

# **Achieving a Consilience of Science and Stakeholders: Integrated Aquatic Vegetation Management for the Tahoe Key Lagoons**

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**Lake Tahoe  
South shore- Looking toward  
Ski Run (November 5, 2015)**

## Topics

- Overview and AIS Management History
- Tahoe Keys IWMP Development: Is consilience possible?
- Components of Draft IWMP Plan
- Public & Agency Responses to IWMP
- What next?

Emerald  
Bay

Ski Run

Tahoe Keys Lagoons



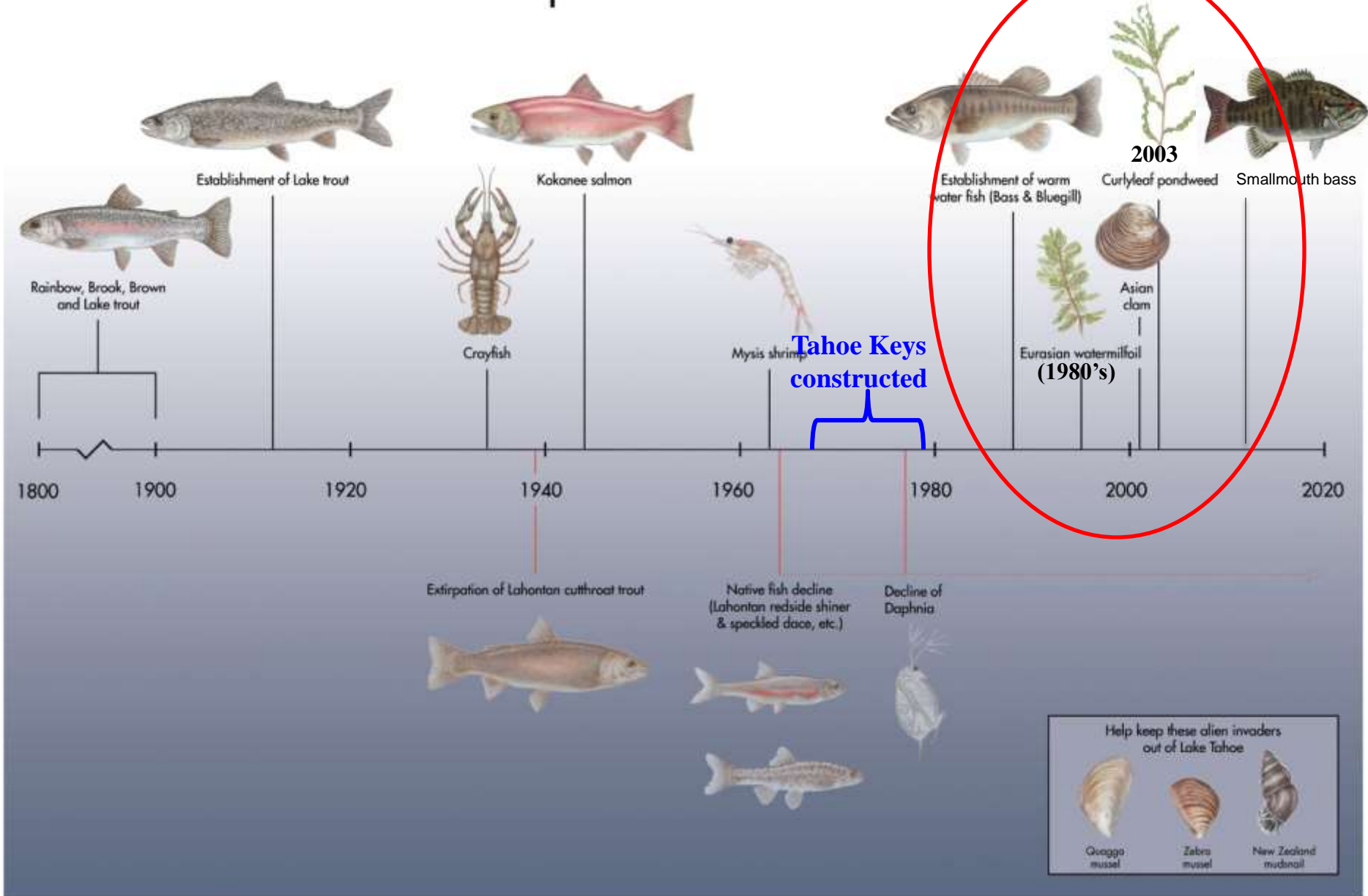


# Tahoe Keys- South Lake Tahoe: 1,500 Homes and 900 docks

Uses, Boundaries and Bathymetry Drive Management



## Lake Tahoe Species Introduction Timeline





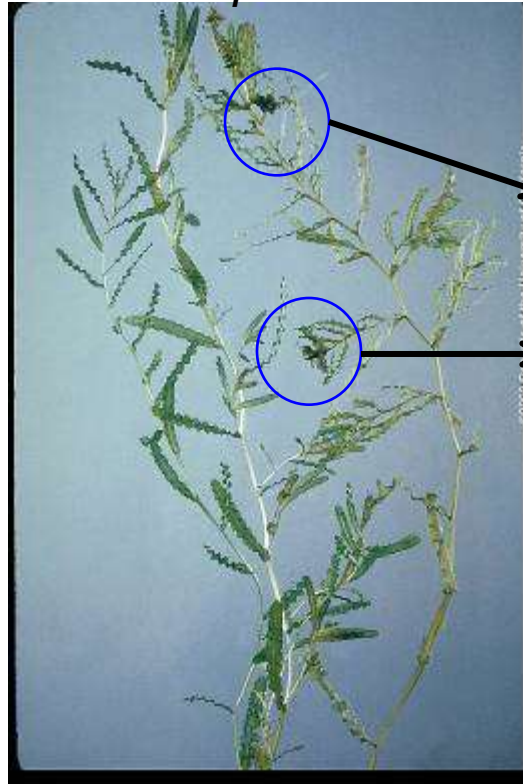
# Non-native and nuisance plants in the Tahoe Keys:

- Eurasian watermilfoil (*Myriophyllum spicatum*)
- Curlyleaf pondweed (*Potamogeton crispus*)
- Native Coontail (*Ceratophyllum demersum*)

*M. spicatum*



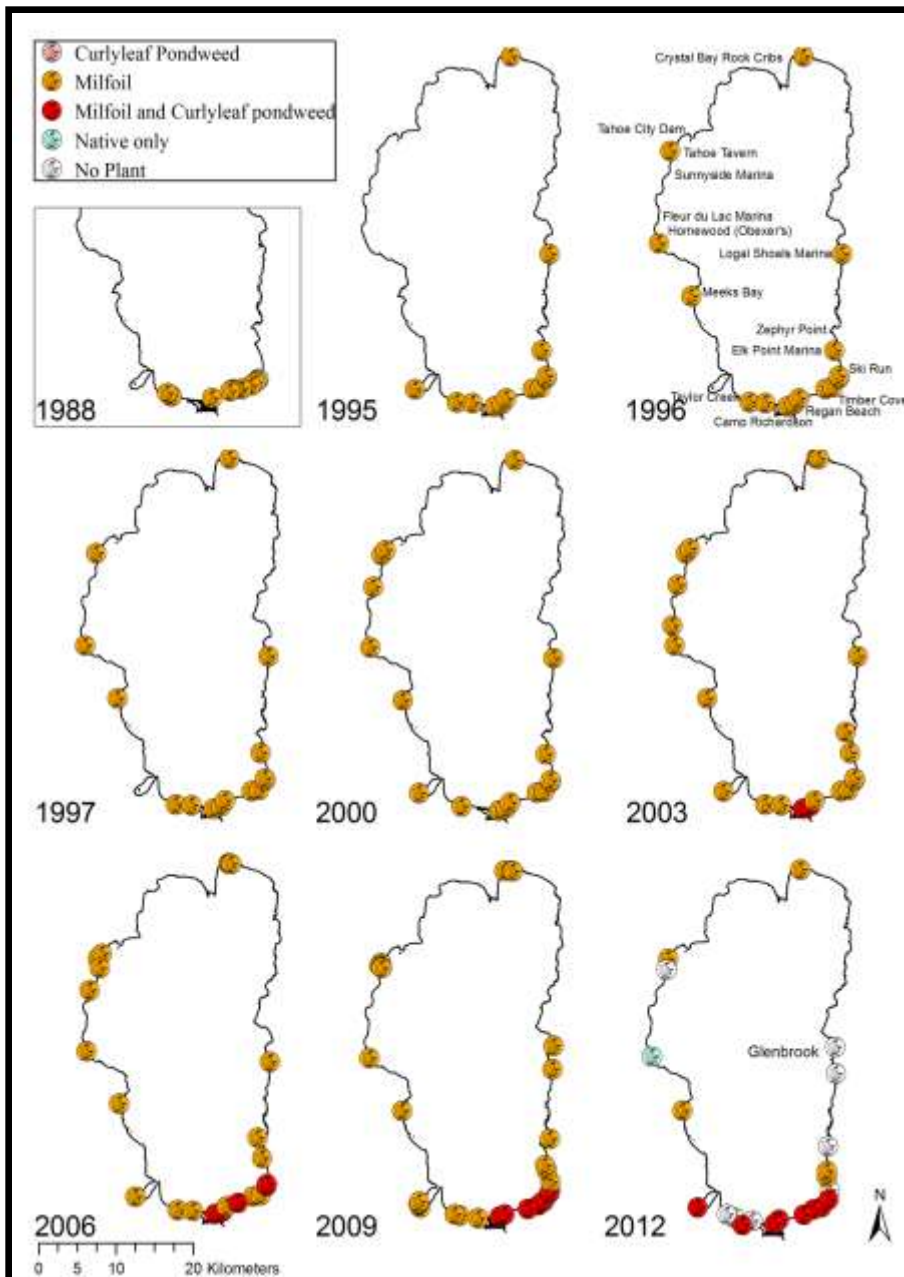
*P. crispus*



*P. crispus* turions:  
Produced in early  
summer; Sprout in fall



# Nearshore invasive plant distribution



- Eurasian water milfoil, expanding since late 1980s surveys, primarily in semi enclosed areas (marinas & embayments)
- Curly Leaf pondweed- rapidly expanding since its discovery in 2003, occurs outside of marinas along south shore
- Warmwater fishes observed within both plants populations



# 2014 TKPOA Surveys (point sampling)

➤ **RED Areas =  
100 % Eurasian  
watermilfoil**





# Tahoe Keys Lagoons:

Hydroacoustic Sampling: August 25 2015

Red= 100 % cover by submersed aquatic weeds

**Main Lagoon (West Basin)**

**Marina Lagoon (East Basin)**



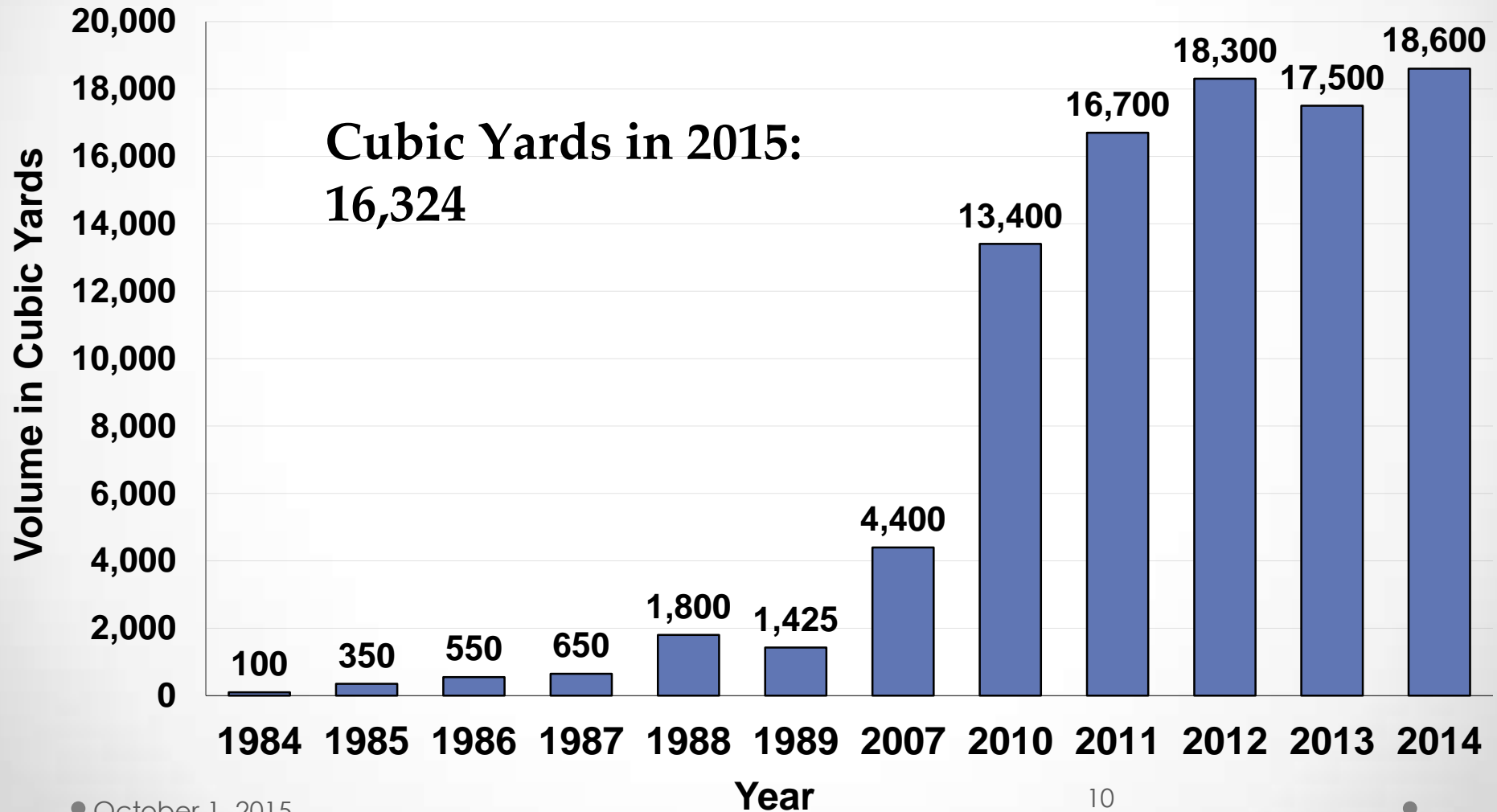


# Current Management Relies on Aquatic Weed Harvesters



- 5 Harvesters
- 4 Work Boats
- 12 Seasonal Employees
- Training
- Insurance
- Administration
- >\$350k/Yr
- **Not Controlling Weeds Well**
- **Contributes viable plant fragments**

# Aquatic Weeds Removed from the Tahoe Keys Lagoons





# 2014 Fragment Study

3,000-4,000 fragments  
per harvested acre



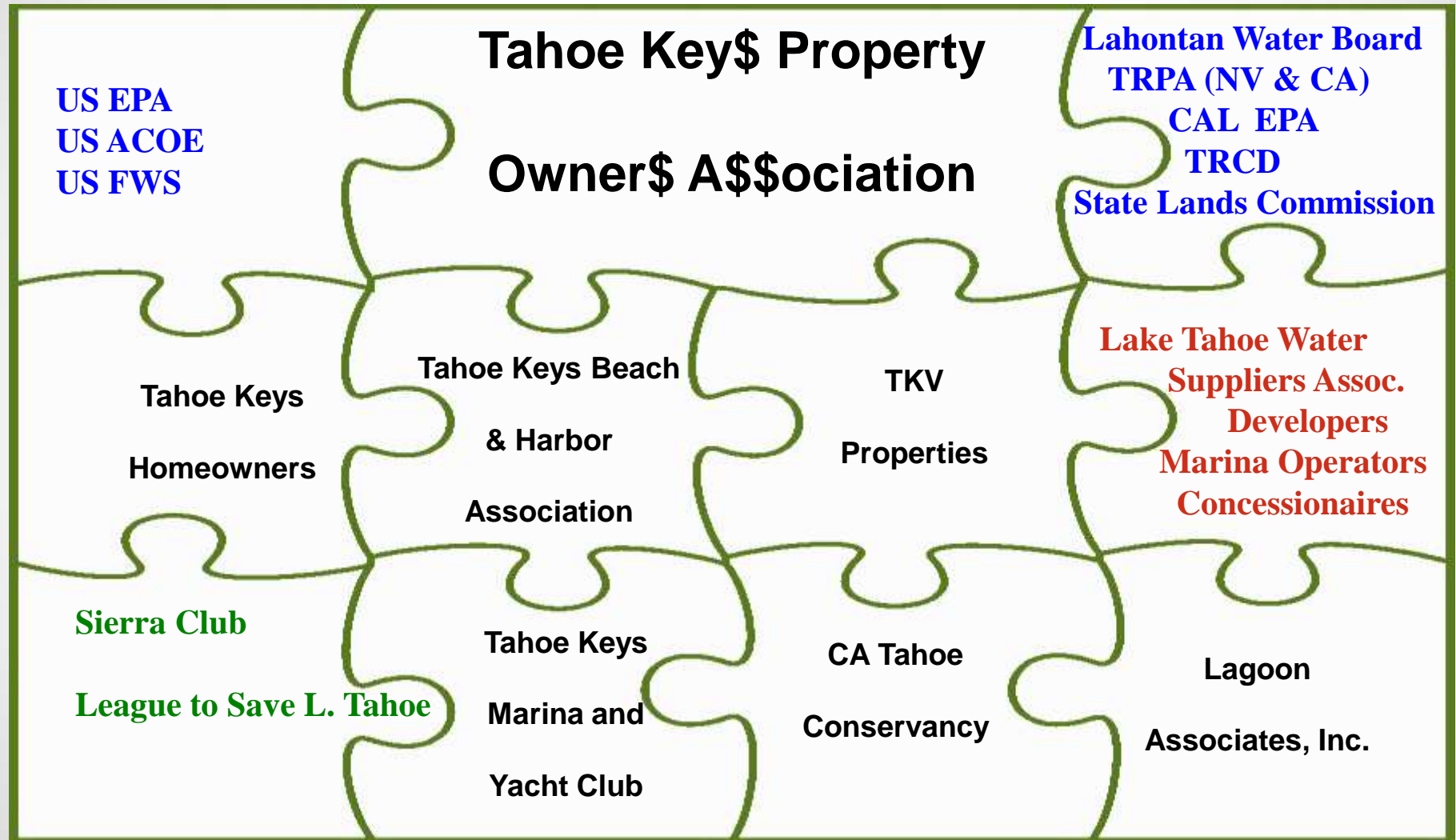
# Consilience Puzzle:

**Land Owners**

**Regulatory Agencies**

**Vendors**

**Env. Groups**





# *Perception: Tahoe Keys = Lake Tahoe Proper: Actually NO: Completely Different Water Bodies*

## Tahoe Keys Lagoons

## Lake Tahoe

▪ <b>Mean depth:</b>	10-12 ft	1,000 ft
▪ <b>Summer Temps:</b>	18 -27C	15-18 C
▪ <b>Volume (gal):</b>	49 x 10 <sup>7</sup>	39 x 10 <sup>12</sup> (10 <sup>5th</sup> more!)
▪ <b>Sediments:</b>	Unconsolidated organic matter	Sand, rock with far less OM, highly variable
▪ <b>Light Field:</b>	10-15 ft	60- 70 ft.
▪ <b>Shoreline energy:</b>	Low, protected	High, unprotected
▪ <b>Bathymetry:</b>	Highly uniform	Extremely variable
▪ <b>Circulation:</b>	Restricted, limited	Unrestricted, dynamic
▪ <b>Nutrients:</b>	Moderate N, P, Ca	Ultra low N, P, Ca
▪ <b>Water inputs:</b>	2 channels (+runoff)	63 creek/river inputs
▪ <b>Wind fetch:</b>	Short, 0.4 miles	12-22 miles
▪ <b>Aq. Plant Habitat:</b>	Entire Keys	Limited by energy, substrate
▪ <b>Water quality:</b>	Highly variable	Highly uniform
▪ <b>Urban Connectivity</b>	Highly Concentrated	Diffuse and Patchy

## *Objectives of Tahoe Keys IWMP*

- Minimize spread of aquatic weeds to Lake Tahoe
- Enhance habitat for native plants and animals
- Restore recreational and commercial uses in the Keys
- Establish adaptive management using best available technologies, BMPs and quantifiable results
- Contribute to Tahoe Region reduction in greenhouse gases by minimize impacts of management on air quality.

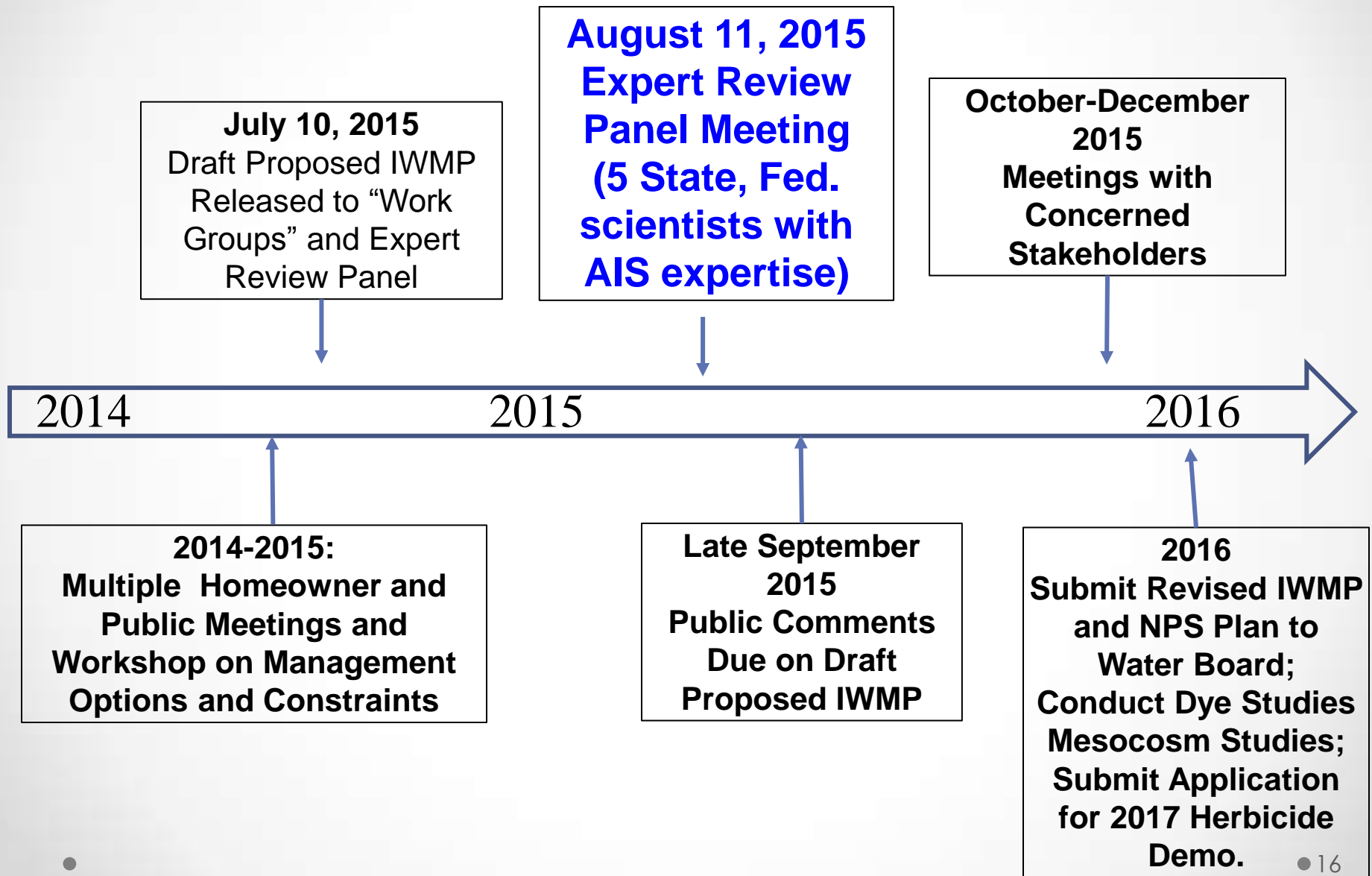


# IWMP Measureable Goals

By 2020 –

- Invasive aquatic weeds are < 15 percent of current coverage; biomass reduced by 80%
- Increase in abundance of native plants
- Reduction in habitat for non-native fish
- Weed impacts are controllable with non-herbicide methods
- Non Point Source actions and BMPs are implemented by > 80 percent of TKPOA members
- Overall improvement in water quality.
- Herbicide use is no longer needed annually

# IWMP Preparation and Vetting Timeline





# Examples of Control Methods Under Consideration



**Bottom barrier placement (limited to 5 acres per year)**

**Boat maintenance practices**



**Modified harvesting and monitoring techniques**



**Diver assisted weed removal**



# Methods Considered and Reviewed for IWMP

- Aquatic Herbicides: EPA and Cal-EPA approved only
- Biological control: 3n (sterile) grass carp; EWM weevil)
- Bottom barriers: synthetic and jute
- Diver-assisted suction removal/ hand removal
- Drawdown (with/ without use of soil active herbicides)?
- Dredging (Channels only- yes)
- Floating Islands
- Fragment Collection systems
- Harvesting with improved systems and strategies
- Nutrient reductions: Non Point Source Plan
- Prevention/ Education/ EDRR
- “Sweepers/Rollers”
- Rotovating
- UV light



# Proposed Control Methods for the IWMP

*NOTE: Methods are to be integrated and tailored for use in specific sites*

## ➤ Mechanical and Physical:

- > Improved fragment capture and efficient harvesting
- > Strategic use of bottom barriers and diver hand/suction removal

## ➤ Cultural: (Non Point Source Plan/ BMP's)

- > Storm water management/ reduction in nutrient inputs
- > Property owner yard, shoreline, and dock maintenance practices
- > Boat operating practices (Reduce transport of plants)
- > Prevention of new introductions ("Eyes on the Lake" program)

## ➤ Aquatic Herbicides

- > US EPA/Cal EPA-approved herbicide applications in selected sites  
(currently not permitted in Lake Tahoe)

Too much herbicide  
reliance?; Biological  
control options?  
Need environmental  
groups' backing.

## Regulatory Agencies

Why not dredge?  
Fill in the Keys!  
Don't poison the  
Lake! Will  
herbicides work?

## Environmental Groups

Thorough review,  
good strategies,  
good monitoring  
program  
Great Job!

## Expert Science Advisory Panel

Draft  
IWMP  
August  
2015

Tahoe Keys plans to  
use chemicals to kill  
weeds in the Keys!  
Many opposed!

## News Media

**NO Herbicides!**  
Didn't include enough  
alternative methods.  
**Will poison drinking  
water!**  
**Website: "Stop  
Herbicides!!"**

## Tahoe Water Suppliers

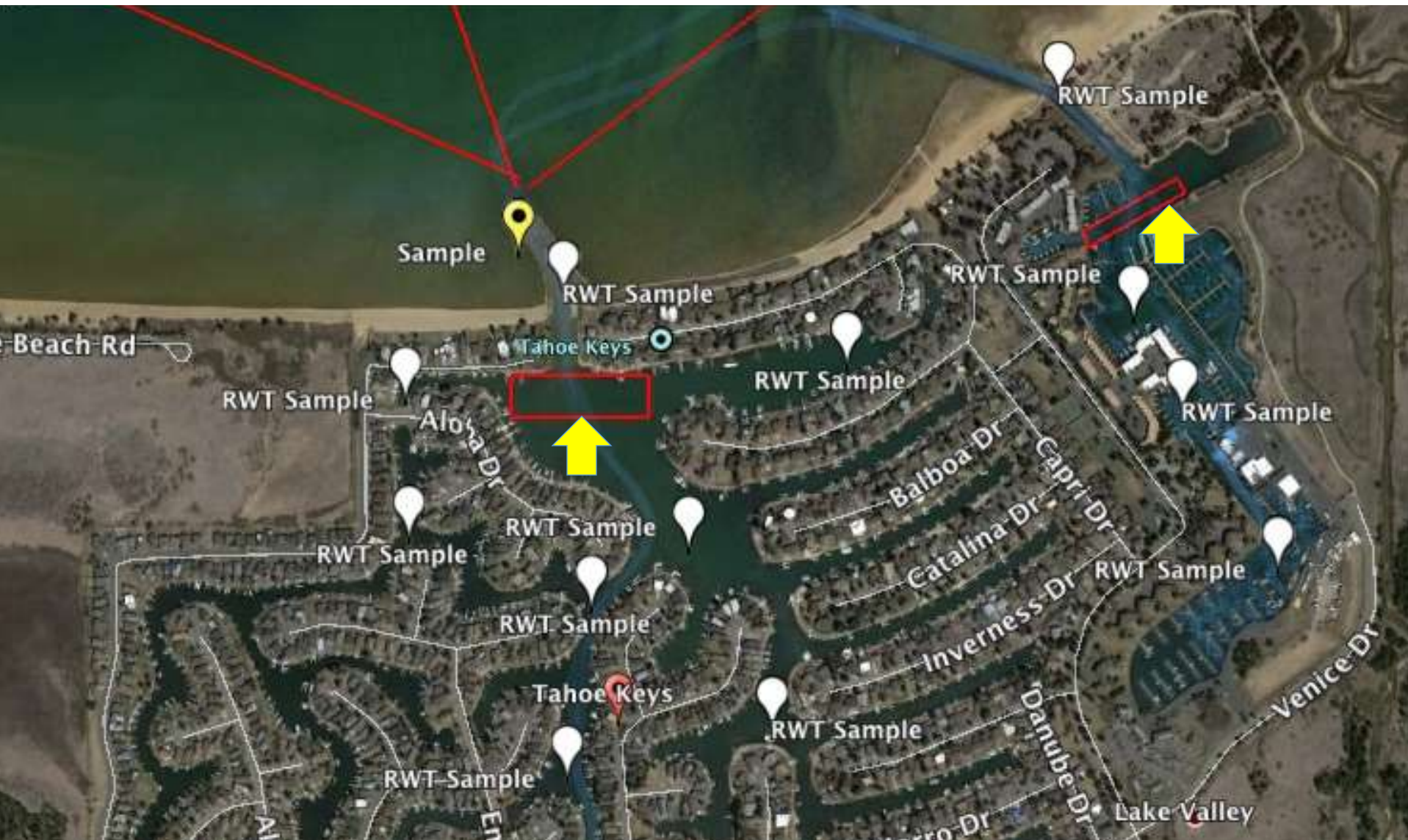
Great! Just do it!  
What will it cost?  
Why can't we use  
herbicides now?

## Tahoe Keys Homeowners



# Proposed Rhodamine WT Injection Sites for June, 2016

Red Rectangles are sites (ca. 5,000 sq. ft)





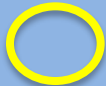
**Tahoe Keys Lagoons Integrated Weed Management Plan**  
**Map of Proposed Implementation by Site, Year, and Method**

Draft

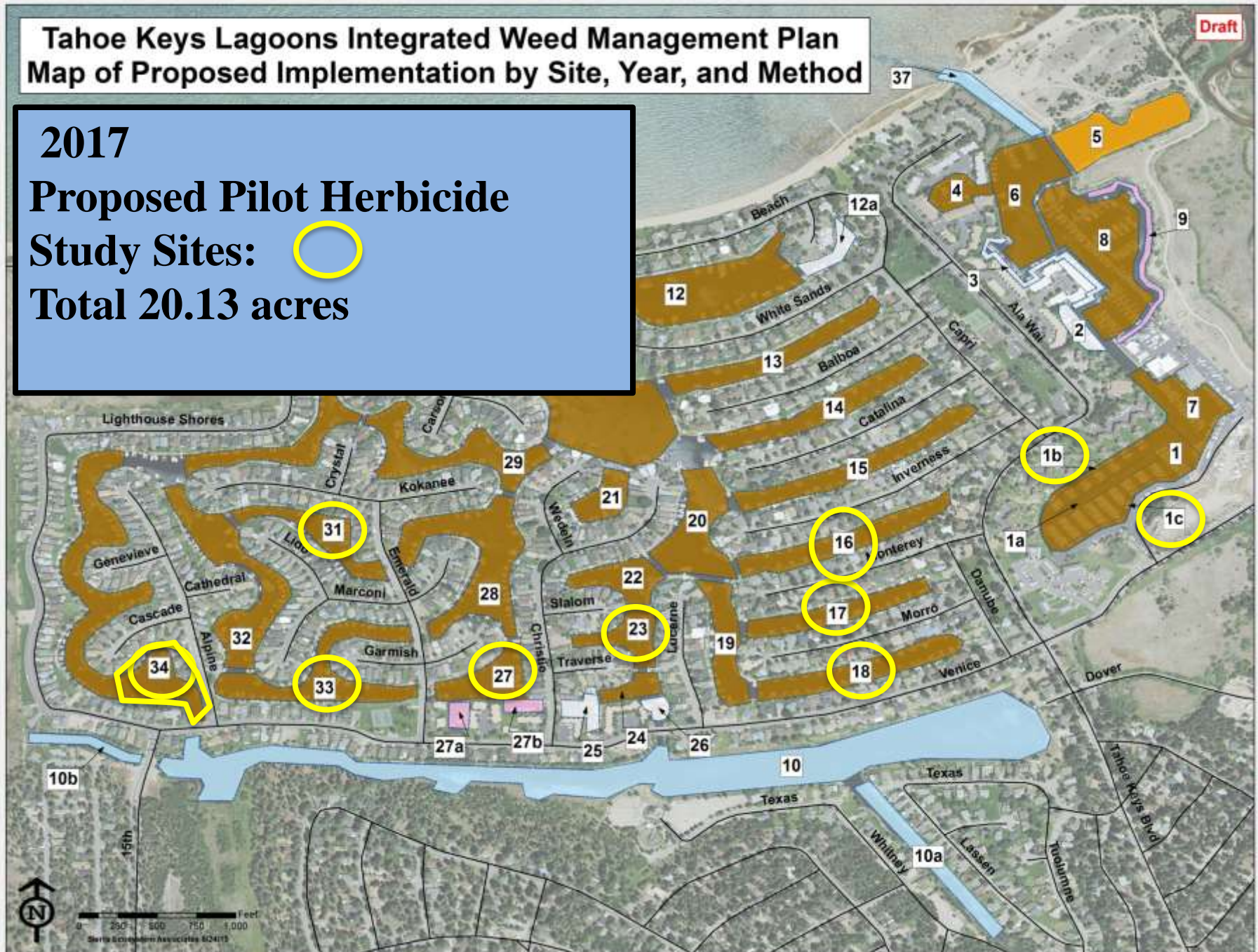
**2017**

**Proposed Pilot Herbicide**

**Study Sites:**



**Total 20.13 acres**



# Summary and Next Steps (2016)

- ❖ Submit Revised IWMP to Lahontan Water Board
- ❖ Submit Application for small scale herbicide use in 2017
- ❖ Conduct Rhodamine WT Dye movement study (2016)
- ❖ Complete Mesocosm Herbicide Evaluation (2016)
- ❖ Submit Revised” Non-Point Source Plan” to Lahontan Water Board (2016)
- ❖ Continue Public Outreach and Stakeholder meetings