Threat	Scope	Severity	Irreversibility	Summary Threat Rating	Comments
Direct Predation on Species	Low	Low	High	Low	

Frogs/Toads

Threat	Scope	Severity	Irreversibility	Summary Threat Rating	Comments
Habitat Fragmentation	Low	Medium	High	Low	
Direct Predation on Species	High	Medium	High	Medium	
Habitat Quality Issues	Low	Medium	High	Low	
Competition	High	Very High	High	High	
Bd/Chytrid	High	High	High	High	• Scope: Some pockets that may not have seen chytrid • Severity: Depends on new introduction vs. old, some populations may not exist without intervention, treatable
Wastewater	Low	Low	Medium	Low	• Wastewater to environment - unknown, could be concentrated in some areas • Main concern is dumping untreated water down direct to water • Unknown effectiveness of water treatment on diseases
Increased demand for water	High	High	High	High	
Ranaviruses	High	High	Very High	Very High	• Unknown scope

Special Status Turtles

Threat	Scope	Severity	Irreversibility	Summary Threat Rating	Comments
Habitat Fragmentation	High	High	High	High	
Direct Predation on Species	Low	Low	Low	Low	• Bullfrogs only • Questions about snapping turtles eating special status turtles
Habitat Quality Issues	High	High	High	High	
Competition	Very High	Very High	Medium	Very High	• Turtle-turtle competition is key
Turtle Specific Diseases	Low	High	Very High	Medium	
Increased demand for water	Very High	Very High	High	Very High	

Special Status Fish

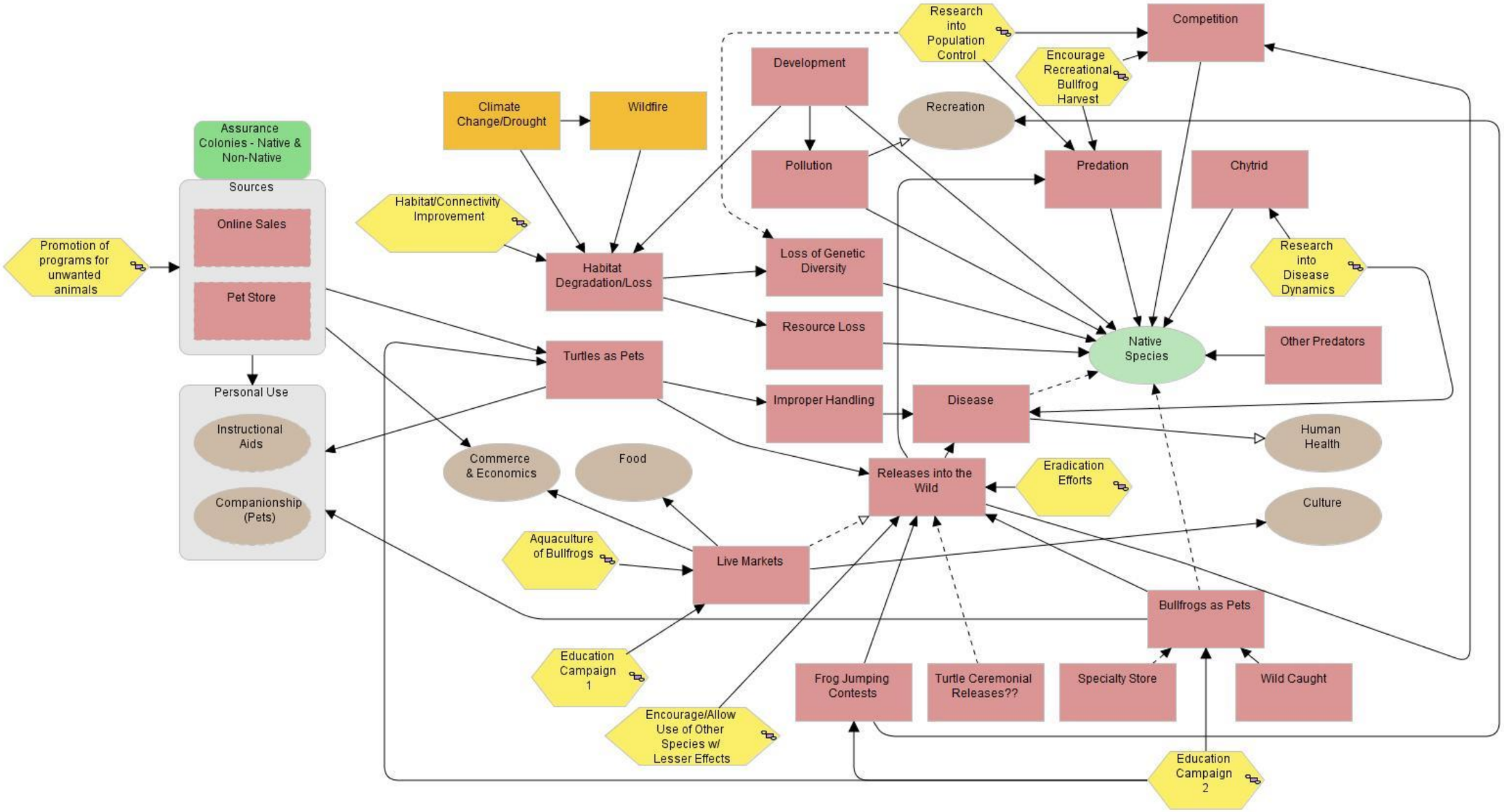
Threat	Scope	Severity	Irreversibility	Summary Threat Rating	Comments
Habitat Fragmentation	Medium	High	High	Medium	
Direct Predation on Species	Low	Medium	High	Low	
Habitat Quality Issues	Very High	Very High	High	Very High	
Competition	Medium	Medium	High	Medium	
Increased demand for water	Very High	Very High	Very High	Very High	

Industry Group Analysis

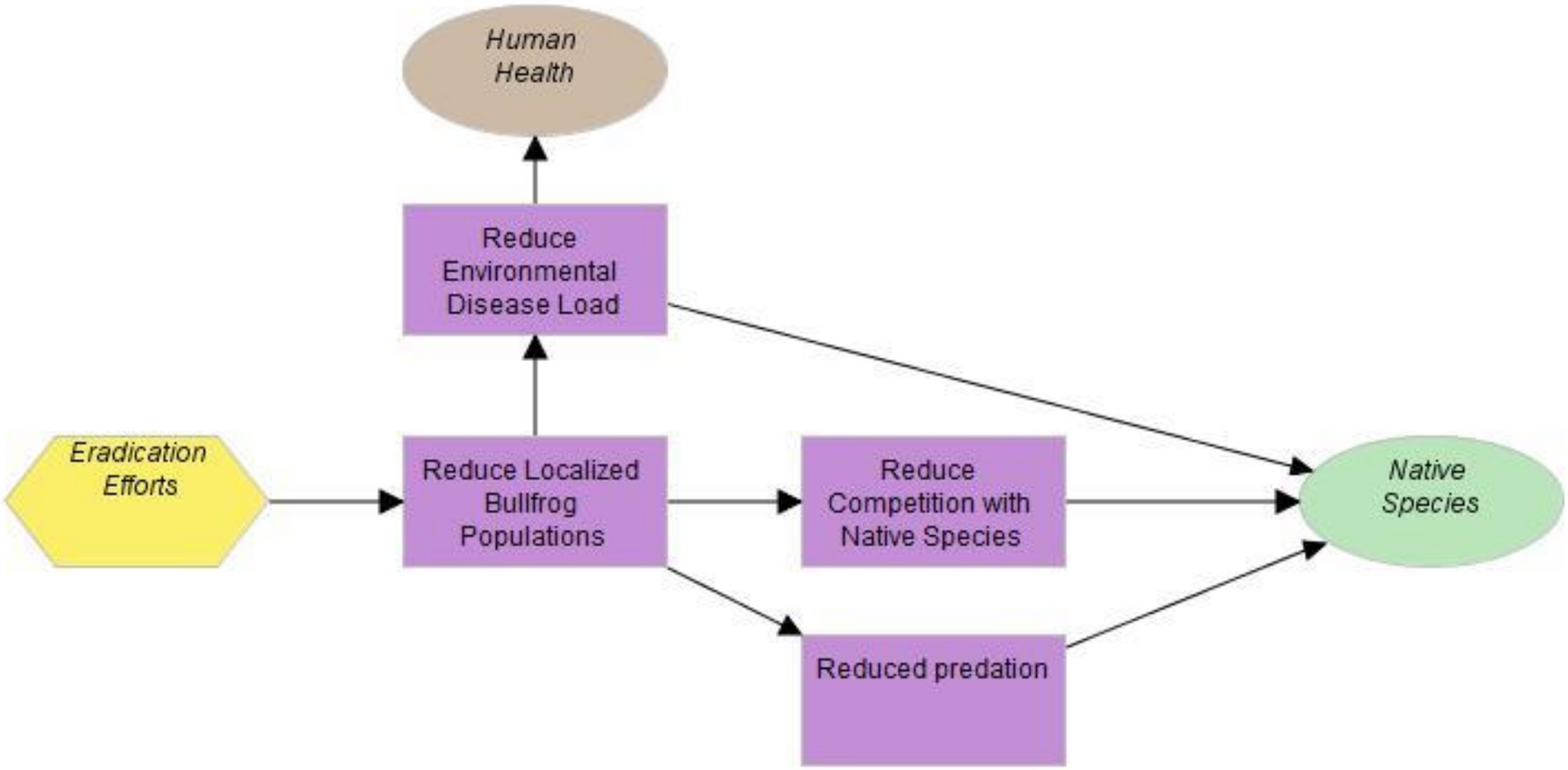
Scope and Vision

Scope/Site Name	California
Vision Statement Text	Our vision of California is one where conservation of native species coexists with access to culturally valuable animals for traditional foods, educational research, and companions, while promoting economic opportunity, recreation, consumer education, feasible management, and effective enforcement concerning harm to other species.
Comments	

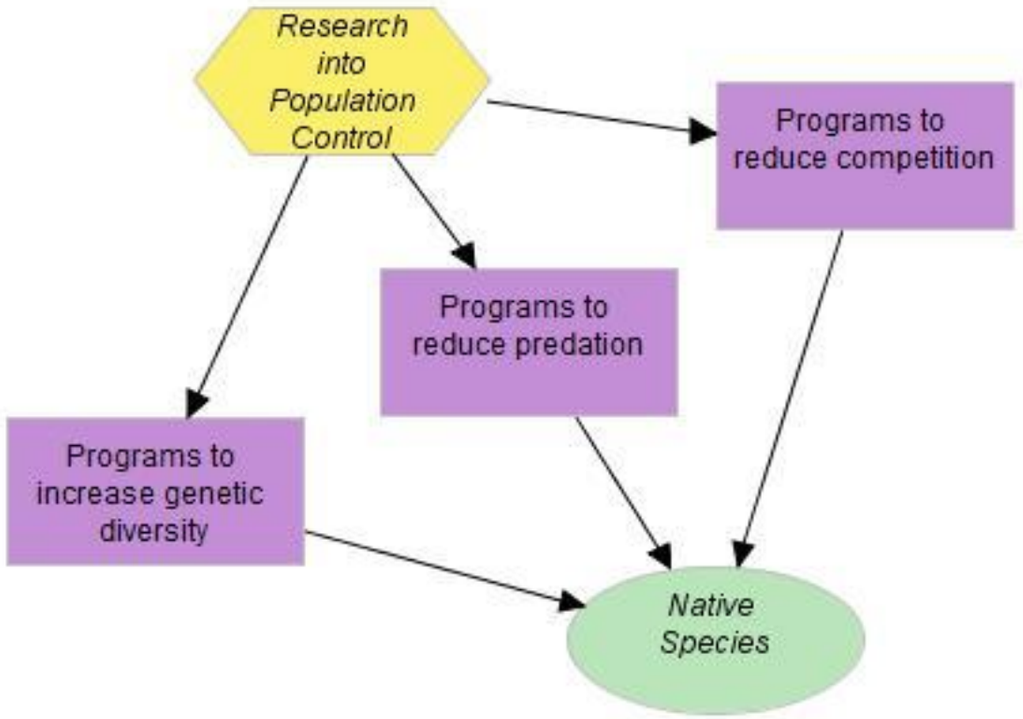
Main Diagram



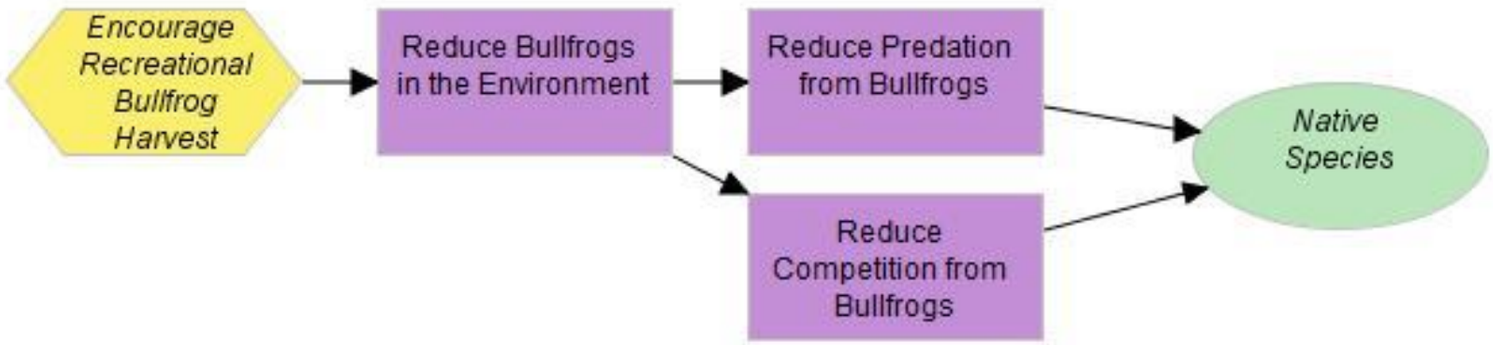
Results Chain: Eradication efforts



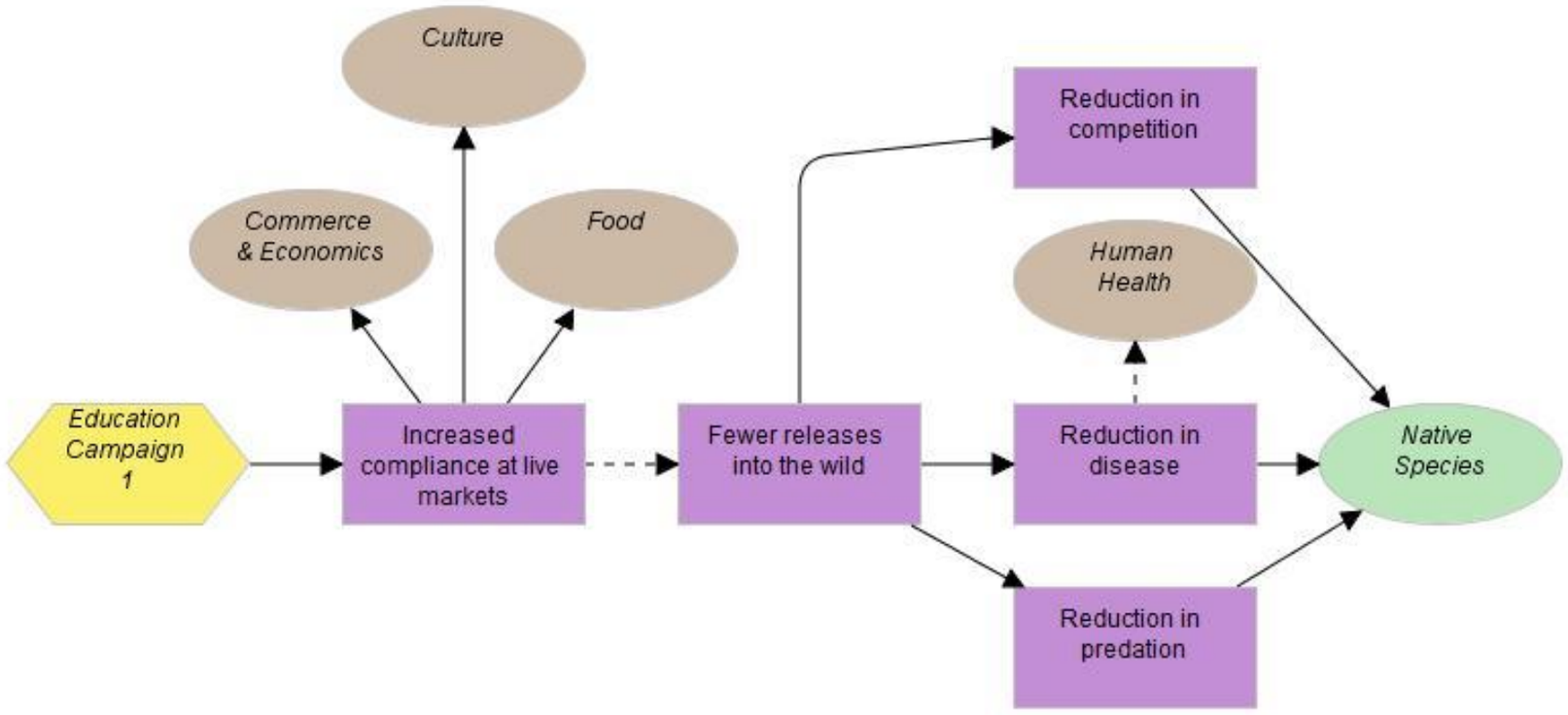
Results Chain: Research into population control techniques



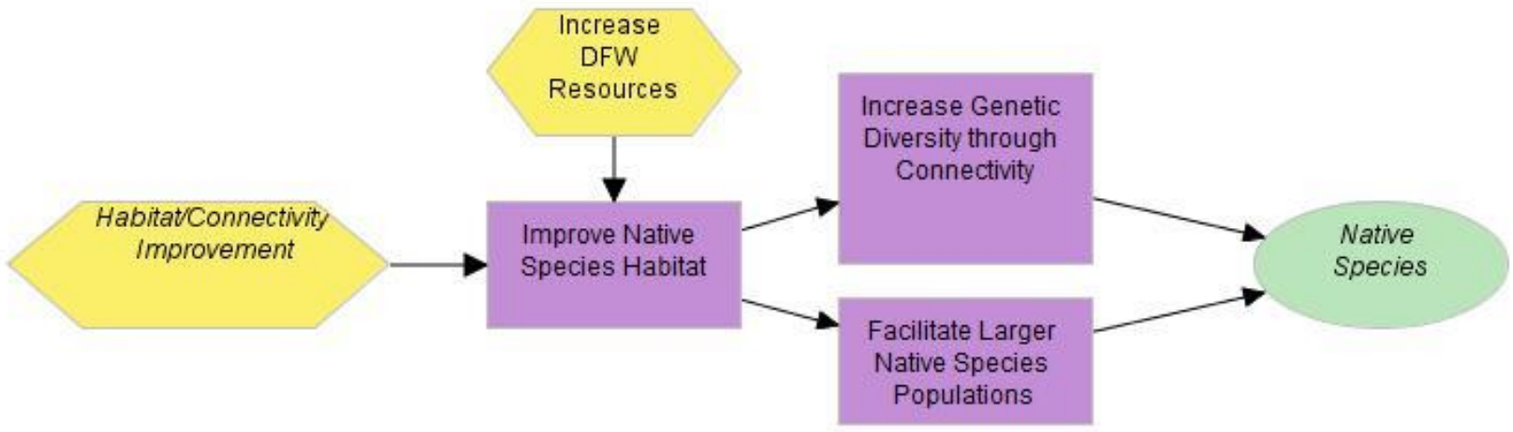
Results Chain: Encourage recreational bullfrog harvest



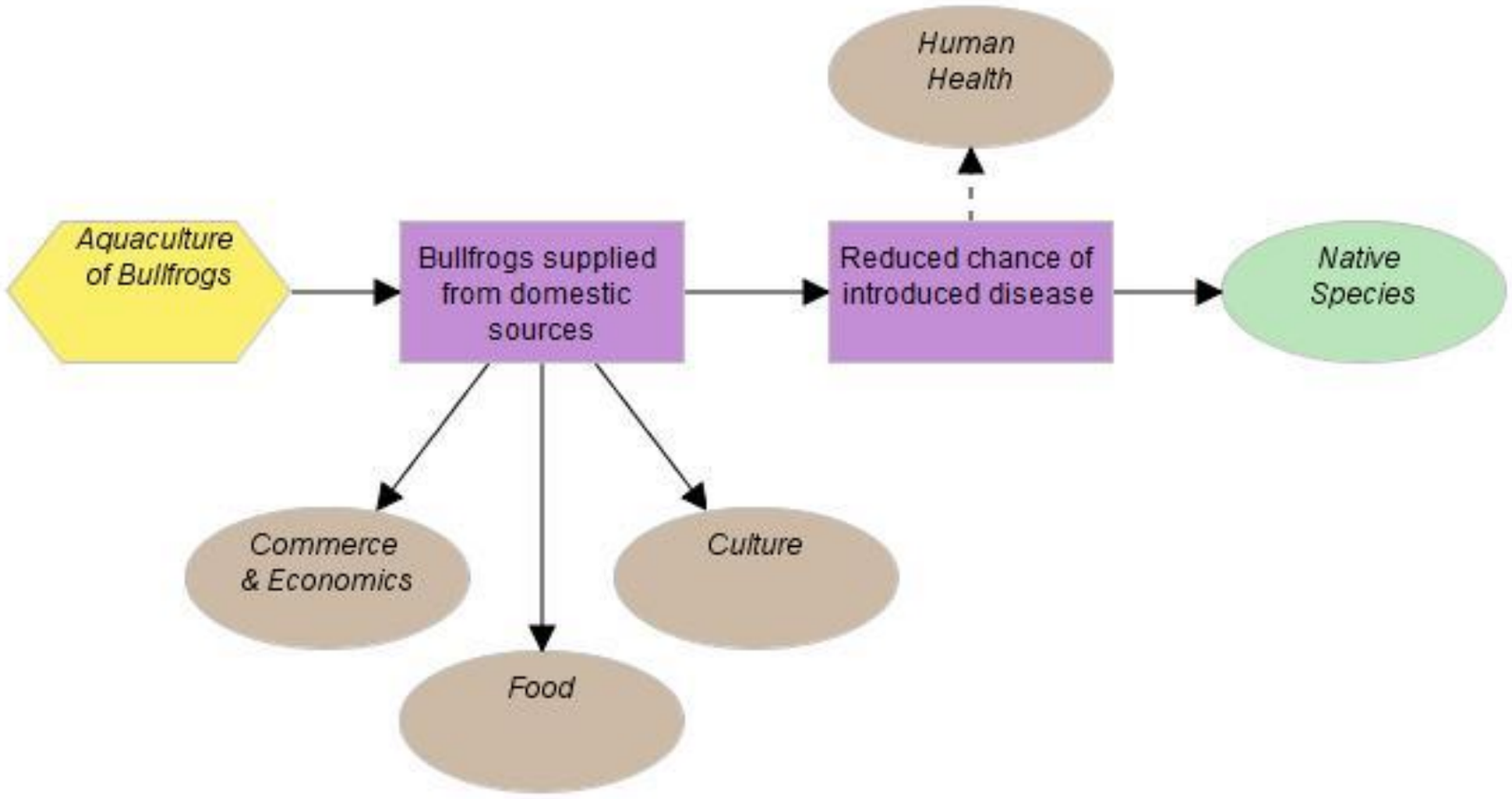
Results Chain: Education campaign 1



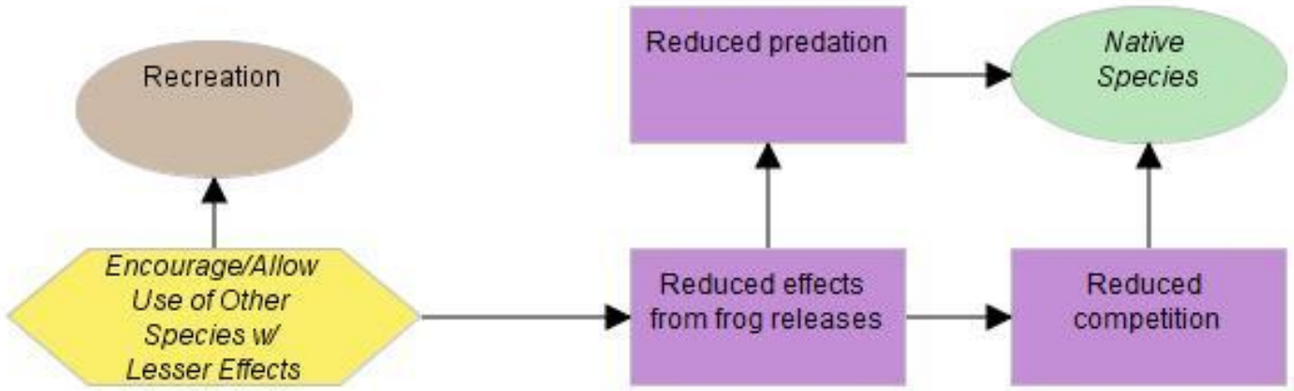
Results Chain: Habitat/connectivity improvement



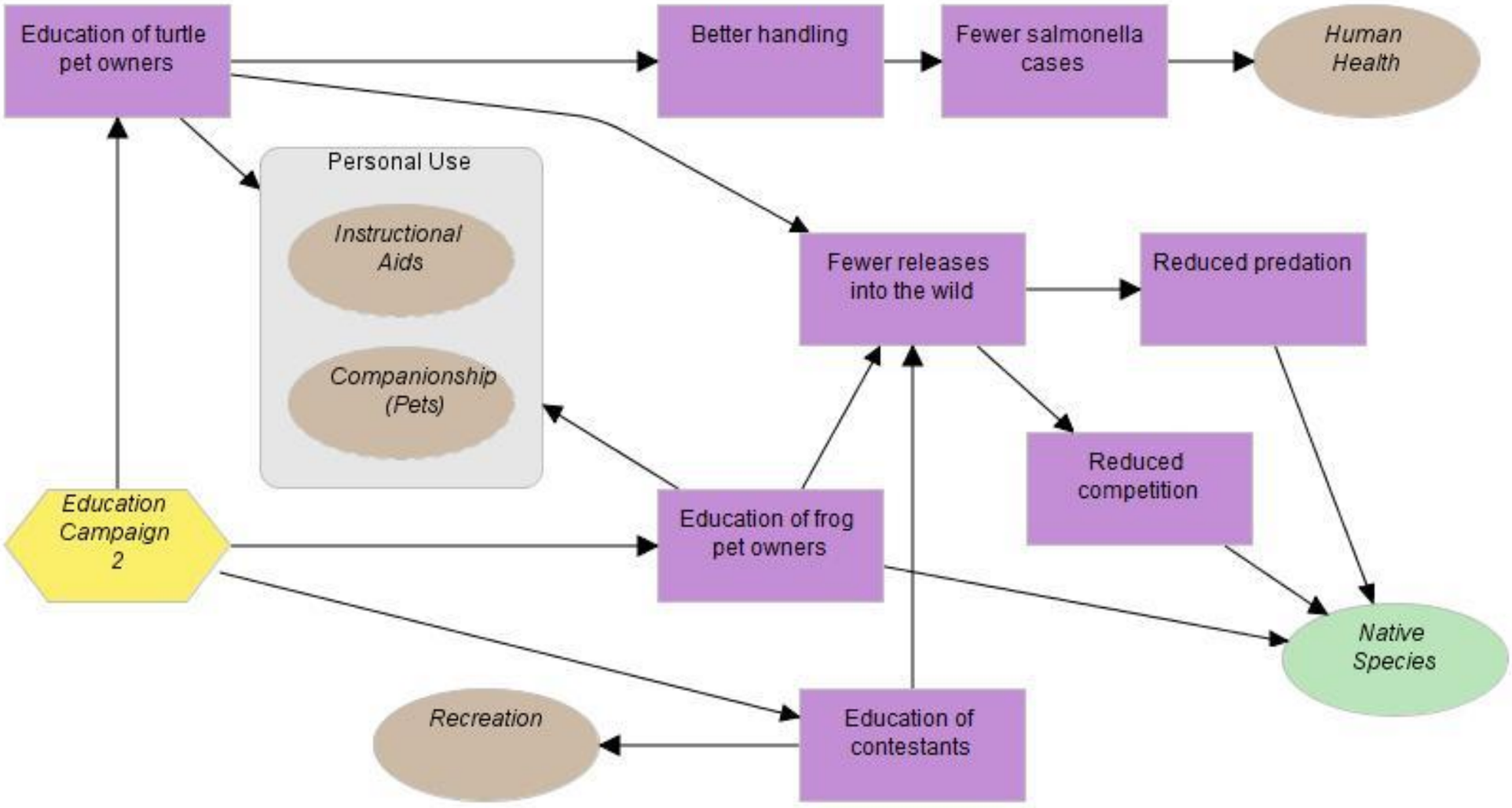
Results Chain: Aquaculture of bullfrogs



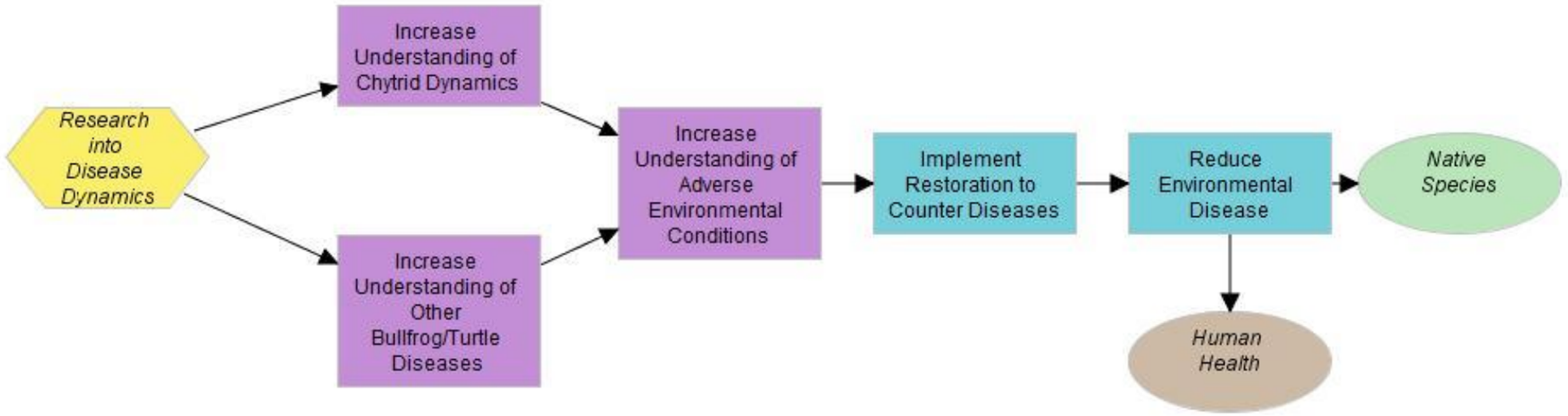
Results Chain: Encourage/allow use of other species w/ lesser effects



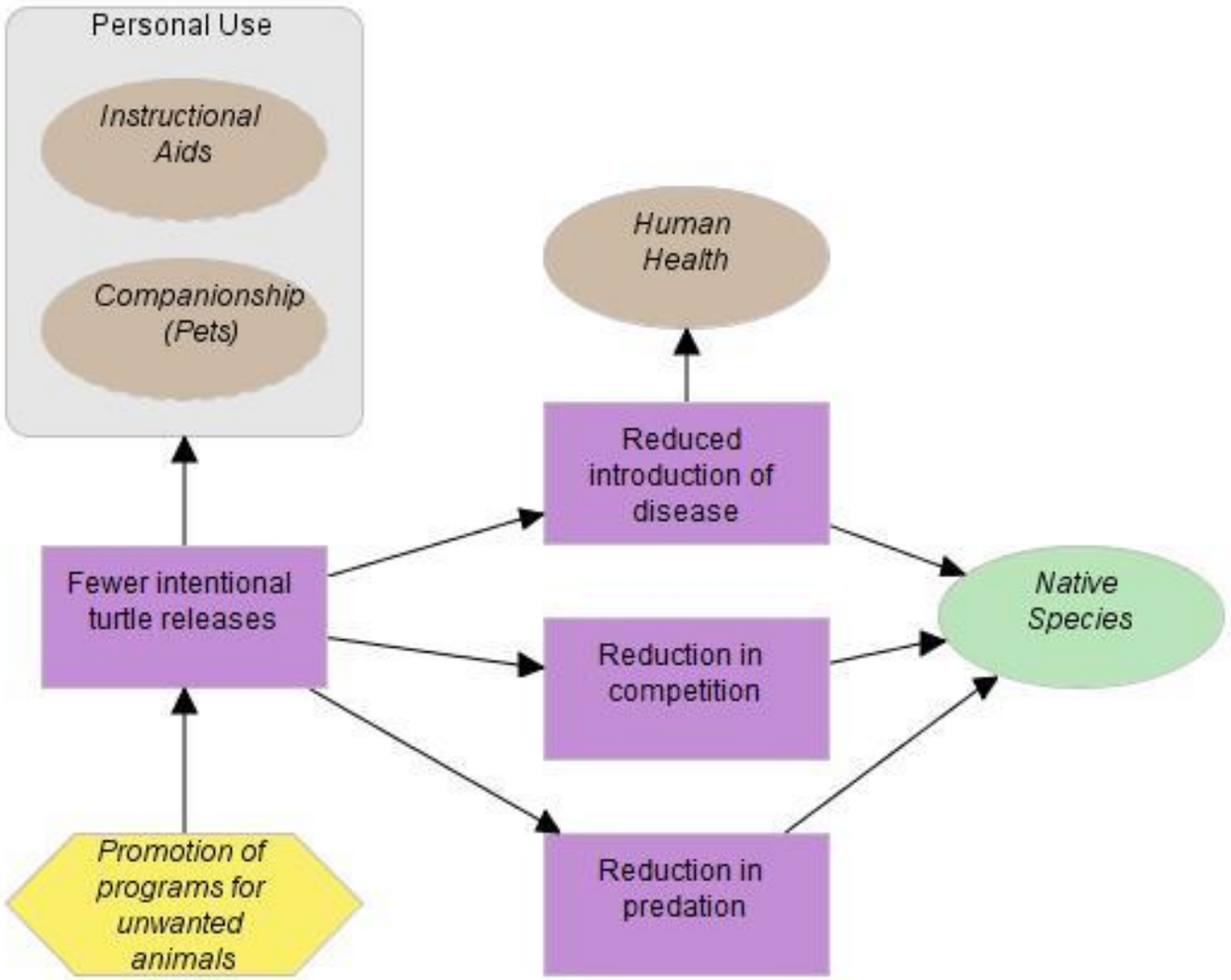
Results Chain: Education campaign 2



Results Chain: Research into disease dynamics



Results Chain: Promotion of programs for unwanted animals



Industry Notes

Item	Details
Aquaculture of bullfrogs	• Likely only viable in the case of an import ban
Education campaign 1	• Content: Handling, Releases, Food Safety • Venue: Live Markets • Audience: retailers
Education campaign 2	• Content: Handling, Releases • Retail Stores • Aimed at prospective pet owners and current pet owners
Encourage/allow use of other species with lesser effects	• Jumping frog contest education
Promotion of programs for unwanted animals	• CA turtle & tortoise club has people that will take in unwanted turtles and give them for adoption Pet stores also have programs to take back unwanted animals "Don't let it loose" program • POS, or when supplies are bought
Research into population control techniques	• Triploids
Online sales	• Exotic species or special individuals
Habitat degradation/loss	• Fragmentation
Turtles as pets	• Red-eared sliders
Loss of genetic diversity	• Fragmentation in turtles
Resource loss	• Food, space, water, plants, breeding sites
Live markets	• Consumers don't touch the animals; all are slaughtered before leaving the market • Held in regular fish tanks • Water goes into drains that lead to sewers, generally combined with cleaners
Specialty store	• Farm & feed stores? • Water garden stores
Bullfrogs as pets	• Does not include tropical species • Prevalence is probably low
Human health	• USDA 4-inch rule
Commerce and economics	• Positive for growers, negative for importers
Companionship (pets)	• Pets

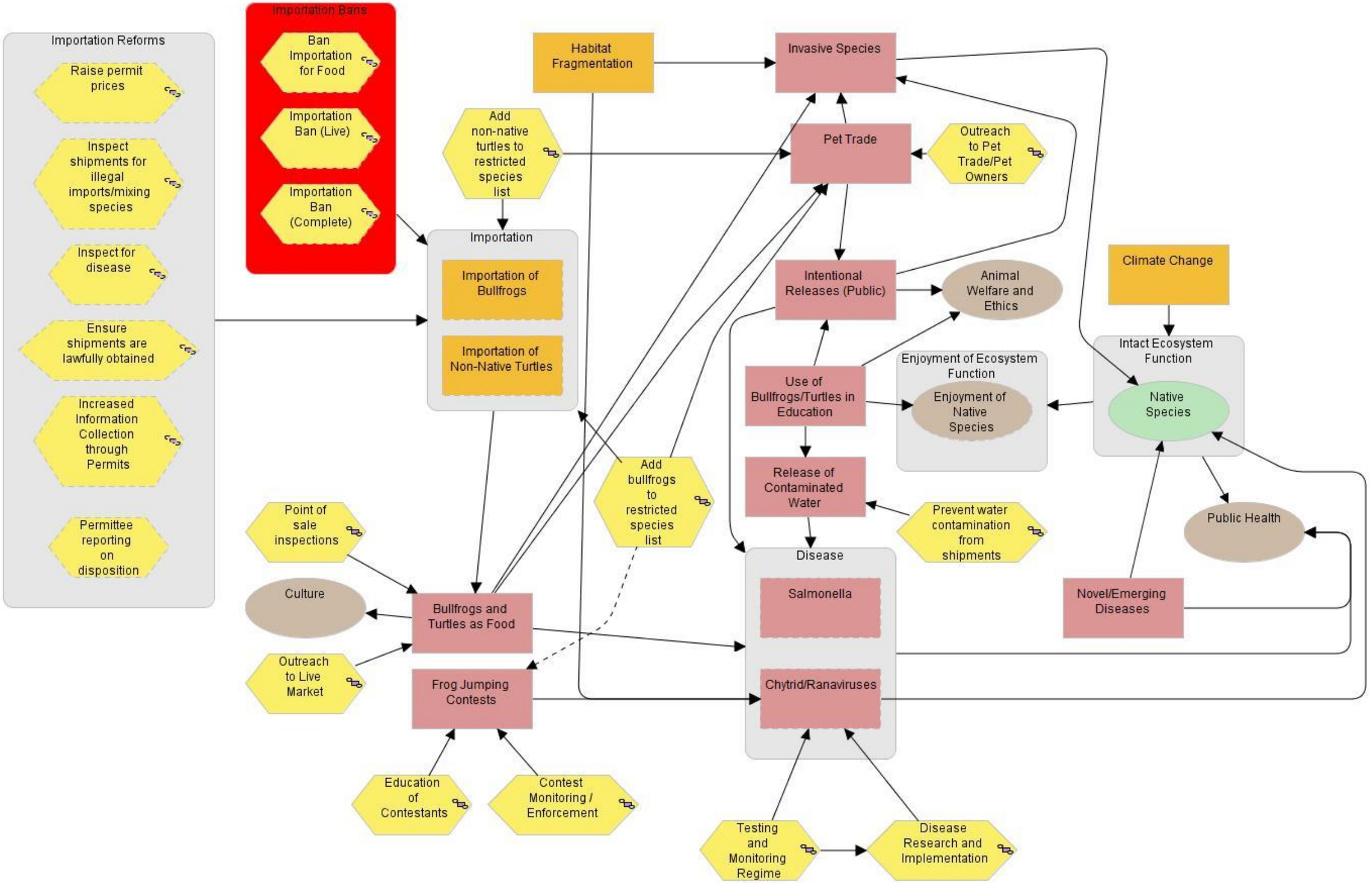
Item	Details
Recreation	• Frog jumping contests, picture taking of turtles, gigging/fishing for bullfrogs
Assurance colonies – Native and non-native species	• Not really any licensing, but Captive Bred Wildlife Permit (FWS) allows possession of turtles • When transferring, both parties need a CBW permit • No colonies for red-eared sliders or soft-shelled turtles
Live markets to releases in the wild	• This link is disputed
Increase Understanding of Adverse Environmental Conditions	• Ecological factors that promote or facilitate disease

Environmental/Animal Welfare Group Analysis

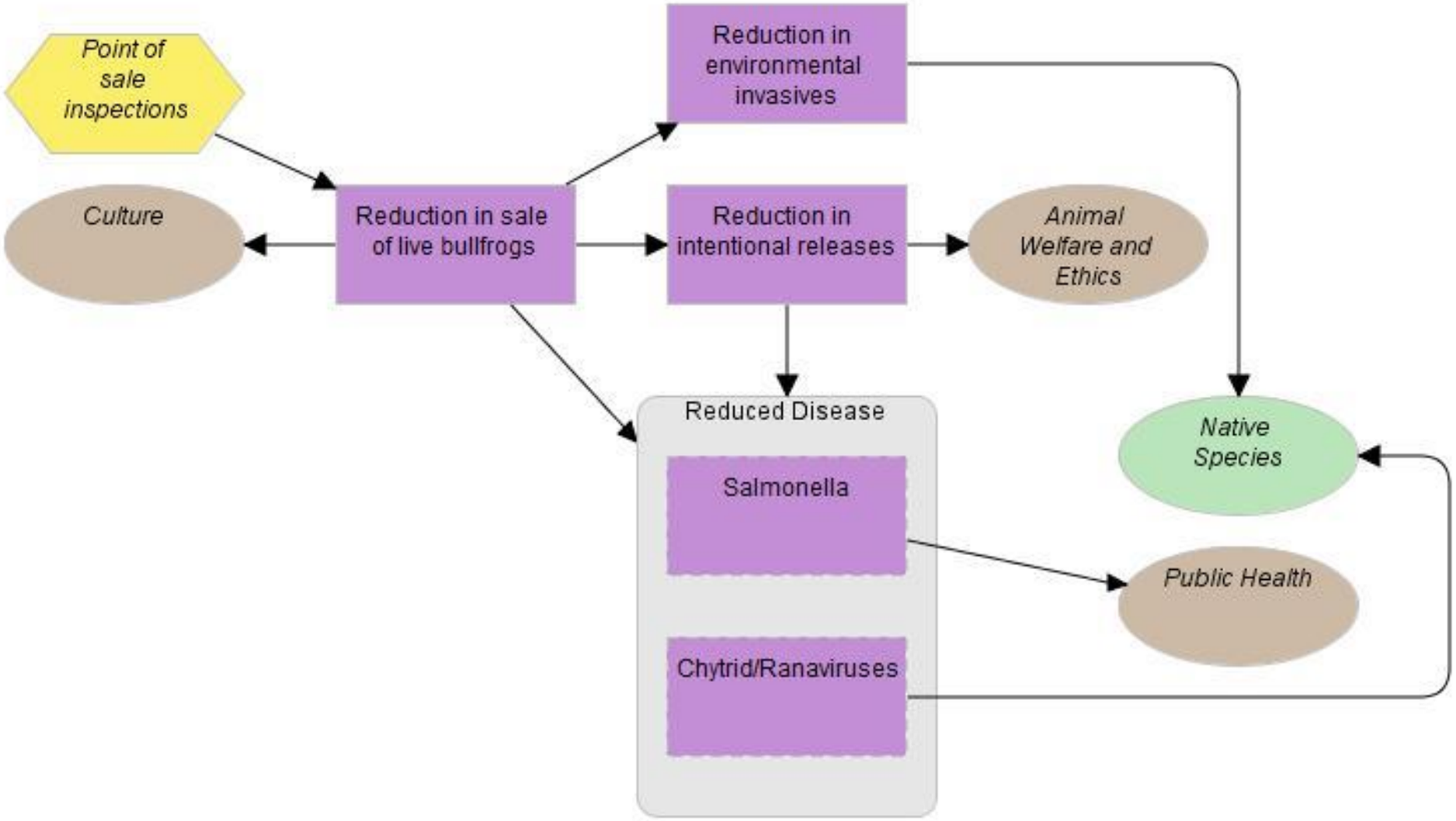
Scope and Vision

Vision Statement Text	A California with an enforced ban on the importation of bullfrogs and non-native turtles. A Department that lives up to its mission and stated purpose and upholds the public trust.
Comments	

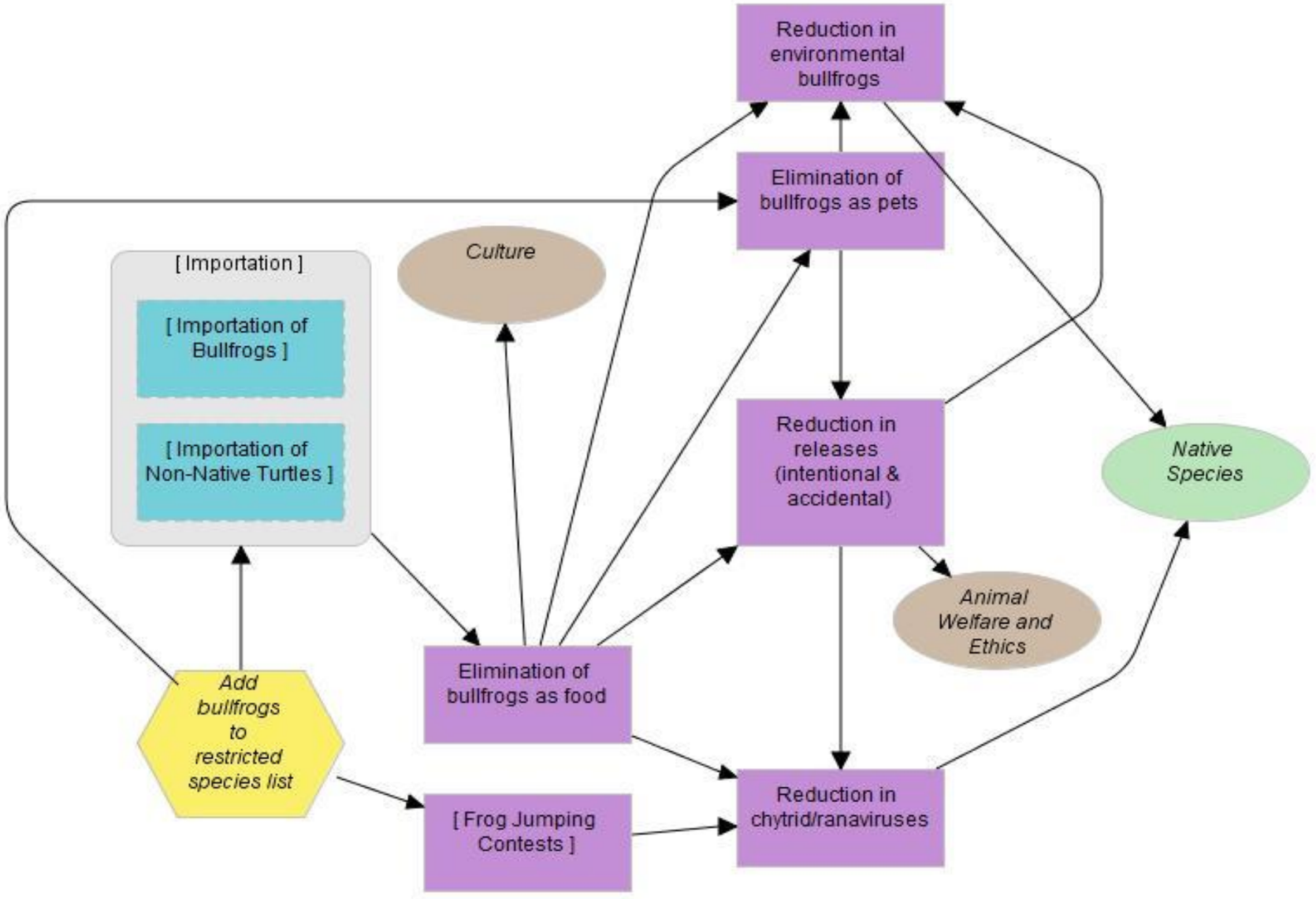
Main Diagram



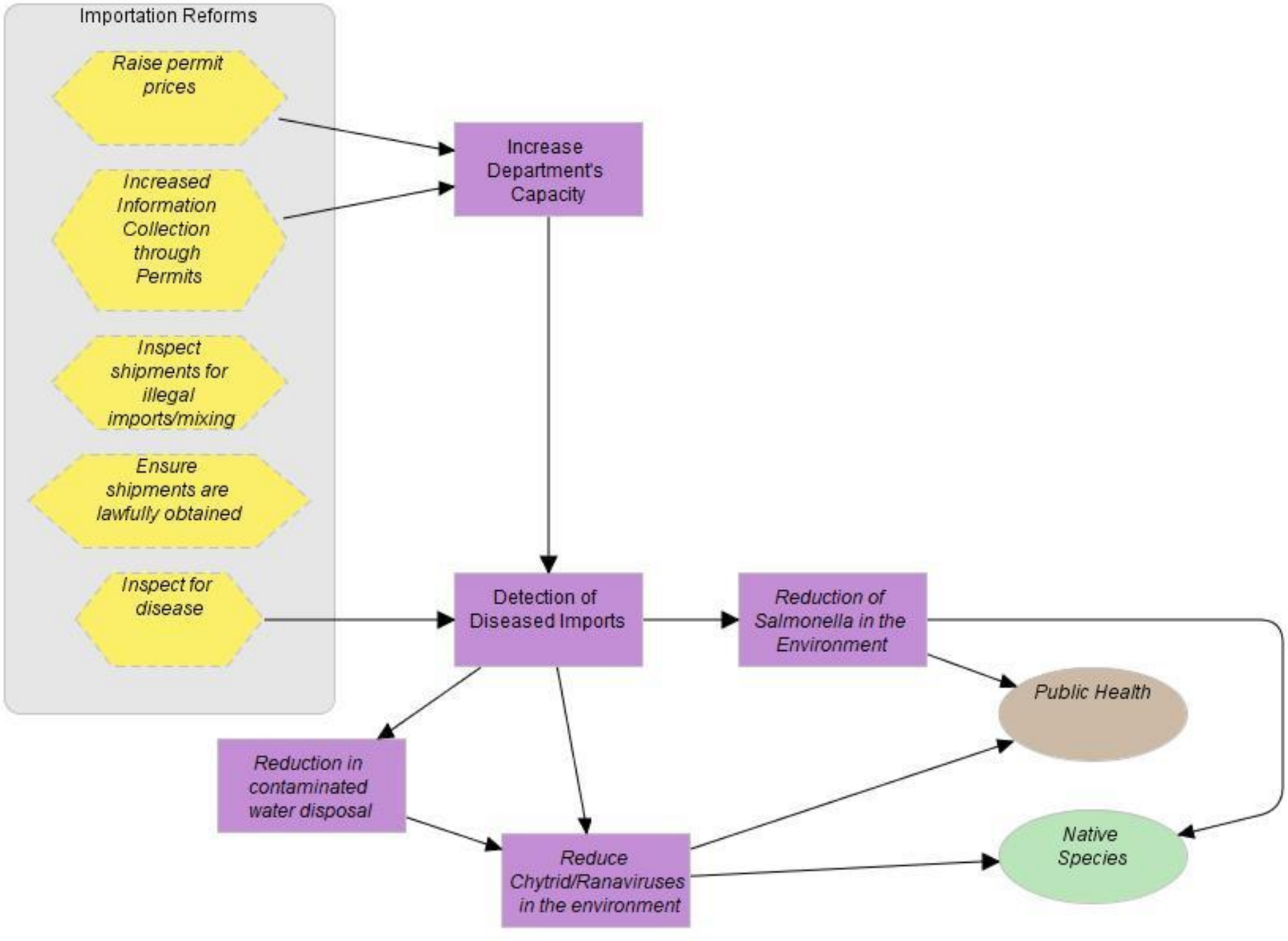
Results Chain: Point of sale inspections



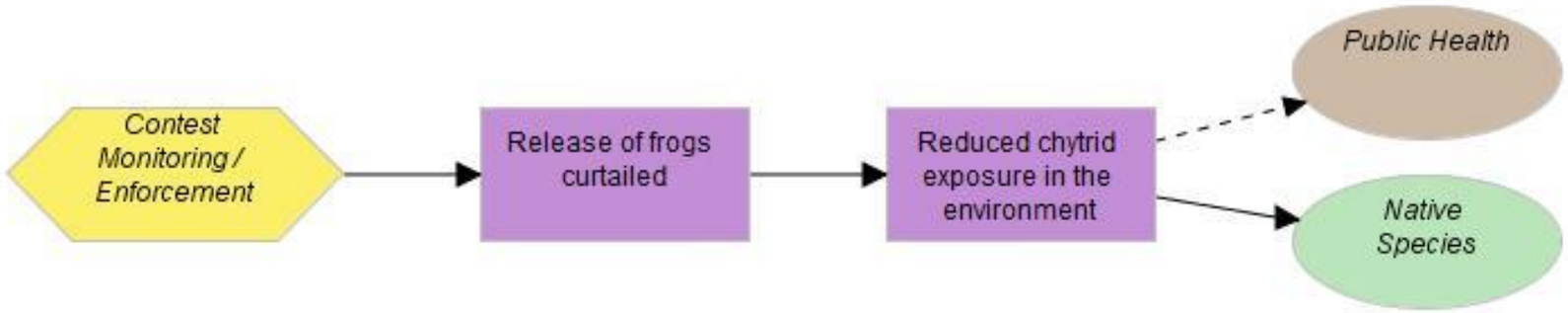
Results Chain: Add bullfrogs to restricted species list



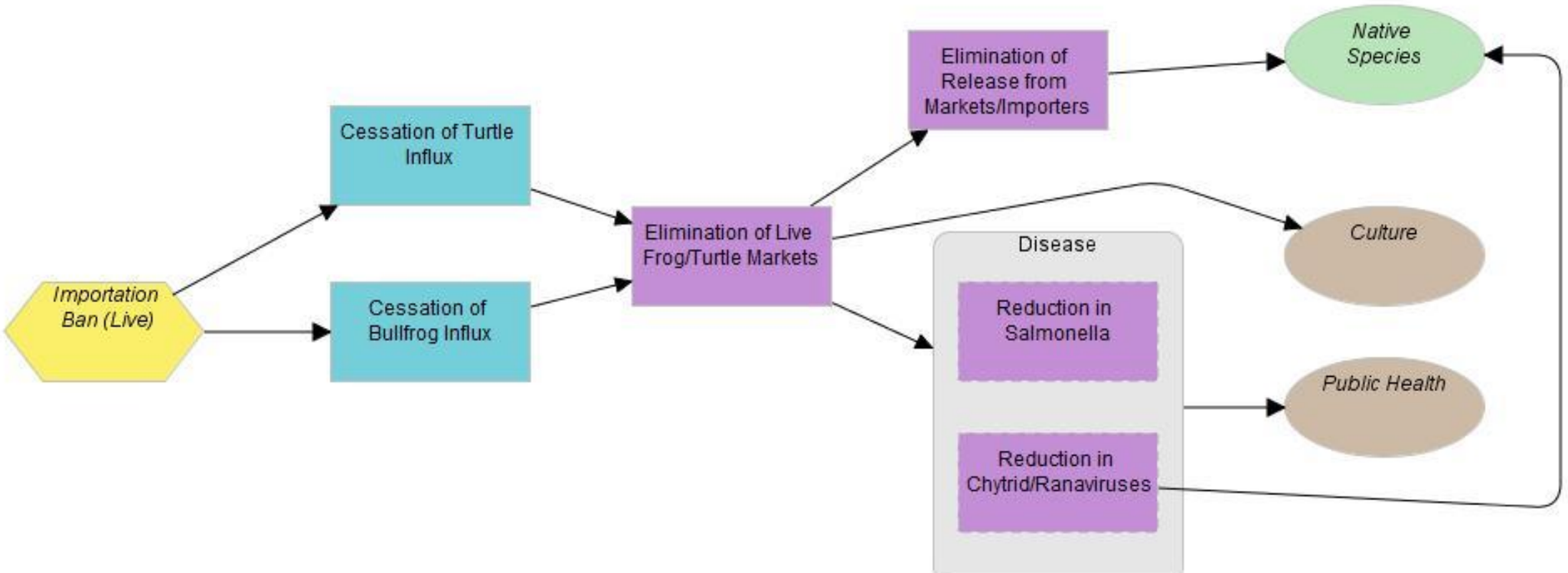
Results Chain: Importation reforms



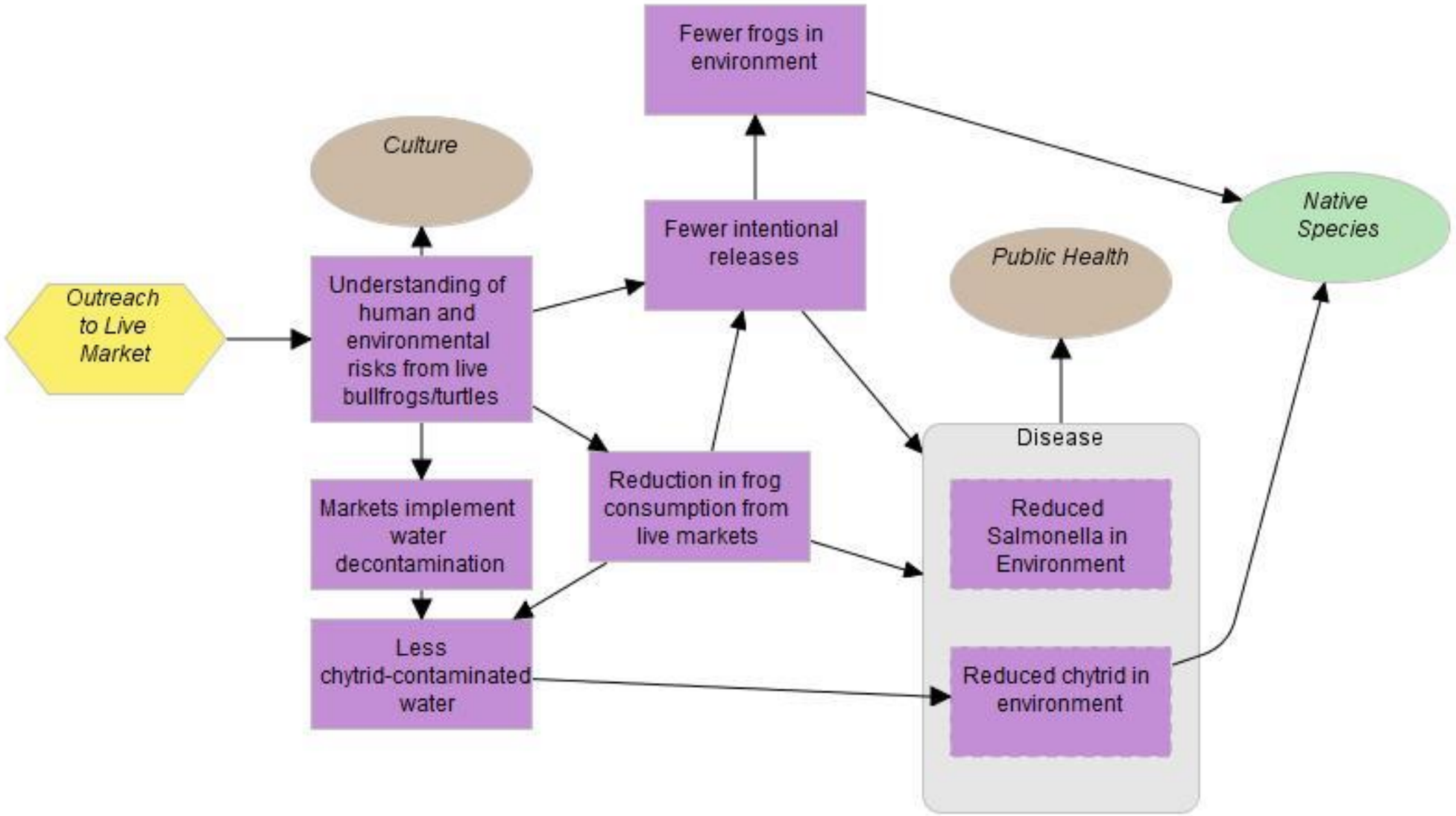
Results Chain: Contest monitoring / enforcement



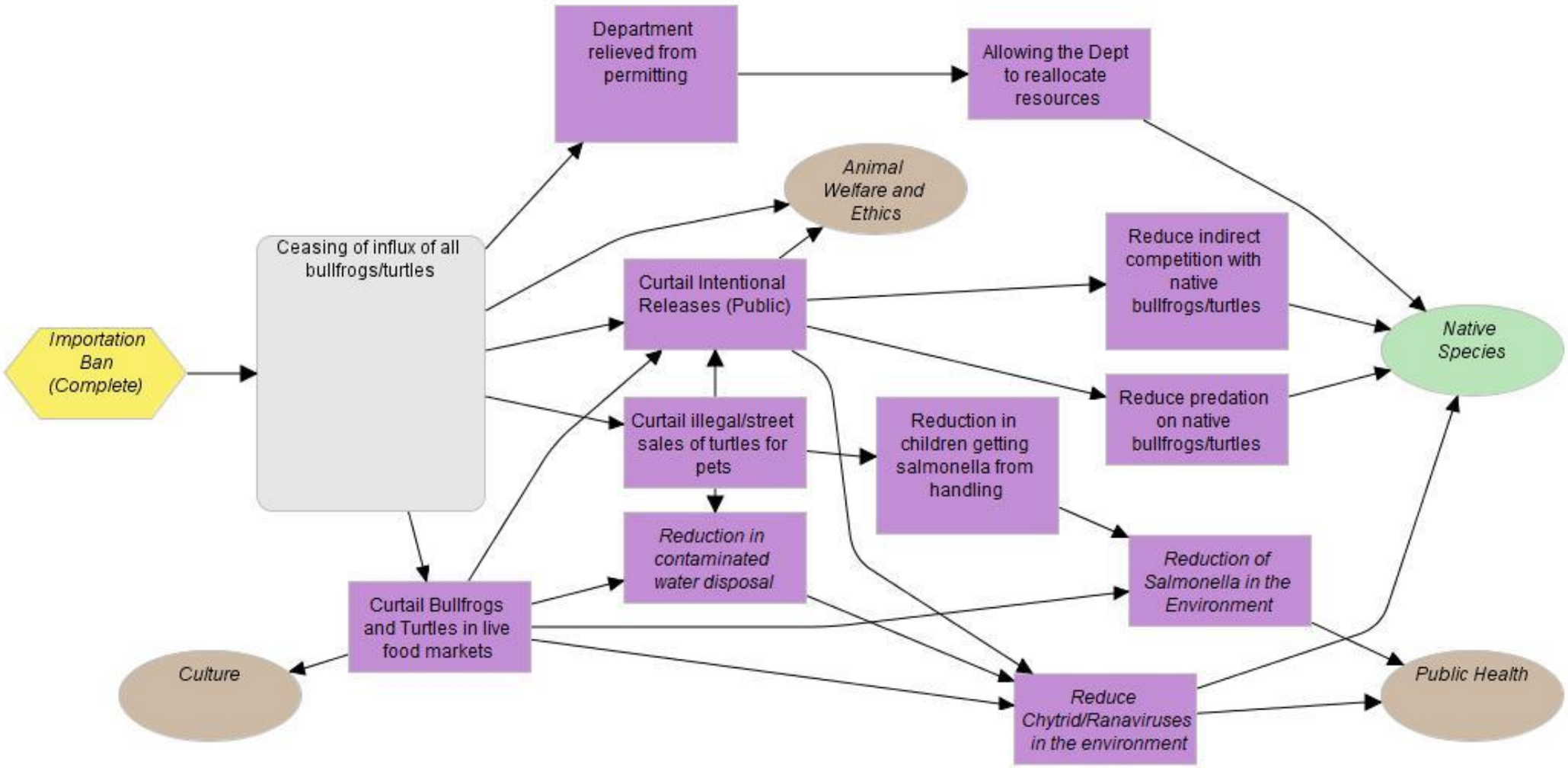
Results Chain: Importation ban (live)



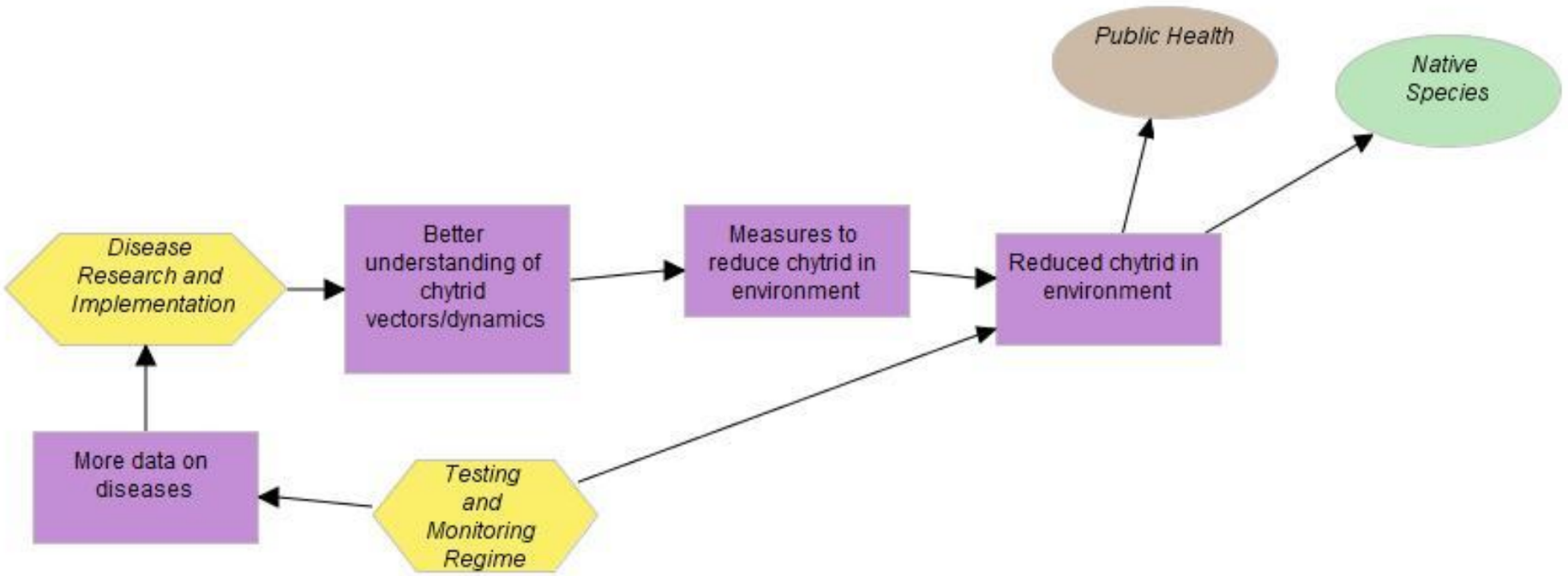
Results Chain: Outreach to live market



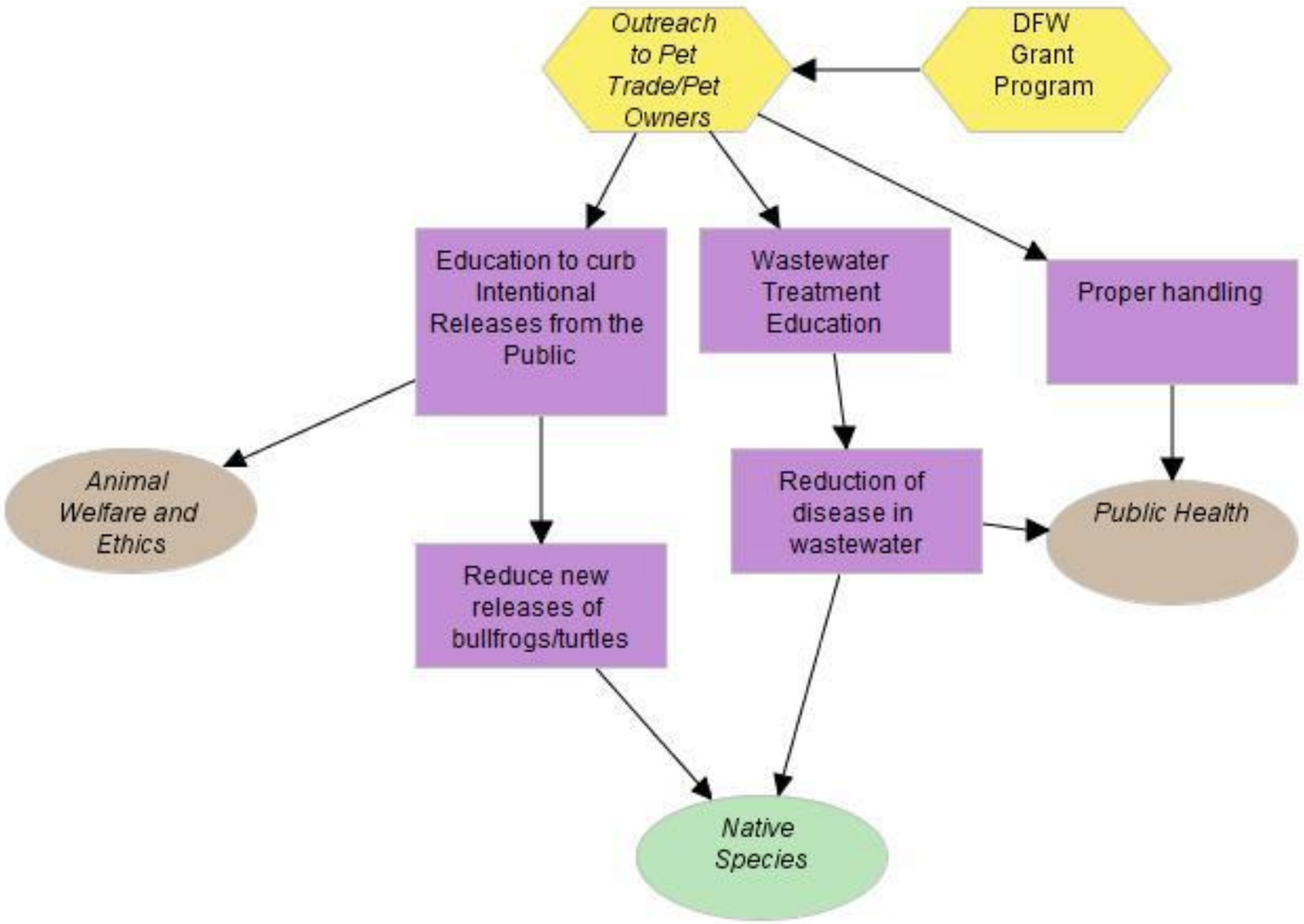
Results Chain: Importation ban (complete)



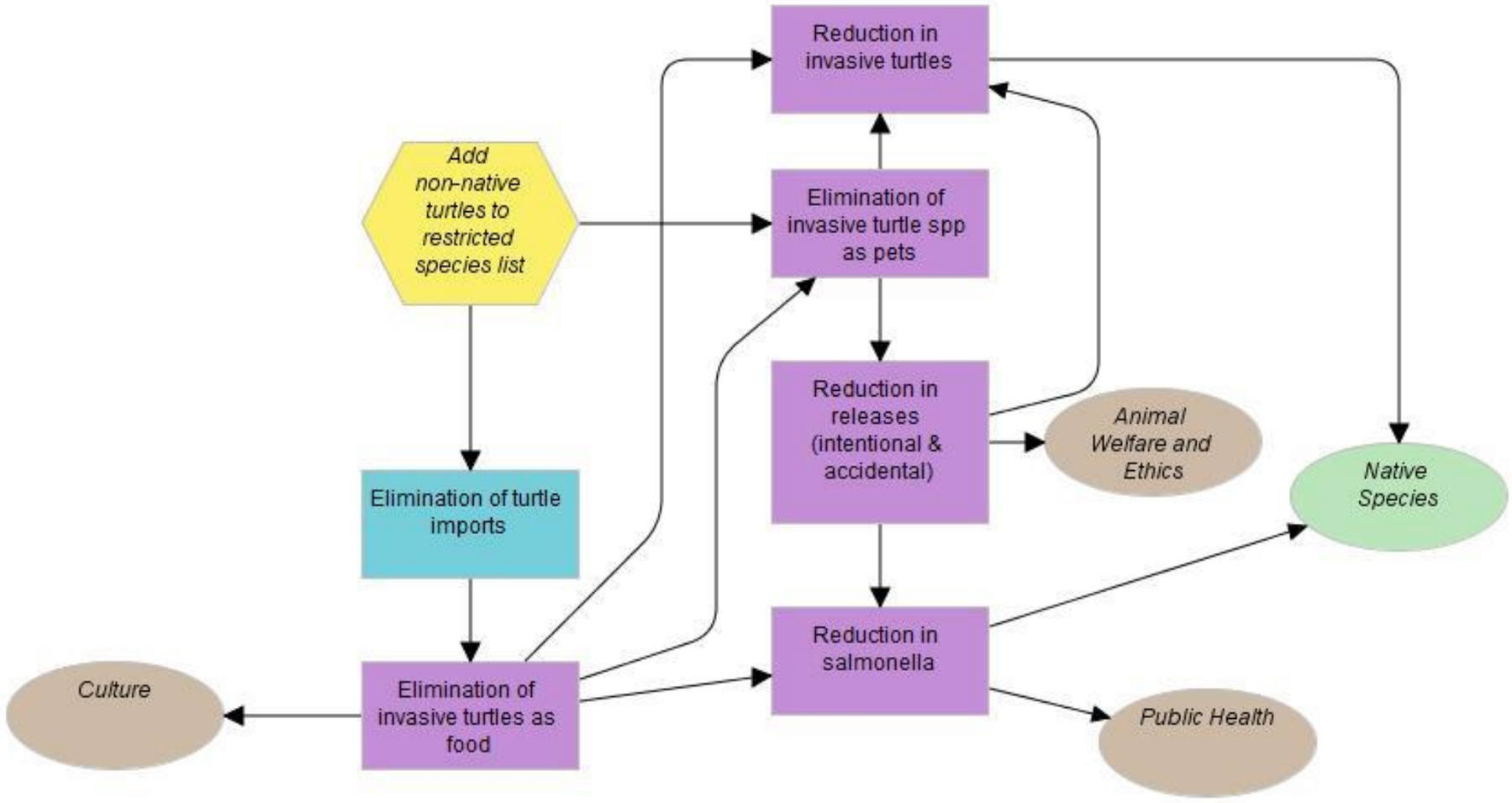
Results Chain: Disease research and implementation



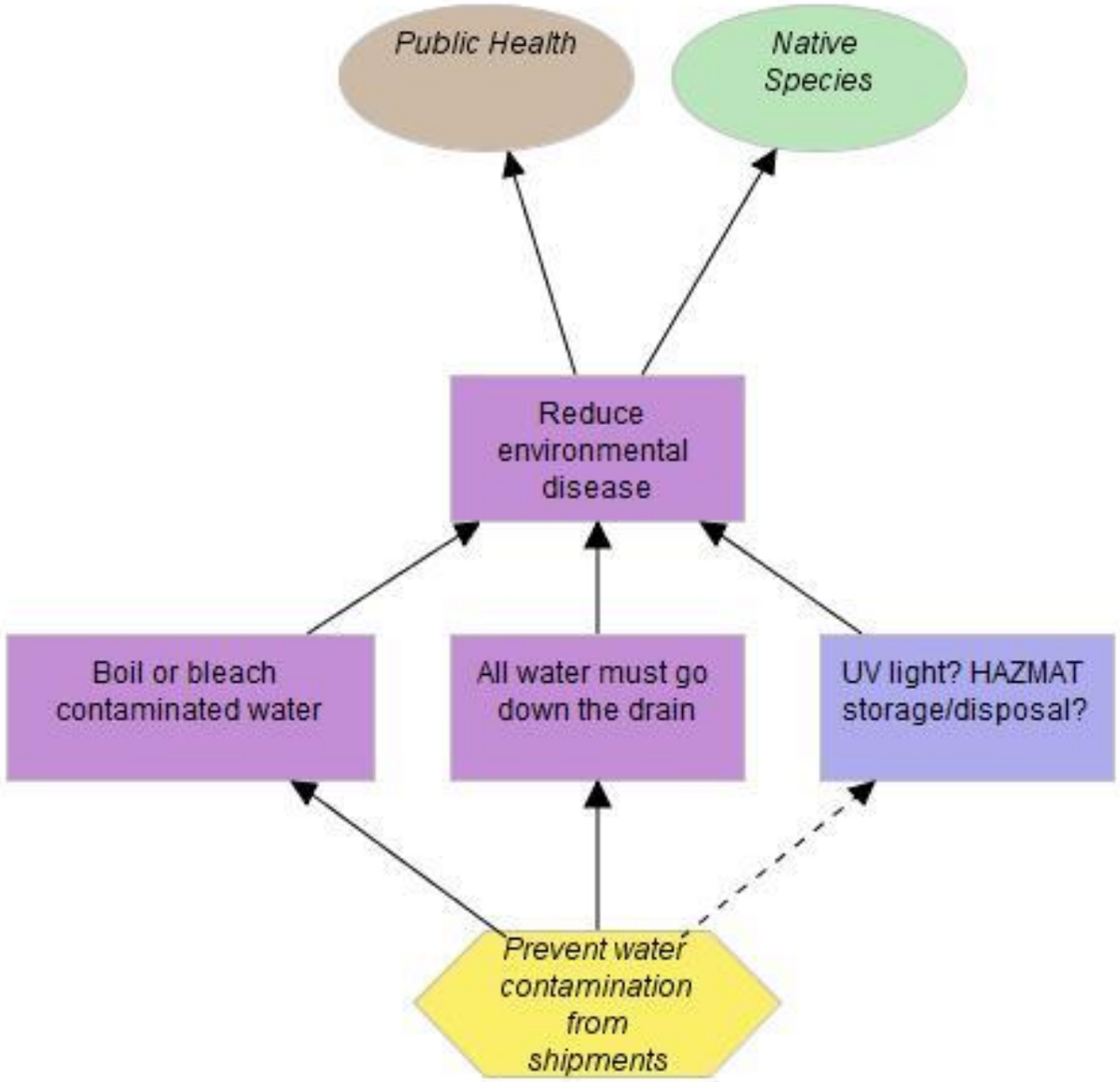
Results Chain: Outreach to pet trade/pet owners



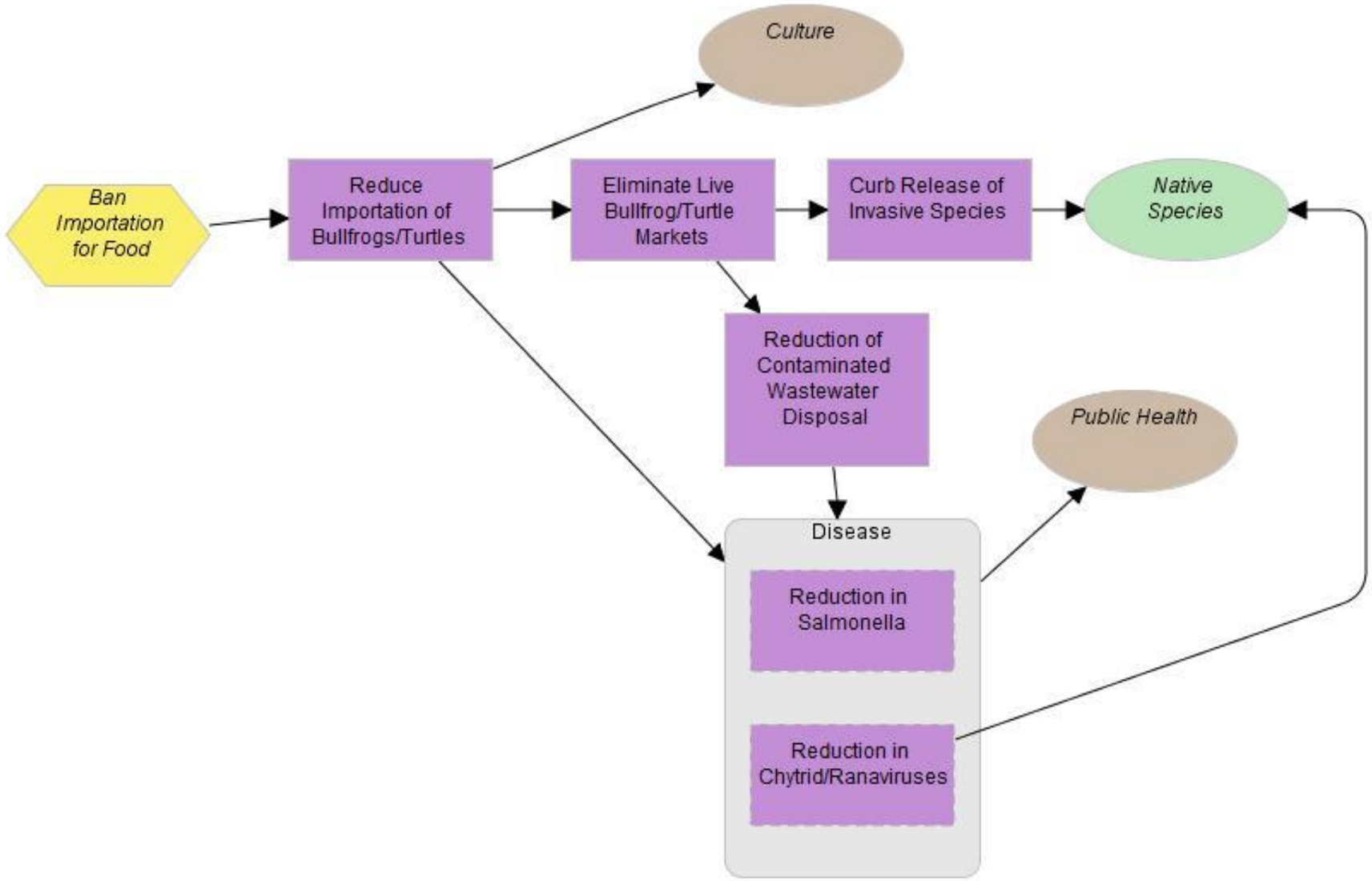
Results Chain: Add non-native turtles to restricted species list



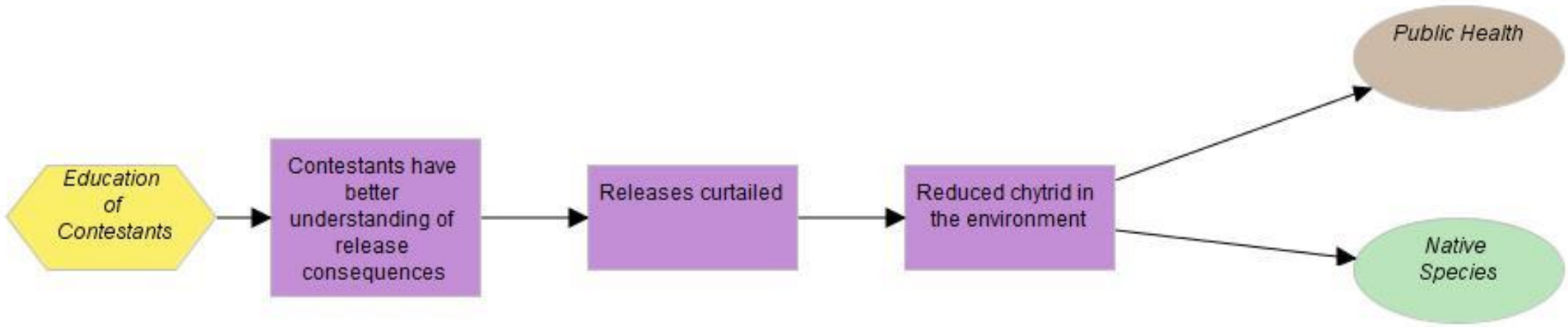
Results Chain: Prevent water contamination from shipments



Results Chain: Ban Importation for food



Results Chain: Education of contestants



Environmental/Animal Welfare Notes

Item	Details
Add bullfrogs to restricted species list	• Could be qualified with certain exceptions
Add non-native turtles to restricted species list	• Could be qualified with certain exceptions
Testing and Monitoring Regime	• Onus could be on the vendor to initiate testing. List of approved testers.
Ensure shipments are lawfully obtained	• See T14, section 236(C)(8) • Pertains to the origin of the shipment. • Perhaps more important for turtles?
Increased Information Collection through Permits	• Where are shipments coming from? How many are you bringing in? Do you have permission from the source?
Inspect shipments for illegal imports/mixing species	• Randomized sample
Raise permit prices	• Price proportional to number of individuals imported? • Permit prices must cover the cost of the DFW bullfrog and turtle program, including inspections and enforcement
Contest Monitoring / Enforcement	• Ensure no use of protected species, information gathering, animal welfare enforcement
Outreach to Live Market	• Shark fin soup – generational • DFW implements, cooperating with SF Library • Could be a comprehensive initiative, should include a contextual component that explains the entire strategy • Importers, retailers • Asian language materials • Benefits of frozen vs. Live animals
DFW Grant Program	• Grant program for organizations to develop education campaigns
Outreach to Pet Trade/Pet Owners	• Responsible wastewater treatment
Point of sale inspections	• Notice posted? • Health and safety codes followed?https://codes.findlaw.com/ca/penal-code/pen-sect-597-3.html
Prevent water contamination from shipments	• Distributor to Retailer - Imported water/disposal • Transfer water/disposal • Market water/disposal
Novel/emerging diseases	• Threats to animals or people *Batrachochytrium salamandrivorans*, plus others that may not be known
Reduce new releases of bullfrogs/turtles	• Complications from returned animals? • Nominal "rehoming fee"? • Education about the reality of keeping/caring for animals before purchase
Reduction of disease in wastewater	• Salmonella? • Cholera
Boil or bleach contaminated water	• Water or ice that has come into contact with frogs/turtles must be boiled or bleached (?%) • Boiling is preferred • Virkon is an alternative (more expensive)
Reduce environmental disease	• Chytrid • Some ranaviruses

California Fish and Game Commission

Draft Staff Analysis of the Conservation Standards Work in the Bullfrog and Non-Native Turtle Stakeholder Engagement Process

Updated 5/12/2022

The draft analyses in this document have been prepared by California Fish and Game Commission (Commission) staff using the materials from *Preliminary Results from the Conservation Standards Work in the Bullfrog and Non-Native Turtle Stakeholder Engagement Process* (dated January 7, 2022), which was provided to the Wildlife Resources Committee (WRC) at its January 2022 meeting. This document therefore relies on, and is intended to pair with, that January document.

The draft analyses are based on the work of three, separate, stakeholder process groups to date, public input, and the most recent stakeholder meetings that have included all process participants from all three groups together. Three analyses are included herein: A literature review, the Oregon situation and regulatory framework, and an assessment of strategy effectiveness.

Literature Review

Campbell, T., B. Shaw, E. Hammond, L. Bao, S. Yang, P. Jurich, and S. Fox. 2021. Qualitative interviews of practitioners of Buddhist life release rituals residing in the United States: implications for reducing invasion risk. Management of Biological Invasions 12:178–192.

Details the practice of releasing live animals into the environment as a spiritual practice. California is among the locations studied. Turtles are mentioned as a possible animal to be released, though fish are the only species specifically mentioned as being released in California. Participants emphasized saving the lives of animals versus simply releasing animals. Sources included pet stores, bait shops, markets, commercial anglers, and wildlife rehabilitation centers. Many interviewees were aware of invasive species issues.

Claytor, S. C., K. Subramaniam, N. Landrau-Giovannetti, V. G. Chinchar, M. J. Gray, D. L. Miller, C. Mavian, M. Salemi, S. Wisely, and T. B. Waltzek. 2017. Ranavirus phylogenomics: Signatures of recombination and inversions among bullfrog ranaculture isolates. Virology 511:330–343.

Genetically characterizes different bullfrog ranavirus strains. Underscores the bullfrog as a vector for ranaviruses.

Cook, D. G., and A. F. Currylow. 2013. Seasonal spatial patterns of two sympatric frogs: California red-legged frog and American bullfrog. Western Wildlife 1:1–7.

Explores the spatial dynamics by which bullfrogs outcompete California red-legged frogs.

Crowley, S. L., S. Hinchliffe, and R. A. McDonald. 2017. Invasive species management will benefit from social impact assessment. Journal of Applied Ecology 54:351–357.

Urges deliberative, participatory approaches to invasive species management by identifying, evaluating and addressing social costs and benefits.

Garwood, J. M., S. J. Ricker, and C. W. Anderson. 2010. Bullfrog Predation on a Juvenile Coho Salmon in Humboldt County, California. Northwestern Naturalist 91:99–101.

Details an occurrence of a bullfrog having eaten a juvenile coho salmon.

Gray, I. A. 2009. Breeding pond dispersal of interacting California red-legged frogs (Rana draytonii) and American bullfrogs (Lithobates catesbeianus) of California: a mathematical model with management strategies. M.S. Thesis, Humboldt State University, Arcata, CA. <http://humboldt-dspace.calstate.edu/handle/2148/560>. Accessed 10 Feb 2014.

Models the dynamics of California red-legged frogs and bullfrogs. Explores cases where co-occurrence could occur, and provides recommendations to enhance California red-legged frog persistence.

Hartmann, A. M., M. L. Maddox, R. J. Ossiboff, and A. V. Longo. 2022. Sustained ranavirus outbreak causes mass mortality and morbidity of imperiled amphibians in Florida. EcoHealth 19:8–14.

In some circumstances ranaviruses can lead to large-scale amphibian dieoffs. Various species can exhibit differential susceptibility and some hosts may serve as reservoirs for pathogenesis. The authors recommend that disease surveillance and pathogen mitigation strategies be developed.

Implications of importing American bullfrog (Lithobates catesbeianus = Rana catesbeiana) into California. 2014. California Department of Fish and Wildlife.

A comprehensive analysis of bullfrog biology and ecology in California, as well as an analysis of bullfrog importation and the threats it poses to California's wildlife populations.

Johnson, M. L., and R. Speare. 2003. Survival of Batrachochytrium dendrobatidis in water: quarantine and disease control implications. Emerging Infectious Diseases 9:915–921.

Chytrid fungus (*Batrachochytrium dendrobatidis*, or Bd) has inhibited growth in tap, lake, and distilled water over ideal laboratory conditions. Bd did not release zoospores in tap and deionized water. Zoospores may persist in the environment in a state of arrested development for long time periods (3-4 weeks).

Johnson, M., L. Berger, L. Philips, and R. Speare. 2003. Fungicidal effects of chemical disinfectants, UV light, desiccation and heat on the amphibian chytrid Batrachochytrium dendrobatidis. Diseases of Aquatic Organisms 57:255–260.

Chemical disinfectants including sodium chloride, household bleach (active ingredient: sodium hypochlorite), potassium permanganate, formaldehyde solution, Path-XTM agricultural disinfectant (active ingredient: didecyl dimethyl ammonium chloride, DDAC), quaternary ammonium compound 128 (DDAC), Dithane, Virkon, ethanol and benzalkonium chloride were tested, as well as sterilizing ultraviolet (UV) light, and heat and desiccation, to test the efficacy of water sterilization of *Batrachochytrium dendrobatidis*. All compounds had some degree of effectiveness, but those containing DDAC were most effective and can be deployed at low concentrations. Heating and drying met with some success but UV was ineffective.

Johnson, M., and R. Speare. 2005. Possible modes of dissemination of the amphibian chytrid Batrachochytrium dendrobatidis in the environment. Diseases of Aquatic Organisms 65:181–186.

Demonstrates *Batrachochytrium dendrobatidis* survival and potential ability for translocation in moist river sand and in bird feathers.

Kamoroff, C., N. Daniele, R. L. Grasso, R. Rising, T. Espinoza, and C. S. Goldberg. 2019. Effective removal of the American bullfrog (Lithobates catesbeianus) on a landscape level: long term monitoring and removal efforts in Yosemite Valley, Yosemite National Park. Biological Invasions. <https://doi.org/10.1007/s10530-019-02116-4>. Accessed 30 Oct 2019.

Documents successful eradication of bullfrogs on a landscape level at Yosemite National Park.

Kim, R., B. J. Halstead, E. J. Routman, and J. Andersen. 2021. When introduced prey violates trophic hierarchy: Conservation of an endangered predator. Biological Conservation 256:109019.

Explores the dynamics between bullfrogs and the imperiled San Francisco garter snake. Notes that localized bullfrog control efforts can be critical in the conservation of many such species.

Lambert, M. R., J. M. McKenzie, R. M. Screen, A. G. Clause, B. B. Johnson, G. G. Mount, H. B. Shaffer, and G. B. Pauly. 2019. Experimental removal of introduced slider turtles offers new insight into competition with a native, threatened turtle. PeerJ 7:e7444.

Recounts a field experiment of the limited removal of red-eared sliders, and measured the responses of western pond turtles. Demonstrates intense competition for basking and potentially other resources such as food.

Nicholson, E. G., S. Manzo, Z. Devereux, T. P. Morgan, R. N. Fisher, C. Brown, R. Dagit, P. A. Scott, and H. B. Shaffer. 2020. Historical museum collections and contemporary population studies implicate roads and introduced predatory bullfrogs in the decline of western pond turtles. PeerJ 8:e9248.

Examination of historical museum specimens indicates negative effects of roads and bullfrogs in the decline of western pond turtle species. Male-biased sex ratios indicate a strong negative effect from roads, while long-term changes in body size implicate competition and predation from non-native invasive species.

Open Standards for the Practice of Conservation. 2020. Conservation Measures Partnership. < https://conservationstandards.org/download-cs/>.

A manual explaining the *Open Standards for the Practice of Conservation*, the process used to examine the issues surrounding bullfrogs and non-native turtles.

Ribeiro, L. P., T. Carvalho, C. G. Becker, T. S. Jenkinson, D. da S. Leite, T. Y. James, S. E. Greenspan, and L. F. Toledo. 2019. Bullfrog farms release virulent zoospores of the frog-killing fungus into the natural environment. Scientific Reports 9:1–10.

Bullfrog farms can harbor *Batrachochytrium dendrobatidis* (Bd) and release it into the environment, and can have high prevalence and pathogen loads. High densities may play a role in increasing frog susceptibility, and tadpoles may serve as a reservoir for Bd. They posit

that controlling chytrid in farms may increase profits. They advocate for treating both frogs and water.

Salafsky, N., R. Margoluis, K. H. Redford, and J. G. Robinson. 2002. Improving the practice of conservation: a conceptual framework and research agenda for conservation science. Conservation biology 16:1469–1479.

Provides the conceptual underpinnings of the *Open Standards for the Practice of Conservation* and how to use the framework to effect positive conservation action.

Salafsky, N., and E. Wollenberg. 2000. Linking livelihoods and conservation: a conceptual framework and scale for assessing the integration of human needs and biodiversity. World development 28:1421–1438.

Discusses the integration of human well-being targets into the *Open Standards for the Practice of Conservation*.

Schloegel, L. M., A. M. Picco, A. M. Kilpatrick, A. J. Davies, A. D. Hyatt, and P. Daszak. 2009. Magnitude of the US trade in amphibians and presence of Batrachochytrium dendrobatidis and ranavirus infection in imported North American bullfrogs (Rana catesbeiana). Biological Conservation 142:1420–1426.

An examination of bullfrogs obtained from live markets in Los Angeles, San Francisco, and New York found a 62% prevalence of *Batrachochytrium dendrobatidis* (Bd) and an 8.5% prevalence of ranaviruses. California markets had a lower probability of Bd infection than New York, but LA frogs had a higher chance of ranavirus than elsewhere. The study found significant seasonal differences in probability of infection (winter > summer > spring). There was no correlation between prevalence of the two diseases.

Schwartz, M. W., K. Deiner, T. Forrester, P. Grof-Tisza, M. J. Muir, M. J. Santos, L. E. Souza, M. L. Wilkerson, and M. Zylberberg. 2012. Perspectives on the open standards for the practice of conservation. Biological Conservation 155:169–177.

Setting free the fish. n.d. Global Times.

A review of the *Open Standards for the Practice of Conservation*, including an examination of its strengths and suitability for approaching a wide variety of conservation planning tasks.

Stromberg, J. 2013. The science of winning leaps at the Calaveras County frog jumping competition. Smithsonian. <https://www.smithsonianmag.com/science-nature/the-science-of-winning-leaps-at-the-calaveras-county-frog-jumping-competition-2277694/>. Accessed 17 Jun 2019.

Expounds on how bullfrogs are able to perform well in jumping frog contests and why bullfrogs are a preferred species.

Wang, H., C. Yang, Z. Sun, W. Zheng, W. Zhang, H. Yu, Y. Wu, X. Didelot, R. Yang, J. Pan, and Y. Cui. 2020. Genomic epidemiology of Vibrio cholerae reveals the regional and global spread of two epidemic non-toxigenic lineages. PLOS Neglected Tropical Diseases 14:e0008046.

Examines the genetics and epidemiology of an outbreak of *Vibrio cholerae* bacteria in humans, linked to soft-shelled turtles and bullfrogs.

West, D. 1997. Buddhists release animals, dismaying wildlife experts. The New York Times, 11 January 1997; section New York. <https://www.nytimes.com/1997/01/11/nyregion/buddhists-release-animals-dismaying-wildlife-experts.html>. Accessed 27 Aug 2021.

Describes the practice of releasing animals in New York, including turtles, for cultural and spiritual ceremonies, and the environmental damage it can cause. Details the purposes for the practices, such as the motivation to show respect for life and do good acts.

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Uses museum specimens to examine the invasion history and disease dynamics of *Batrachochytrium dendrobatidis* (Bd). Creates a suitability model to glean the historical spread of Bd across the US and link it to the proliferation of bullfrogs.

Oregon Situation and Regulatory Framework

In Oregon, non-native bullfrog and turtle populations are reproducing naturally. Oregon currently does not have an active eradication program because the populations are already well-established.

Bullfrogs are a “controlled” species, so importing or exporting them is prohibited. Most water turtles from North America, Europe and Asia are not allowed to be sold, but selected non-native species that are thought to be unable to survive in the wild are allowed to be sold. Sometimes they are surrendered by owners or are found moving to nesting grounds and are turned over to the Oregon Department of Fish and Wildlife (ODFW) and humanely euthanized. Importing through online sellers, particularly from Florida, continues to be a problem.

Schools can apply for a permit and may be allowed to import bullfrogs, so long as they are kept contained and eventually are euthanized. Bullfrogs often come into Oregon as tadpoles inadvertently included in shipments of aquatic plants.

Enforcement depends on the field district. There is no inspection system for commercial trade; enforcement actions typically manifest through complaints or through Craigslist, or when ODFW personnel personally check stores. Volunteers often watch Craigslist and report suspected violations. ODFW has sole jurisdiction over these matters.

Assessment of Strategy Effectiveness

Commission staff assessed the effectiveness of all strategies that were proposed by the three stakeholder groups. After eliminating duplicate strategies, staff used the many discussions and understandings from stakeholder groups to evaluate how successful a strategy would be at achieving a particular goal. A strategy's goal(s) were identified through analysis of its "results chain," as either the primary means by which threats would be abated, or as "research" in the case of strategies designed to fill informational gaps.

Strategies are rated on two criteria, potential impact and feasibility.

Potential Impact - If implemented, will the strategy lead to desired changes in the situation at your project site?

- *Very High* - The strategy is very likely to completely mitigate a threat or restore a target.
- *High* - The strategy is likely to help mitigate a threat or restore a target.
- *Medium* - The strategy could possibly help mitigate a threat or restore a target.
- *Low* - The strategy will probably not contribute to meaningful threat mitigation or target restoration.

Note that at least two dimensions are combined into this rating: probability of positive impact and magnitude of change. The potential impact rating takes into account both of these factors, which were assessed in terms of the overall scope of the strategy. For example, a strategy which contemplates a localized biological effect would be evaluated in terms of the likelihood and magnitude of impact to a local area, and not penalized because it did not have a statewide scope.

Feasibility - Would implementation of the strategy be likely within biological, regulatory, time, financial, staffing, ethical, and other constraints?

- *Very High* - The strategy is ethically, technically, AND financially feasible.
- *High* - The strategy is ethically and technically feasible, but may require some additional financial resources.
- *Medium* - The strategy is ethically feasible, but either technically OR financially difficult without substantial additional resources.
- *Low* -The strategy is not ethically, technically, OR financially feasible.

Potential impact and feasibility are combined to give an overall summary effectiveness rating for the strategy, as illustrated in the table below.

		Potential Impact			
		Very High	High	Medium	Low
Feasibility	Very High	Very High	High	Medium	Low
	High	High	High	Medium	Low
	Medium	Medium	Medium	Medium	Low
	Low	Low	Low	Low	Low

Strategies are then classified as Very Effective (very high result), Effective (high result), Potentially Effective (medium result), or Low Efficacy (low result).

Note that it is critical to understand that effectiveness is an attempt to rate strategies with respect to whether they will be successful, ***not whether they are desirable****.* Even a strategy with low efficacy may be desirable for particular reasons (for example, if it requires minimal investment to implement or fills a needed gap in strategy diversification). Effectiveness is an attempt to rate the ability of a strategy to accomplish specific goals in addressing extant threats to natural and human well-being targets. Desirability — the decision whether or not to implement a given strategy — is usually informed by effectiveness, but it is ultimately a value judgement whether or not to move forward with a particular solution.

Strategy Analysis

The grouping of various strategies in this analysis are simply for convenience; while they characterize the primary domain of a strategy, the proposed solutions should not be seen as exclusive to that category as strategies can have considerable overlap among groupings.

Resources

All strategies will require some level of resources to implement – financial, temporal, staffing, and so on. The amount and type necessary to achieve a given strategy will depend on a number of factors, including the specific portfolio of projects to be implemented within a strategy, the ability to capitalize on already available resources, and the formation of strategic partnerships, to name but a few. Assessing the resources necessary to implement particular strategies is an important consideration, but is beyond the scope of the stakeholder inquiry; while the expertise of stakeholders is extensive, even as a group they do not possess an overview of available resources within various partner organizations that may be involved in implementation: state governments, local governments, non-governmental organizations, trade and industry groups, businesses, research institutions, etc.

However, in this analysis Commission staff has attempted to identify strategies that would likely require a great deal of additional resources to implement. The strategies below have a primary goal of obtaining more resources to implement other strategies.

Strategy: More Resources for the Department. Procure more budgetary resources for the California Department of Fish and Wildlife (Department), either directly from the state legislature or through a special program, such as voluntary income tax contributions.

Primary Goals: Increase resources for implementation

Potential Impact: Very High Feasibility: High

Effectiveness: Effective

Reasoning: This strategy is a critical prerequisite for many other strategies and could muster significant resources for the Department to implement strategies.

Primary Mode of Action: Resources Controversy: Low

Strategy: Raise Permit Prices. Raise the cost of importation permits and apply the funds to other strategies.

Primary Goals: Increase resources for implementation

Potential Impact: Medium Feasibility: High

Effectiveness: Potentially Effective

Reasoning: Would produce more resources for the Department, but raising importation permit prices substantially while keeping imports economical may not be possible.

Primary Mode of Action: Resources Controversy: Medium

Strategy: Department Grant Program. Establish a new grant program for the Department to disburse funds for various bullfrog and non-native turtle projects.

Primary Goals: Increase resources for implementation

Potential Impact: High Feasibility: Medium

Effectiveness: Potentially Effective

Reasoning: Could convey resources for innovative and critical projects, but would likely require dedicated funding from the Legislature.

Primary Mode of Action: Resources Controversy: Low

Research

The stakeholder engagement process identified several important knowledge gaps. Many of the informational needs are critical to properly assess the scope of particular issues, the biological dynamics at play and relative risk caused by various ecological threats, and the overall effectiveness of strategies.

Strategy: Research into Release "Inputs." Gain more information about escapees and intentional releases from live markets and pets.

Primary Goals: Research

Potential Impact: Very High Feasibility: Very High

Effectiveness: Very Effective

Reasoning: These are critical knowledge gaps. This research would help resolve many uncertainties about the dynamics at play and the effectiveness of other strategies.

Primary Mode of Action: Informational Controversy: Low

Strategy: Research on Discharge. Gain more information about water used for transport and storage, including disease pathogens, invasive aquatic organisms, and water treatment methods.

Primary Goals: Research

Potential Impact: Medium Feasibility: High

Effectiveness: Potentially Effective

Reasoning: The research would fill in knowledge gaps with respect to contaminated runoff water, but contaminated water may not be a very significant threat.

Primary Mode of Action: Informational Controversy: Low

Strategy: Research into Live Food as Vectors for Diseases. Gain more information about the prevalence, epidemiology, and treatment of frog- and turtle-borne diseases in the live markets.

Primary Goals: Research

Potential Impact: Very High Feasibility: Very High

Effectiveness: Very Effective

Reasoning: There has been some research on this topic, but many open questions remain. Answers may help lower the risks of new diseases entering California.

Primary Mode of Action: Informational Controversy: Low

Notes: Chytrid fungus is nearly ubiquitious in California. Ranaviruses have a relatively low prevalence.

Strategy: Research into Population Control Techniques. Gain more information on eradication and control techniques, habitat enhancements to combat bullfrogs and non-native turtles, and other similar environmental interventions.

Primary Goals: Reduce the number of bullfrogs/turtles in the environment

Potential Impact: High Feasibility: Medium

Effectiveness: Potentially Effective

Reasoning: Could provide valuable results but would require substantial new resources.

Primary Mode of Action: Informational Controversy: Low

Education and Outreach

All stakeholder groups identified educational campaigns as an important initiative. Potential audiences identified included live market retailers, pet owners and retailers, teachers, aquaculture facilities, and importers; key themes and messages would vary according to the particular audience.

Stakeholders identified several existing educational programs that could be adopted or serve as partners to achieve educational goals. Alternatively, one or more of the programs could serve as models from which to develop proprietary education initiatives.

Other Stakeholder Insights

Stakeholders identified certain religious ceremonies where live animals are released as a potential source of non-native introduction. FGC staff were able to corroborate the practice of releasing fish and potentially invertebrates in California, but not of reptiles or amphibians. Outreach to these communities may help facilitate understanding.

Strategy: Encourage Wild Collection. Promote collection of bullfrogs for personal food usage as an alternative to purchase in live markets.

Primary Goals: Reduce the number of bullfrogs/turtles in the environment

Potential Impact: Medium Feasibility: Very High

Effectiveness: Potentially Effective

Reasoning: Will likely have minimal effect but readily accomplishable.

Primary Mode of Action: Biological Controversy: Low

Strategy: Bullfrogs as Bait. Promote the use of bullfrogs as bait for fishing.

Primary Goals: Reduce the number of bullfrogs/turtles in the environment

Potential Impact: Low Feasibility: Very High

Effectiveness: Low Efficacy

Reasoning: Easy to implement, but likely to have very limited impact.

Primary Mode of Action: Social Controversy: Low

Strategy*: Education Campaign 1 (Live Markets).* Establish a focused, periodic education initiative at live market vendors to instill best practices and reinforce existing regulation.

Primary Goals: Reduce the number of bullfrogs/turtles in the environment

Curtail risks from diseases and/or introduction of new diseases

Potential Impact: Medium Feasibility: High

Effectiveness: Potentially Effective

Reasoning: Focused education campaign could lessen escapees and contaminated water, but effectiveness depends on the actual level of the threat which is currently unknown.

Primary Mode of Action: Educational Controversy: Low

Strategy: Education Campaign 2 (Pets). Establish a sustained education campaign aimed at pet owners, retailers, and other relevant audiences to instill the importance of not releasing animals into the wild. Teach good animal care techniques to lessen the impetus to abandon pets.

Primary Goals: Decrease introduction of new frogs/turtles into environment

Potential Impact: High Feasibility: High

Effectiveness: Effective

Reasoning: Focused education campaign could lessen escapees. Existing good models of this type of campaign exist to build on.

Primary Mode of Action: Educational Controversy: Low

Notes: While it is unclear the extent to which it happens, people do bring wild frogs and turtles home to keep as pets.

Strategy: Education Campaign 3 (All-Encompassing). Establish a comprehensive education campaign, or a series of campaigns, to address many different audiences and issues.

Primary Goals: Curtail risks from diseases and/or introduction of new diseases. Decrease introduction of new frogs/turtles into environment.

Potential Impact: Very High Feasibility: Very High

Effectiveness: Very Effective

Reasoning: Broad-scale education campaign that would encompass many threat vectors and could significantly affect releases into the wild.

Primary Mode of Action: Educational Controversy: Low

Notes: Clean Drain Dry and Stop AIS (aquatic invasive species) are potential models for good education campaigns. They have had positive impacts.

Habitattitude is a PIJAC partnership with the U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration with a wide audience including water gardners, students, and teachers. Key messages include: don't release pets into the wild, move things up the consumer timeline, be aware of all that comes into play when owning a pet. It is composed of partnerships with organizations that share the message. It is mostly on the web.

Strategy: Increased Compliance with Animal Release Regulations. Education initiative aimed primarily at reducing intentional releases, including live market, unwanted pets, and other wildlife releases. One potential audience is local and county officials, to encourage the development of local ordinances which may play a role in reinforcing state regulations agaist releases as well.

Primary Goals: Decrease introduction of new frogs/turtles into environment

Potential Impact: Medium Feasibility: High

Effectiveness: Potentially Effective

Reasoning: These solutions may have significant effects but would be very dependent on the specifics of the educational material and on local interest and cooperation in the case of municipal or county ordinances.

Primary Mode of Action: Educational Controversy: Low

Ecological Restoration

Direct action in the environment will be an important component of any comprehensive solution. Direct action could include strategies such as habitat improvement for native species threatened by non-native turtles and bullfrogs, or localized eradication initiatives; these strategies are typically resource intensive, requiring a great deal of time, planning, and funding to execute properly. However, they have been shown to be successful in many cases.

Strategy: Habitat Improvement. Implement restoration projects to improve conditions for various native species to allow them to deal with the threats posed by bullfrogs and non-native turtles.

Primary Goals: Improve conditions for native species

Potential Impact: High Feasibility: Medium

Effectiveness: Potentially Effective

Reasoning: The Department has extensive experience in this activity, but it requires substantial resources to implement.

Primary Mode of Action: Biological Controversy: Low

Notes: Bullfrogs and non-native turtles are prolific in fragmented habitats. Habitat improvements could include creating base habitat conditions that favor native species and disfavor bullfrogs, promoting favorable water temperatures (e.g., colder water), promoting running water, reestablishing food webs, and/or eliminating barriers between native populations.

Strategy: Localized Eradication. In selected circumstances, eradication of bullfrogs has been shown to be achievable (it is unclear whether the same is true for non-native turtles). Other strategies short of eradication, such as invasive population reductions or limited control efforts, have also been shown to be effective at reducing competition and increasing the fitness of native populations.

Primary Goals: Reduce the number of bullfrogs/turtles in the environment

Potential Impact: Very High Feasibility: High

Effectiveness: Effective

Reasoning: The Department has extensive experience in this activity, but it requires substantial resources to implement.

Primary Mode of Action: Biological Controversy: Low

Strategy: Use of Private Land Eradication of Fish. Existing authorities allow the Department to cooperate with private landowners to eradicate invasive and harmful fish, which includes bullfrogs.

Primary Goals: Reduce the number of bullfrogs/turtles in the environment

Potential Impact: High Feasibility: High

Effectiveness: Effective

Reasoning: Provides flexibility for bullfrog control but regulatory updates may be necessary to include turtles.

Primary Mode of Action: Biological Controversy: Low

Live Markets

Live markets have been identified as an important vector for disease. However, bullfrogs and turtles used for food are a culturally important tradition.

Other Stakeholder Insights

- The practice of eating bullfrogs and certain turtles was identified as an important cultural tradition – particularly for first-generation immigrants. When immigrants attend the markets, they feel comfortable and welcomed.
- Some stakeholders claimed that market leftovers are sometimes sold to the pet trade, where a middleman/broker transfers unsold turtles and/or frogs to pet stores.

Strategy: Ban Sale of Live Bullfrogs. Sale of live bullfrogs would be illegal, but dead bullfrogs could still be sold.

Primary Goals: Curtail risks from diseases and/or introduction of new diseases

Decrease introduction of new frogs/turtles into environment

Potential Impact: High Feasibility: High

Effectiveness: Effective

Reasoning: Would lower risks of introductions and disease from live markets, but scope of risks are unknown and has cultural implications.

Primary Mode of Action: Social Controversy: High

Notes: Disease risk from frozen bullfrogs is considerably less, and there is less water volume. However, live frogs are preferable from a cultural standpoint. There was concern raised that frozen frogs may be considered inedible or unsafe.

Strategy: Point of Sale Inspections. Department personnel would perform inspections on live markets to ensure compliance with state regulations.

Primary Goals: Curtail risks from diseases and/or introduction of new diseases. Curtail risks from invasive aquatic species and/or introduction of new invasive aquatic species. Decrease introduction of new frogs/turtles into environment

Potential Impact: Medium Feasibility: Medium

Effectiveness: Potentially Effective

Reasoning: Could be valuable to detect escapees or poor conditions, but actual frequency of escapees is unknown. Strategy would require substantial new resources for the Department.

Primary Mode of Action: Social Controversy: Medium

Notes: Posters are passed out in and hung in live markets, explaining in native languages that "Releasing live turtles or frogs is prohibited" and listing the CALTIP line for reporting violations. The Department has informed merchants that they must post the signs where live animals are sold for food.

Strategy: Domestic Bullfrog Aquaculture. In the event of a loss of extra-state bullfrog importation (presumably through regulation), domestic aquaculture facilities could establish a market supply.

Primary Goals: Maintain market sales

Potential Impact: Medium Feasibility: High

Effectiveness: Potentially Effective

Reasoning: Could allow a domestic supply of frogs that may be better monitored, but would likely be dependent on implementation of an import ban to make it financially feasible.

Primary Mode of Action: Social Controversy: Low

Notes: Bullfrogs are ubiquitous in agriculture currently; they are always caught in on-site nets and are a typical byproduct. Turtles are a very rare occurrence.

Bullfrogs are a minute business consideration. Price per frog would be an important factor in making California bullfrog aquaculture a viable business. But there do not appear to be any regulatory barriers to aquaculture -- bullfrogs can be recognized as a legitimate aquaculture product now.

With respect to disease, initially, bullfrog farms may have the same disease prevalence as the environment, but that may change depending on the culture practices, treatments, etc.

Strategy: Testing and Monitoring Regime. Develop and implement a protocol for sampling animals for sale at live markets for various diseases and/or invasive aquatic organisms.

Primary Goals: Curtail risks from diseases and/or introduction of new diseases

Curtail risks from invasive aquatic species and/or introduction of new invasive aquatic species

Potential Impact: Medium Feasibility: Medium

Effectiveness: Potentially Effective

Reasoning: Would be valuable to monitor disease better, but practical potential to stop disease entry is unknown. Strategy would require substantial new resources for the Department.

Primary Mode of Action: Social Controversy: High

Notes: The Taiwan Health Department provides health certifications based on testing a sample of the water where bullfrogs are produced for diseases. There are five primary frog farms that obtain a Taiwanese license to export, mainly to the United States, Southest Asia, and Singapore.
There is generally no intermediate storage. Frogs are shipped directly to markets.

Strategy: Increased Information Collection through Permits. Revise importation permits to gather more information that may be useful, such as: Where are shipments coming from? How many shipments/individuals are you bringing in under this permit? Do you have permission from the source?

Primary Goals: Curtail risks from diseases and/or introduction of new diseases

Potential Impact: Low Feasibility: High

Effectiveness: Low Efficacy

Reasoning: Some additional information may be minimally helpful in the case of problems or for general data collection, but it will likely be of limited use.

Primary Mode of Action: Social Controversy: Low

Pets and Bullfrog Contests

Bullfrogs and turtles being kept as pets, in homes and classrooms, can pose several threats to California's environment, including release of unwanted animals. However, pets also provide companionship and can help people to appreciate wildlife.

Strategy: Promotion of Programs for Unwanted Animals. Implement and support places, such as sanctuaries, for unwanted pets to be taken and kept when they are unwanted. Also includes "rehoming" organizations.

Primary Goals: Decrease introduction of new frogs/turtles into environment

Potential Impact: Low Feasibility: Medium

Effectiveness: Low Efficacy

Reasoning: Similar programs exist but have limited capacity and effectiveness.

Primary Mode of Action: Social Controversy: Low

Strategy: Dispatching Bullfrogs in Contests. In jumping frog contests, terminate all bullfrogs that are not being kept by contestants.

Primary Goals: Decrease introduction of new frogs/turtles into environment

Potential Impact: High Feasibility: Very High

Effectiveness: Effective

Reasoning: Bullfrogs being let loose or escaping from contests could be a significant source of bullfrogs entering the environment. Would likely raise significant controversy.

Primary Mode of Action: Social Controversy: High

Strategy: Ban Frog Jumping Contests. Frog jumping contests would be outlawed through regulation.

Primary Goals: Decrease introduction of new frogs/turtles into environment

Potential Impact: High Feasibility: Low

Effectiveness: Low Efficacy

Reasoning: May stop a significant source of bullfrog introductions into the environment. Would be controversial, as contests provide significant enjoyment and economic benefits, and would require changes to the California Fish and Game Code.

Primary Mode of Action: Social Controversy: High

Strategy: Contest Monitoring/Enforcement. Deploy monitors to jumping frog contests to help guard against escapees and ensure compliance with state regulations.

Primary Goals: Decrease introduction of new frogs/turtles into environment

Potential Impact: Medium Feasibility: Medium

Effectiveness: Potentially Effective

Reasoning: Would require increased resources for implementation. Magnitude of impact is unclear but could be significant.

Primary Mode of Action: Social Controversy: Medium

Notes: Frogs can be bought from authorized sellers, caught in the wild, or rented. Rented frogs are likely collected and then released (staff has not yet confirmed this statement). Events have a minimum size limit to avoid other non-native frogs.

Strategy: Encourage/Allow Use of Other Species with Lesser Effects. Disallow or discourage the use of bullfrogs in jumping contests, in favor of utilizing other species.

Primary Goals: Reduce the number of bullfrogs/turtles in the environment

Potential Impact: Medium Feasibility: Medium

Effectiveness: Potentially Effective

Reasoning: May curtail a significant source of bullfrog releases, but also may encourage the use of native species which may cause problems for those species. Bullfrogs are generally seen as the leading animal for jumping contests.

Primary Mode of Action: Social Controversy: High

Regulatory Actions

The Commission promulgates regulations concerning wildlife in the State of California, consistent with the California Fish and Game Code. Stakeholders offered many strategies that would require legislative and/or regulatory changes to implement. Evaluating the effectiveness of these strategies necessarily involved the likelihood of rule changes actually being implemented; particularly in the case of legislative changes, this involved a value judgement.

Other Stakeholder Insights

- There is some risk in implementing strategies to combat use of a particular species, because users may switch to using another species. Some stakeholders emphasized a broad-brush approach which would instantiate a precautionary principle, while others favored a narrowly-tailored tactic which considers the environmental risk that could be anticipated by each species.
- Stakeholders raised the prospect of a bullfrog bounty, but raised concerns about creating a market; it could lead to cultivation and widespread non-target collection. Bounties were ultimately rejected as a viable strategy.

- Local municipalities can play an important role in non-native species control. The city of Santa Cruz enacted a ban on the sale and collection of bullfrogs in Santa Cruz. There is no specific mechanism for enforcement; enforcement is largely complaint driven. Santa Cruz has conducted outreach to pet stores. While the impacts on local frog populations may not be readily apparent, success is difficult to appraise in the absence of a concerted monitoring effort. Effectiveness may be greatly increased if a cluster of geographically proximate localities were to enact similar restrictions.

Strategy: Water & Reservoir Management. Encourage municipalities to enact ordinances to protect against bullfrogs and non-native turtles, and to manage their water features to enhance suitability for native species.

Primary Goals: Decrease introduction of new frogs/turtles into environment

Potential Impact: Medium Feasibility: High

Effectiveness: Potentially Effective

Reasoning: Effective implementation will depend on local government ability and willingness to implement measures to control bullfrogs/turtles.

Primary Mode of Action: Biological Controversy: Medium

Notes: Potential impact could be high in some cases, where ponds/reservoirs are a primary source for many of the bullfrogs an area.

Strategy: Ban Bullfrog Imports. Enaction of a complete ban on any bullfrogs or bullfrog parts, living or dead, shipped from any source outside of California.

Primary Goals: Curtail risks from diseases and/or introduction of new diseases

Potential Impact: High Feasibility: High

Effectiveness: Effective

Reasoning: Would lower risks of new disease establishment. Would stop sales of bullfrogs unless domestic sources were established.

Primary Mode of Action: Social Controversy: High

Notes: Long-term importation permits stopped around 2005. Only standard importation permits are issued currently (i.e., container by container).

There are few small importers left in the state – they would be hurt by a ban. Suppliers may not be able to switch to in-state sources, even if those sources were established. Turtle prices may increase, leading to a black market. A ban may encourage importation of unregulated animals.

Strategy: Develop Commercial Harvesting. Allow and develop a market for the commercial harvest of bullfrogs and/or non-native turtles, to supplement (or supply, in the case of some type of import ban) animals for the live markets.

Primary Goals: Reduce the number of bullfrogs/turtles in the environment

Potential Impact: Medium Feasibility: High

Effectiveness: Potentially Effective

Reasoning: May significantly reduce the number of bullfrogs in the environment, but also may establish desires for a non-native species, including illicit raising of frogs for sale.

Primary Mode of Action: Social Controversy: Medium

Notes**:** Will encouraging commercial harvest promote or create an incentive to maintain bullfrogs in the environment?

Strategy: Add Non-Native Turtles to Restricted Species List. Promulgate a regulation to make it unlawful to import, transport, possess, or release alive selected non-native turtle species under normal circumstances.

Primary Goals: Curtail risks from diseases and/or introduction of new diseases. Decrease introduction of new frogs/turtles into environment.

Potential Impact: High Feasibility: Low

Effectiveness: Low Efficacy

Reasoning: Effectively eliminates use of non-native turtles completely. Posession restrictions could cause complications.

Primary Mode of Action: Social Controversy: High

Strategy: Add Bullfrogs to Restricted Species List. Promulgate a regulation to make it unlawful to import, transport, possess, or release alive bullfrogs under normal circumstances.

Primary Goals: Curtail risks from diseases and/or introduction of new diseases. Decrease introduction of new frogs/turtles into environment

Potential Impact: High Feasibility: Low

Effectiveness: Low Efficacy

Reasoning: Effectively eliminates use of bullfrogs completely. Posession restrictions could cause complications.

Primary Mode of Action: Social Controversy: High

Strategy: Prevent Water Contamination. Implement water treatment to prevent disease and/or invasive aquatic organisms from entering the environment. Could be required for any or all of import shipments, pet stores, market facilities, water from frogs or turtles in homes, and classrooms.

Primary Goals: Curtail risks from diseases and/or introduction of new diseases. Curtail risks from invasive aquatic species and/or introduction of new invasive aquatic species.

Potential Impact: Medium Feasibility: Medium

Effectiveness: Potentially Effective

Reasoning: Most water likely goes down a municipal drain and receives standard water treatment, but that may or may not be completely effective. A regulation may prevent the introduction of new diseases or new strains of extant diseases. There are readily available, inexpensive, effective treatments that are easy to use.

Primary Mode of Action: Social Controversy: Low

Enforcement Actions

Stakeholders generally agree that bullfrog- and turtle-related enforcement actions are not predominant in California. There are differing opinions on whether increased enforcement is necessary, where those actions should focus, how to accomplish obtaining more resources for the Department's enforcement efforts, and how effective increased enforcement actions would be in alleviating some of the threats to California's native wildlife.

Strategy: Ensure Shipments are Lawfully Obtained. Perform inspections to ensure that shipments have a valid chain-of-custody, valid health certificates when necessary, and other documentation as needed.

Primary Goals: Curtail risks from diseases and/or introduction of new diseases

Potential Impact: Medium Feasibility: Medium

Effectiveness: Potentially Effective

Reasoning: Current law, would require more resources for implementation and uncertain impact.

Primary Mode of Action: Social Controversy: Low

Notes: Importers obtain two primary certifications; one from the Taiwanese Health Department indicating the bullfrogs are free from diseases, and another from the Taiwanese Department of Commerce attesting to the legitimacy of the company.
Most imported turtles are originally collected from the wild. Shipments get documentation that the exporter is legal, but there are no health or safety documents.

Strategy: Inspect Shipments for Illegal Imports/Mixing Species. Imported shipments would be subject to spot testing and/or inspections for diseases and invasive aquatic organisms.

Primary Goals: Curtail risks from diseases and/or introduction of new diseases. Curtail risks from invasive aquatic species and/or introduction of new invasive aquatic species.

Potential Impact: Medium Feasibility: Medium

Effectiveness: Potentially Effective

Reasoning: Would be valuable to detect problems in shipments, but actual prevalence of such import issues is unknown. Strategy would require substantial new resources for the Department.

Primary Mode of Action: Social Controversy: Low

Notes: Turtles are imported from a number of small and large sources, but most are from commercial facilities in Louisiana or Arkansas. The health standards for imports rest largely on the reguations (and thoroughness of regulatory enforcement) from the originating state.

Selected Summary Analyses of Strategies