A binational effort to re-establish populations of the California red-legged frog (*Rana draytonii*) in southern California

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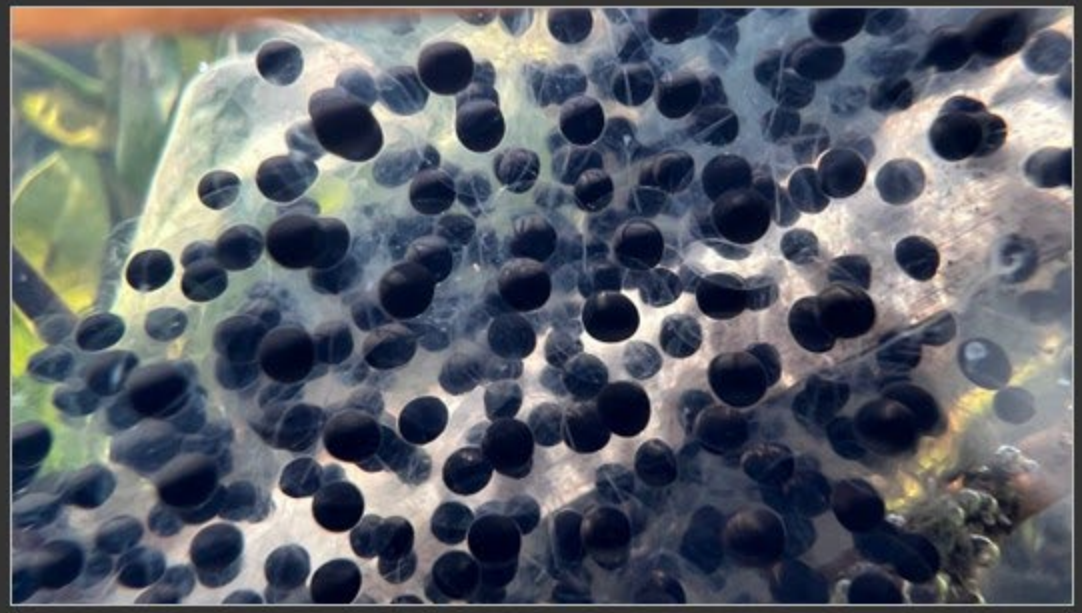

Photo by Brad Hollingsworth

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- The purpose of the work is to reintroduce the California red-legged frog to parts of its historic range where it once thrived but is now extirpated – it is now listed as a threatened species under the Endangered Species Act.
  - This picture is of a freshly fertilized egg mass of the California red-legged frog – those things that look like chia seeds are embryos that in a few weeks time will turn into free swimming tadpoles and in about 5 months time will turn into frogs
  - On the right are the main agencies and organizations involved with the work – there are at least three dozen people involved
- Currently this effort is being conducted on tribal adjacent lands, at least as we think of property boundaries today - in reality, we're talking about the ancestral lands of the Ipai and Payómkawichum First Nation peoples
  - Maps will geographically orient you in upcoming slides
- We are very interested in working with tribes to expand this project, both in terms of acquiring new knowledge as to how might approach it in new locations and in participation
- That's not happening yet, but we've been building a relationship with tribal members the Ipai Nation of Santa Ysabel in support of their ecosystem restoration efforts for the southwestern pond turtle – If you haven't heard about this project, you should look into because its truly impressive in terms of what they've been able to do in fairly short amount of time and its scope.

Photo by RW Hansen

Xa'nya Reuuy

or

Hantak Mat Kuumiirrp

Species decline and place in Indigenous peoples' history

- In Spanish its known as 'rana con patas rojas' or frog with red-legs
- Populations have severely declined in southern CA and northern Baja CA over the past ~60 years, and are completely gone from other parts of its historic range as well
- Like the southwestern pond turtle, it is a species of cultural significance, or potentially culturally significant to the Ipai/Tipai Kumeyaay
  - Frogs appear in the creation story and song (Tipai and Ipai variants of story name):

- *Xa'nya Reuuy* - "The Frogs That Are in Love"
- *Hantak Mat Kuumiirrp* - Frogs in Love
  - I obviously cannot say that it was this species of frog that inspired the story, but I have no doubt in my mind that First Nation peoples of southern California were *very* familiar with this frog because its such an impressive creature. It is also the largest native ranid frog in western North America, that is until bullfrogs were introduced toward the end of the 19th century.

Range Decline over time

This is a map of the historic range of the species demonstrating how its changed through time, going from the pre-1950s at time T_3 on the left up to the present time T_0 on the right.

- The **first** biggest insult to the species was overharvesting during and after the gold rush era for food – frogs were harvested by the millions and became so depleted that they were supplanted as a food resource by imported bullfrogs, which are now one of the most-damaging invasive species of all time.

Population Decline

- More recently, since the 1960s the species has become extirpated from southern California and northern Baja California largely because of habitat loss, modified hydrology, and introduction of invasive species like bullfrogs, predatory fish like this largemouth bass, and crayfish

Focus of project

- Until this project, the southern most surviving population in California was in the Santa Monica Mtns just north of Los Angeles on the coast
- The goal of this work is to (1) restore habitat and then (2) use translocations to help the species re-establish itself into parts of the historic range where its currently extirpated.

Translocation

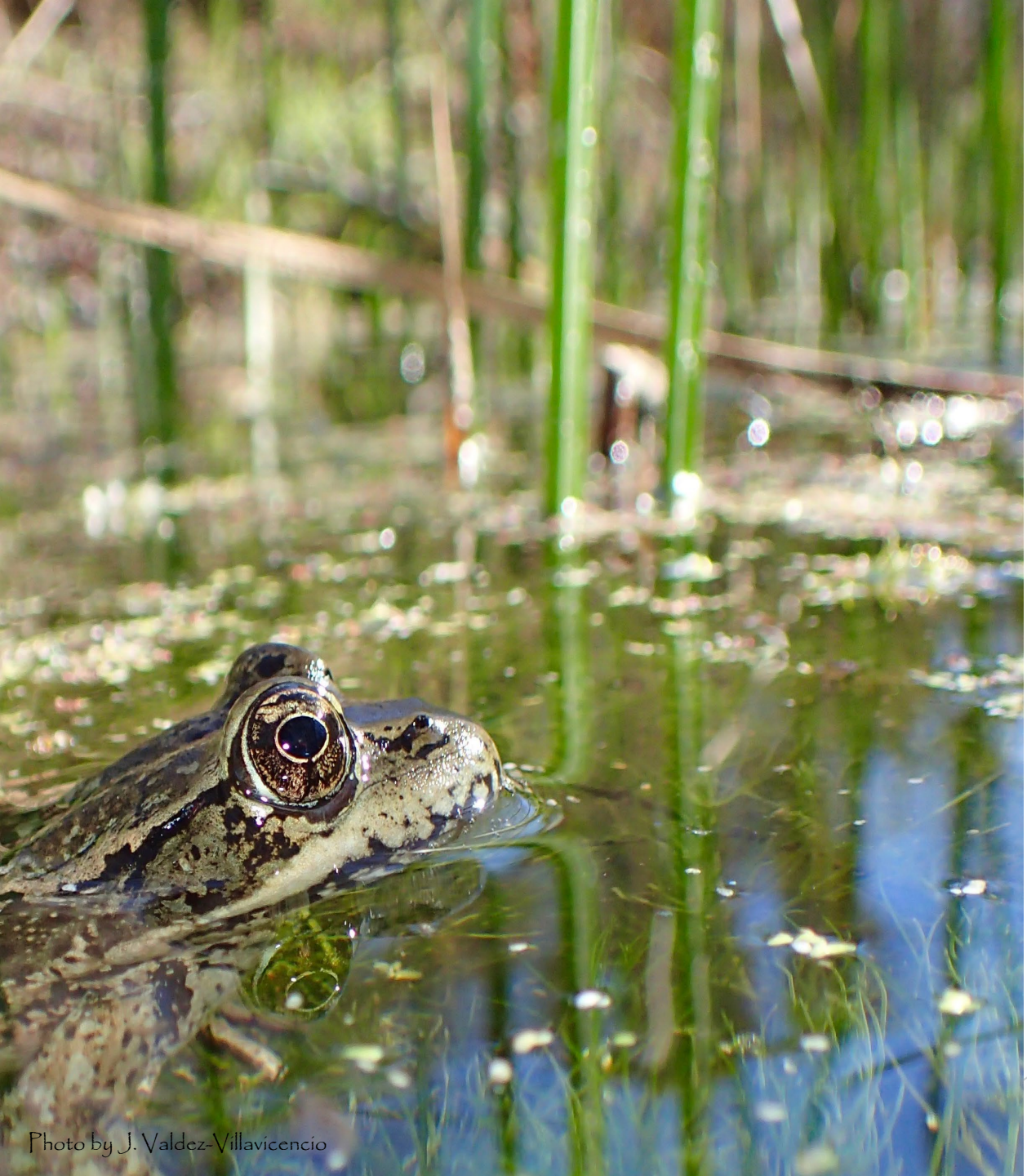

Photo by RW Hansen

- Deliberate transport of individuals to support recovery:
  - Translocation is the deliberate movement of frogs from one place to another to support recovery.
  - Re-establish populations in extirpated parts of a species' range
  - Establishing new populations to increase redundancy
  - Augment the genetic diversity of an existing population(s)

Project Objectives

“Our plan is to get a few populations re-established in CA that are large enough and actively breeding such that we can harvest from those instead of having to bring them up from Mexico.”

1. To repatriate parts of the historic range of California red-legged frog in southern California
2. To increase population redundancy and improve species ‘resilience’
3. Establish a process for the bi-national recovery of California red-legged frog



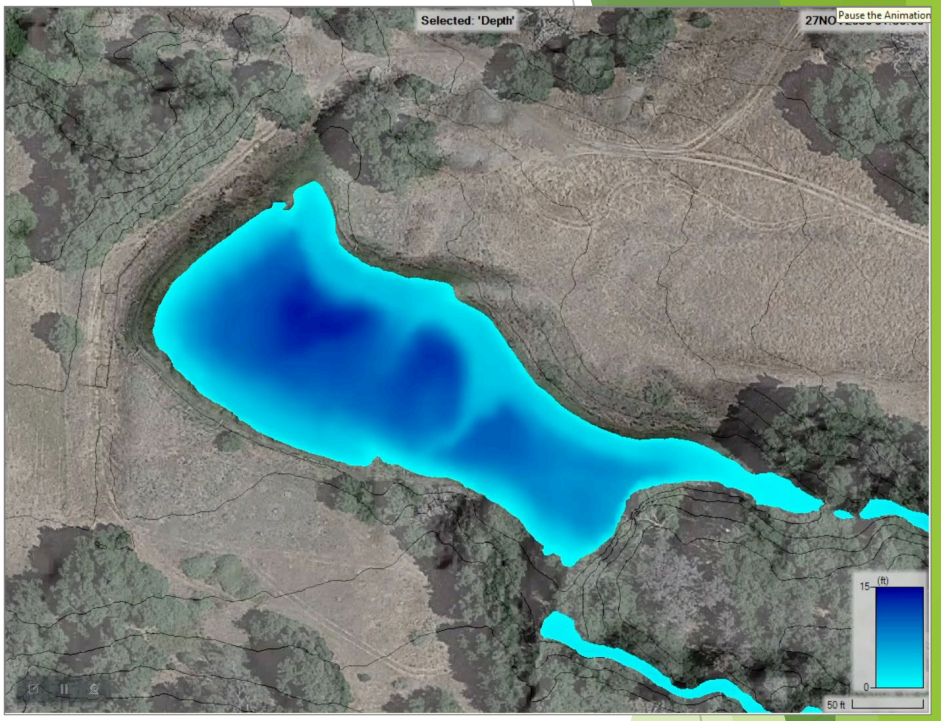
The steps

1. Recipient site selection in CA
2. Source population selection in México
3. Permitting
4. Translocation process
5. Post-translocation monitoring
6. Status as of 2025

Recipient site criteria in California

- Did the site historically support the frog?
- Have threats been abated or minimized at the site?*
- Are there opportunities for frogs to colonize new areas?
- Is the land protected and managed?

Hydrology models



2D HEC-RAS model by Holly Callahan USFWS

- Depending on the needs of the translocated eggs, this could help determine placement locations with more or less water circulation.
- Or in this case, downstream of the pond, the velocity and depth results can help in determining/designing where restoration efforts could improve the habitat.

Recipient sites in California

Santa Rosa Plateau Ecological Reserve – is state-owned ecological reserve that is managed by the Nature Conservancy, just west of Wildomar in Riverside County in what would be Payómkawichum ancestral lands

Mesa Grande – privately owned Ranch in close proximity to the Ipai First Nations of Mesa Grande and Santa Ysabel Reservations in San Diego Counties

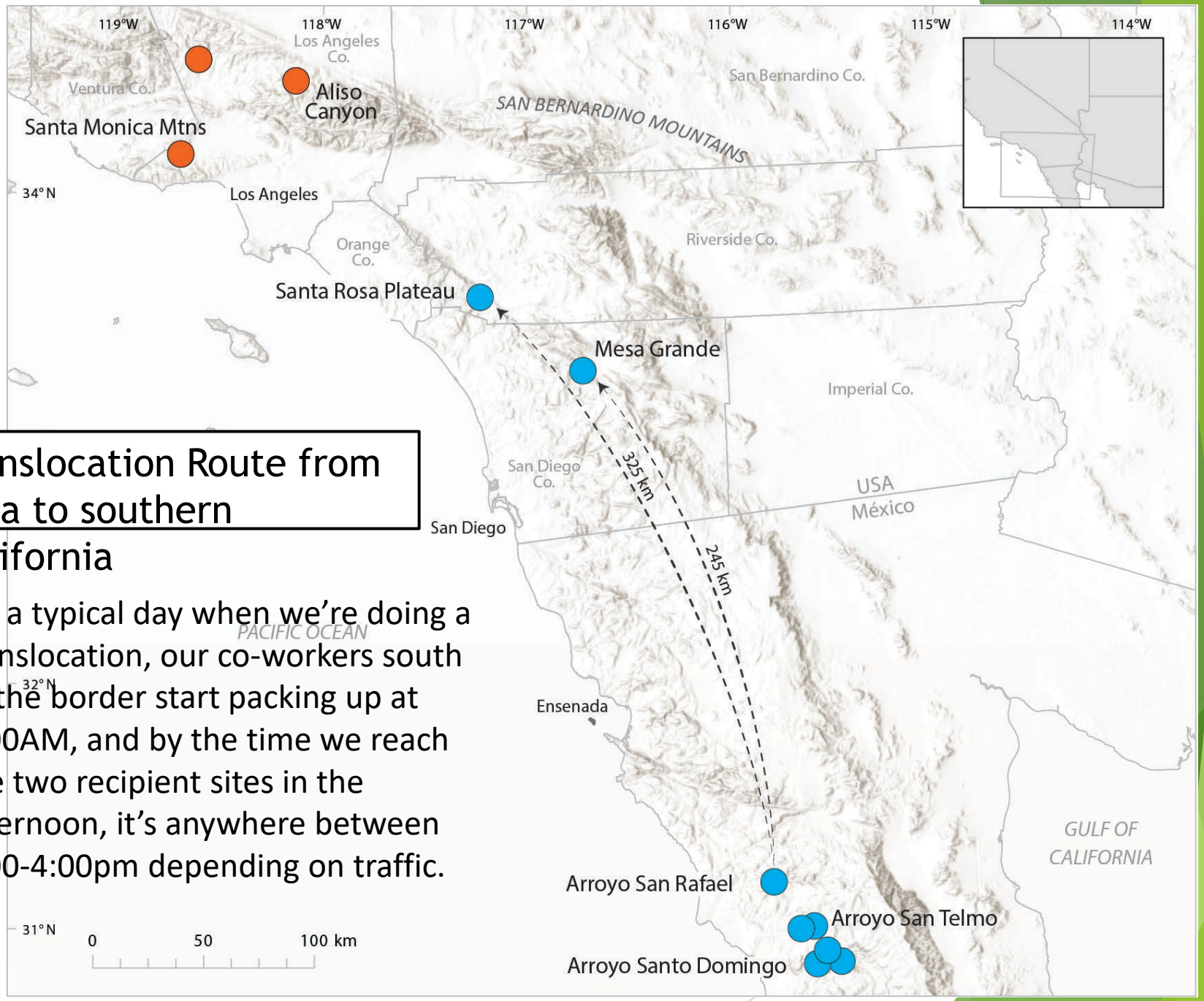
Photo by RW Hansen

Source populations in México:

Based a genetic data, the closest living relatives of the frogs extirpated from southern CA are in the Sierra San Pedro Martir Mountains in northern Baja California.

We want frogs back into southern CA that have the closest genetic background to what used to be here because that background will be best adapted to the environment and most likely to survive.

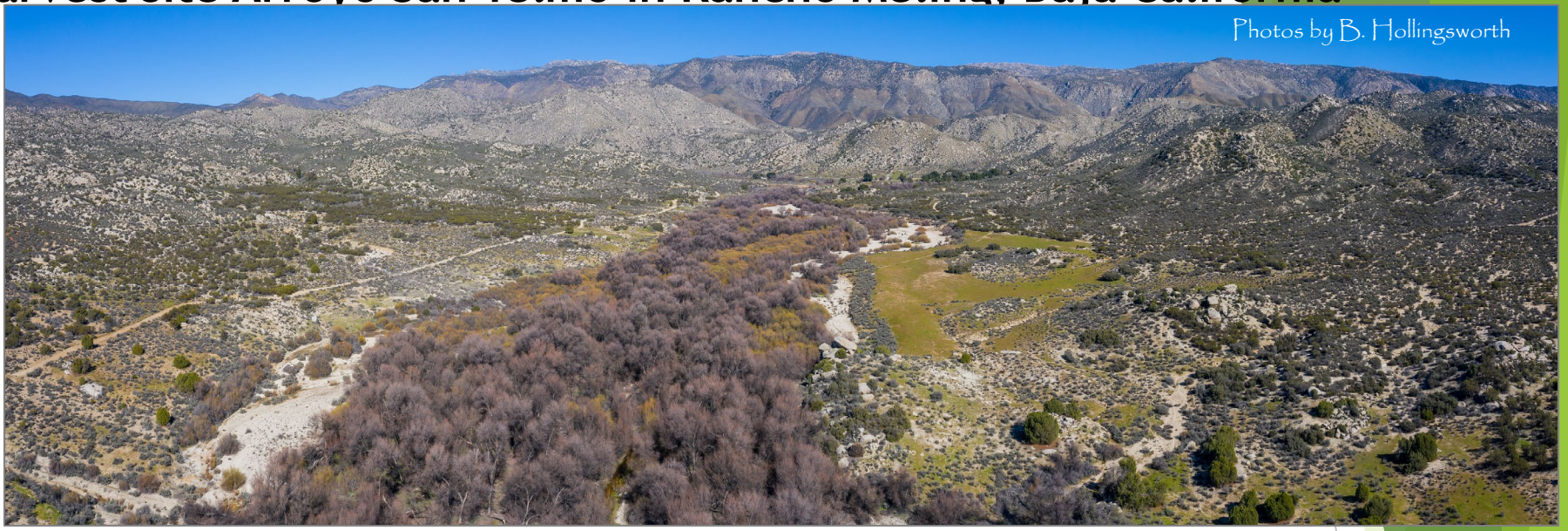
- Does the site have regular reproduction & recruitment?
- Is there a good relationship with landowner?
- Is there reasonable access to the site?
- How similar is the elevation to the recipient sites in California?
- Are there ongoing habitat improvement or monitoring efforts?



Translocation Route from Baja to southern California

On a typical day when we're doing a translocation, our co-workers south of the border start packing up at 4:00AM, and by the time we reach the two recipient sites in the afternoon, it's anywhere between 2:00-4:00pm depending on traffic.

Harvest site Arroyo San Telmo in Rancho Meling, Baja California



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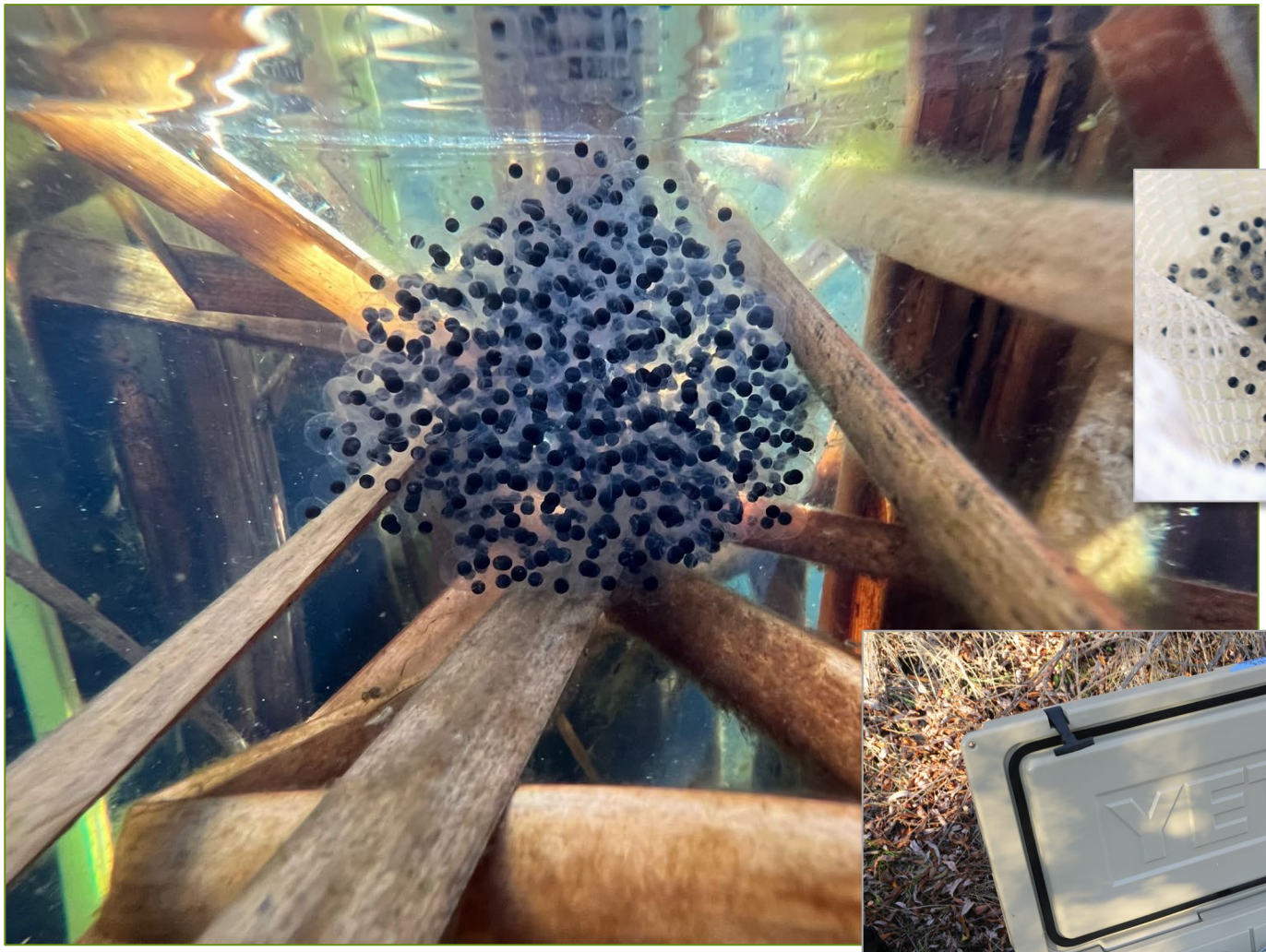
Translocation of fertilized egg masses

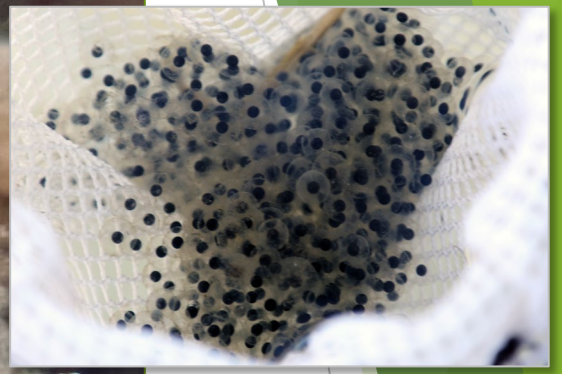
We translocate fertilized egg masses because it:

- Avoids problems with the homing instinct of juveniles and adult frogs
- We can transport hundreds of embryos at any one time
- Egg masses are not susceptible to a widespread fungal disease, currently impacting amphibians around the world, whereas, frogs can
- We limits how many eggs are harvests because we don't want to negatively impact the populations we're harvesting from

Harvesting Procedure

- Eggs are moved in little mesh pouches
- •We've determined that we can move ½ egg mass for every 5 detected in the wild without having any demographic impacts to the source population.
- If the embryos are beyond a certain developmental stage, we don't move them due to the risk of premature emergence
- Egg masses are transported in Yeti coolers outfitted with aerators and temperature gauges to slowly adjust the water temperature to match that of the receiver pond.



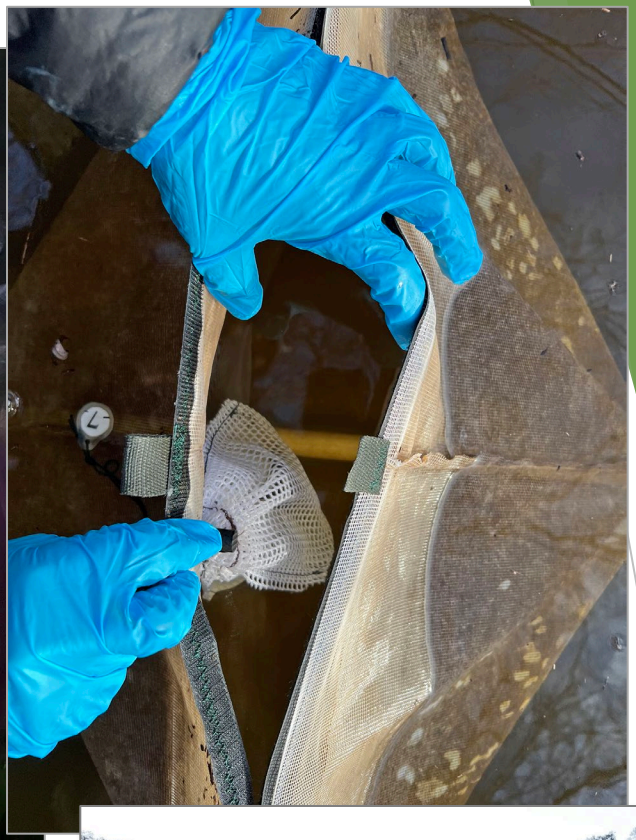



YETI
LET'S DO THIS.
YETI

Release procedure

- Once embryos arrive at the site, they are taken through a “marination” step, while still within the mesh pouches they are successive rinsed in the pond water at the recipient site.
- The mesh pouch with embryos are places in a protective larger hammock-like sack that’s porous and the hammock is suspended in the pond using t-stakes
- The embryos develop in their new home and protected from any predators inside the hammock.


Susan North



Post embryo release in receiver pond

- We monitor the eggs for about 4-6 weeks checking for mold, and any other signs of disturbance
- Once the tadpoles emerge from the egg, they're able to get out of the inner mesh bag and then swim freely and develop inside the hammock.
- When the tadpoles reach a certain size and determined that they do a better job of taking care of themselves.
  - Each are counted
  - And released into the pond
- We usually release them anywhere between early April to early May depending on growth and weather conditions


Photo by B. Hollingsworth

Video of tadpole release into pond

Video by Liz Gallegos

Metamorph surveys

- By mid-Sept, the tadpoles have mostly undergone metamorphosis into small frogs with lungs and are out on land.
- Froglets are at various stages of change. Some fully formed others still developing.
- Once the froglets reach a certain size, we implant tiny PIT tags (passive integrative transponders) into each individual that have unique identifiers; we have electronic pig tag readers that we wand over the frog and it tell us the unique ID for the individual.
- Because each frog has its own unique PIT tag, we can then monitor growth and survivorship
- Although we do the best we can with monitoring, the abundances can only underestimate the total number of frogs that survive because these are enormous landscapes, there are lots of places for frogs to go and hide, they're good at avoiding predators, and they're just hard to see.


Liz Gallegos & Jared Heath


'Esteban'

upper Scholder Creek

Summary data

Year	Source site	Recipient site	Release Date	Total # Released at Site
2020	El Potrero/Rancho Meling	Mesa Grande	5/12	471
2020	Rancho Meling	Santa Rosa Plateau	5/12	3
2021	San Rafael/Rancho Meling	Mesa Grande	3/31	2343
2021	San Rafael/Rancho Meling	Santa Rosa Plateau	3/11	1600
2022	San Rafael/Rancho Meling	Mesa Grande	3/31	1359
2022	San Rafael/Rancho Meling	Santa Rosa Plateau	3/31 and 4/4	1105
2023	San Rafael/Rancho Meling	Mesa Grande	4/24 and 5/9	3022
2023	San Rafael/Rancho Meling	Santa Rosa Plateau	4/13 and 5/8	2357
2024	Rancho Meling	Mesa Grande	4/25	5208
202	Rancho Meling	Santa Rosa Plateau	4/17	5534
2025	Rancho Meling	Mesa Grande	4/24	2216
2025	Rancho Meling	Santa Rosa Plateau	4/15	285

Reproductive Success!

- We are happy to report that into our 6th year of doing these cross-border translocations, we now have reproductively mature frogs at both sites!
- San Diego Natural History Museum staff picked up male breeding calls from sound recording devices around the ponds. (audio on next slide).
- During the breeding season the males will add these grunts and growls at the end of the ‘chuck’ part of the call, and they become aggressive towards one another as they carve out their territories and attempt to gain access to females.


Photo by F. Santana

Egg masses in Santa Rosa Plateau!

- And it's not just that we have mature males, they actually bred for the first time –this is an actual egg mass from Santa Rosa Plateau.
- You'll notice that this mass doesn't have a lot of the chia seed-like embryos, but those white frosty looking interiors – those are just unfertilized eggs.
- The reason is because young, unexperienced males have
- trouble properly eject sperm over the eggs - these frog have external fertilization, but they do get better with age.
- With more and more adult frogs on the landscape now, I think we have maybe one more year of helping them out before they take off on their own.

I closed the talk with a personal anecdote that doesn't represent the views of the federal government. I took some latitude to share something I learned from a group of friends that I've been getting to know over the past handful of years from the Ipai Nation of Santa Ysabel.

- It's an ideology that was taught to my friend/colleague by an elder member of tribe, and he shared the insight at a meeting we all attended together, and then later he and I had a personal communication about it because it struck a chord with me.

- The reason it struck a chord with me was twofold. One is because (1) I'm deeply concerned about the near future of the climate, our environment and the health of our ecosystems, particularly in the current times. And the second reason is that (2) this ethos that he shared with me stands in stark contrast to the ways in which a lot of 'westerners' think about the natural world - obviously not everyone thinks this way, and I'm painting with a very broad stoke. But there's this pervasive view that humans are somehow above everything in this world we live in. That we are more important. That our purpose here is to dominate and control. That we have some innate right to exploit the earth to its full potential for whatever purpose we deem appropriate. There is a clear separation between 'us', and everything else.

- This 'western' view contrasts sharply with an Ipai belief that is captured in this term Ma'at, which has a dual meaning – it's the word for "Land", and also the word that's used when referring to the body. The dual meaning comes from the belief that there is no distinction between the body and land. That land helps us with what we need to be healthy and it's our responsibility to help the land with what it needs to be healthy. We are the land; the land is us.

- It's my opinion that if we, as human beings, were to make a more concerted effort to live by Ma'at, that many of our environmental problems would naturally go away. If we do things like restore habitats for CA red-legged frog and southwestern pond turtle and re-establish these populations and species in places where they once thrived, that the benefits we provide them will indirectly help us in ways that are difficult to imagine until we actually do those things.

Ma'at (M-aww-t)