California Department of Fish and Wildlife: Quagga/Zebra Mussel Prevention Planning

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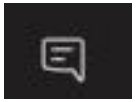
CALIFORNIA DEPARTMENT OF
Fish and Wildlife

Microsoft Teams Tips

- Computer audio recommended
  - Audio problems? Try logging out and back in
- Phone option (listed in email)
  - 916-535-0984. Conference ID: 225 169 552#
- Hover at bottom of screen for controls
- Please type questions into Chat 
- Turn off your camera to save bandwidth

Overview

1. The Benefits of Investing in Prevention
2. Code and Regulations
3. How to Prepare a Prevention Plan
   - Guidance for Developing a Dreissenid Mussel Prevention Program
   - Assessment of Vulnerability
   - Monitoring Program
   - Management Actions
   - Public Education
   - Documenting the Prevention Program
4. CA State Parks Division of Boating and Waterways Requirements for QZ Grant Program Applications
5. How CDFW Regional Staff Can Help You

Invasive Species Management Approach

- Prevent further introductions into and within the State
- Contain invasive species within currently infested waters
- Eradicate invasive species from infested areas, when feasible

Quagga and Zebra Mussel Sightings

- Map available on CDFW website
- No new sightings since 2017

Mussel Biology

- Freshwater bivalve
- Broadcast spawner
  - 1 million eggs/year
  - Year-round spawning in warmer waters
- Two life stages
  - Adult: Benthic (bottom)
  - Veliger: Planktonic (free floating in water column)
- Minimum calcium required for veliger survival
  - 15 mg/L for zebra mussels
  - 18 mg/L for quagga mussels

Benefits of Investing in Prevention: Impacts to the Environment

- Disrupt the food chain
- Out-compete other species
- Change water quality

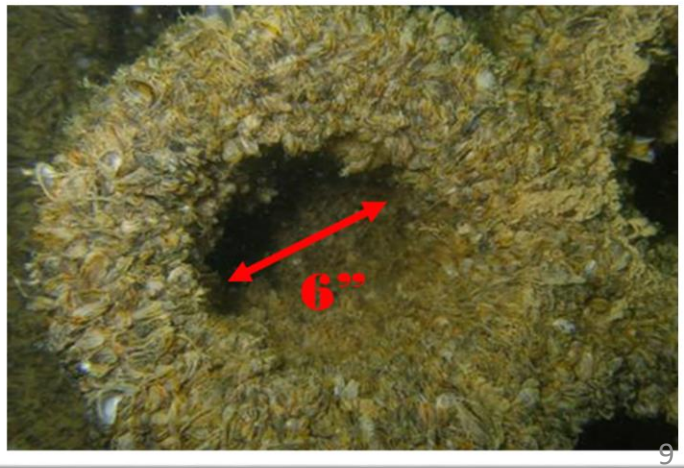
Impacts to Recreation

- Ruin boats
- Require expensive decontamination
- Some lakes have restricted access
- Mandatory inspection programs

Impacts to Infrastructure

- Dense populations clog pipes, pumps, fire suppression and components of water supply system
  - Removal = on going cost
  - Metropolitan Water District spent $30 million in 5 years on control

Davis Dam, Lake Mohave



Questions and Discussion, Part 1

Codes and Regulations - §2301

California Fish and Game Code §2301

- Restricts importation, possession and transport of dreissenid mussels
- Authorizes inspection of conveyances
  - Enforcement authority to CDFA and State Parks
- Authorizes inspection of waters of the state
- Requires reporting of mussel detections
- Requires Control Plans

Codes and Regulations - §2302

California Fish and Game Code §2302

- Applies to reservoirs open to the public
- Requires assessment of the vulnerability of introduction
- Requires Prevention Programs

Mussel Regulations (1)
(Effective April 1, 2016)

California Code of Regulations Title 14 §672

- Definitions
  - (a)(6) “Introduction” means the intentional or unintentional placement of adult or veliger dreissenid mussels into a reservoir.
  - (a)(7) “Prevention Program” is a written document that describes the actions to be implemented at a reservoir to keep dreissenid mussels from being introduced and keep them from being moved from the reservoir should they be present.
- Dead Mussel Permits

Mussel Regulations (2)
(Effective on April 1, 2016)

Title 14 §672.1(a) and (b)

- Control Plan
- Prevention Program
- Annual reports
- Inspection of conveyances

Title 14 §672.2

- Penalty and appeal procedures

CCR Title 14, Section 672.1(b)

- Requires reservoir owners/managers to summarize their Prevention Program in a written “Plan”
- Plan must include:
  - Vulnerability assessment for the introduction of mussels
  - Monitoring for mussels
  - Management of recreational activities
  - Education and outreach
- Submit annual reports by March 31 covering the prior January 1 – December 31
  - Summarize any changes in reservoir’s vulnerability, monitoring results, and management activities

Questions and Discussion, Part 2

How to Prepare a Prevention Plan

Plan Elements

- Description of regulatory and environmental settings
- Vulnerability Assessment – risk of introduction
- Mussel monitoring
- Management of recreational activities
- Public education and outreach

Prevention Plan Introduction

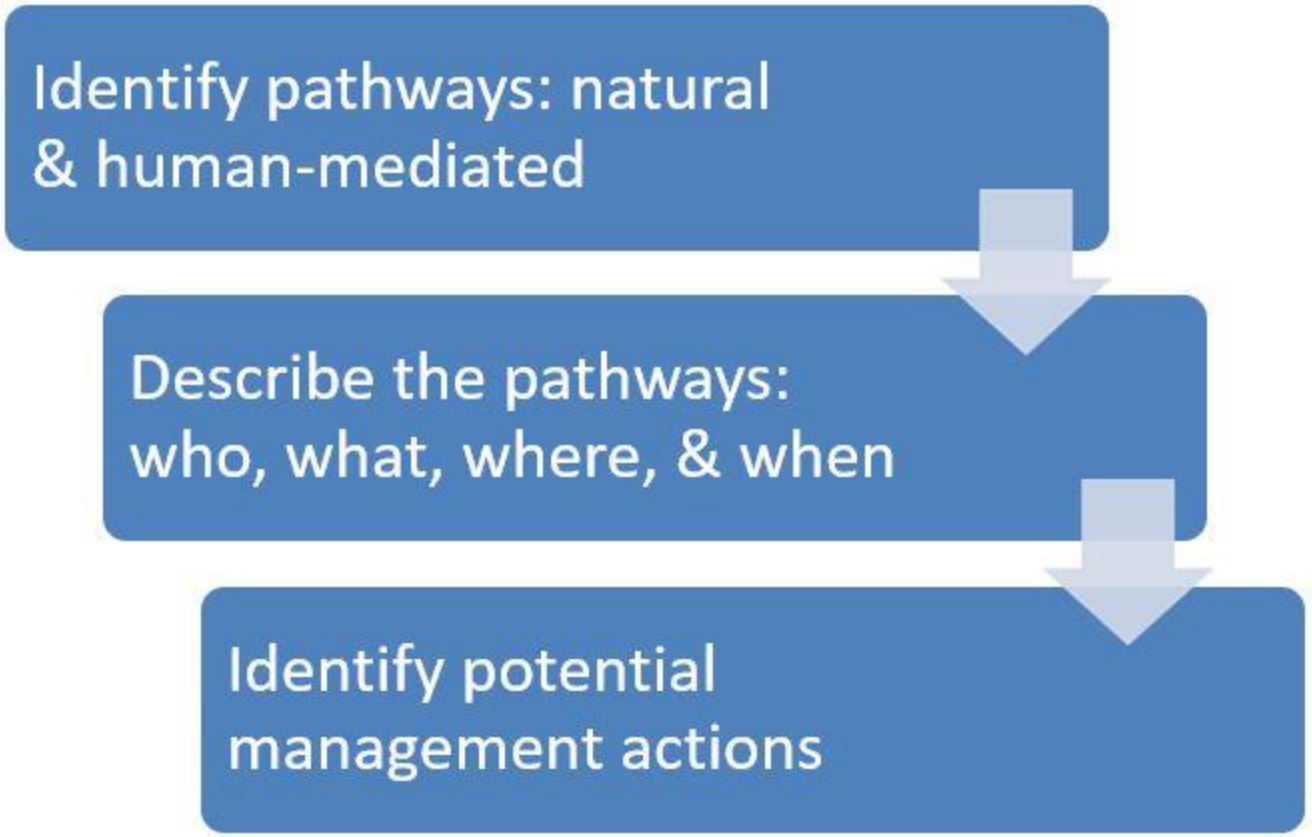
Provide an introduction to the managing authority and each waterbody

- Regulatory setting
- Environmental setting
  - County, acre/feet, source water, access, # of launch ramps, fish stocking, etc.
  - Recreation that takes place: fishing, boating, hiking, camping, hunting, fishing tournaments, use of live bait
  - Could be displayed in a table

Types of Risk

Introduction	Establishment
The potential that mussels will be brought into a waterbody	The potential that mussels, if introduced into a waterbody, will survive and reproduce there
Pathways	Mussel biology and water chemistry
Vulnerability Assessment	Monitoring and management actions

Vulnerability Assessment Overview



Vulnerability Assessment

Assesses the Potential Introduction of Mussels

- Examining Pathways
  - Source of water
  - Recreational activities
    - Boating
    - Fishing
    - Fishing tournaments
    - Sea/float planes
  - Maintenance equipment
  - In-water equipment
  - Firefighting equipment
  - Research

Common Pathways of Introduction

Natural Pathways	Potential management actions to prevent mussel introduction (including education and outreach)
Open water flowing from upstream sources	Chlorination, filtration
Flooding	-

Human-mediated Pathways	Potential management actions to prevent mussel introduction (including education and outreach)
Watercraft Motorized Ballast ski boats Non-motorized Law enforcement Natural resource agencies Rental	Self-inspections, inspections by trained staff at the waterbody, mandatory dry periods, decontamination, etc.
Fishing Anglers / Angling equipment Fishing tournaments Live bait Fish planting	Inspect fishing gear, provide gear cleaning stations, conditions on fishing tournaments, inspect live bait (check origin of live bait), restrict live bait, etc.

Common Pathways of Introduction (2)

Human-mediated Pathways	Potential management actions to prevent mussel introduction (including education and outreach)
In-water equipment Construction equipment Docks Buoys Floating restrooms Firefighting tanker trucks or equipment	Inspect all incoming equipment, allow sufficient dry time if equipment cannot be drained, coordinate with firefighting agencies for inspections of equipment, decontaminate equipment used previously, etc.
Facility maintenance Large equipment Field gear and equipment	Inspect maintenance gear and equipment, if managing multiple waterbodies have dedicated equipment, etc.
Aerial contact Sea planes Float planes Firefighting aircraft	Prohibit planes coming from infested waters, etc.
Research	Inspect gear, require mandatory decontamination of equipment prior to use at waterbody, etc.

Example Pathway Assessment

Pathway: Pleasure boating	No fishing from watercraft; includes motorized and non-motorized
Who:	The public
What:	Boaters come from throughout the state for day-use boating; many visitors are local residents
Where:	Happy Valley Lake; north and south boat ramps with self-service pay kiosks
When:	Open for boating year-round; visitation highest May-October, sunrise – dusk

Management and Outreach Actions

Current efforts to prevent or mitigate an introduction: None

Potential management options to prevent or mitigate an introduction:

- Watercraft inspection program for all watercraft (install gates, limit access hours)
- Offer banding for returning boats to expedite launching
- Self-serve decontamination unit on-site
- Limit boating season to highest use times

Education and outreach opportunities:

- Conversation preceding and during inspection will convey information
- Post informational poster and handouts on kiosks
- Post permanent metal signs at each boat ramp

Questions and Discussion, Part 3

Incorporating Risk of Establishment

Based on mussel biology, and physical and chemical properties of the waterbody

- Calcium
- Salinity
- Temperature (minimum and maximum)
- pH

Considered for selecting appropriate

- Mussel monitoring
- Management actions

Why Monitor?

- Required by law
- Provides a measure of prevention program effectiveness
- Early detection is key
- Stop the spread to other waters
- DBW requires for grant applicants

Monitoring Methods

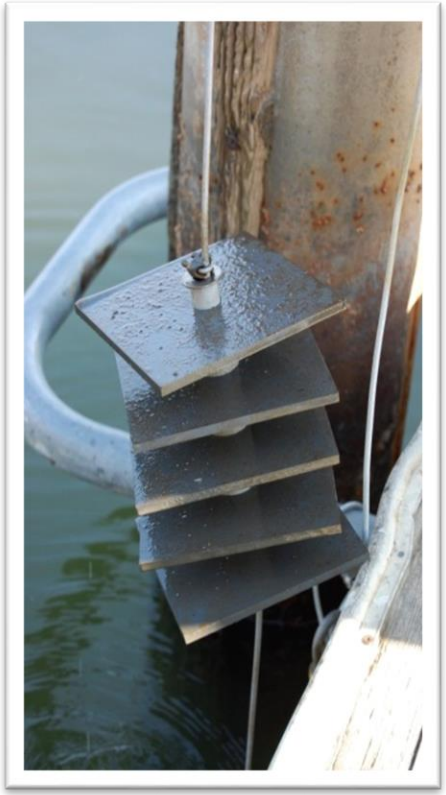
- Surface survey
- Artificial substrate
- Plankton tow

Monitoring – Surface Survey

Life Cycle Stage	Sampling Frequency	Sampling Period	Equipment Cost	Relative Cost
Juveniles & Adults	Monthly	Depends on water temperature	Minimal	$

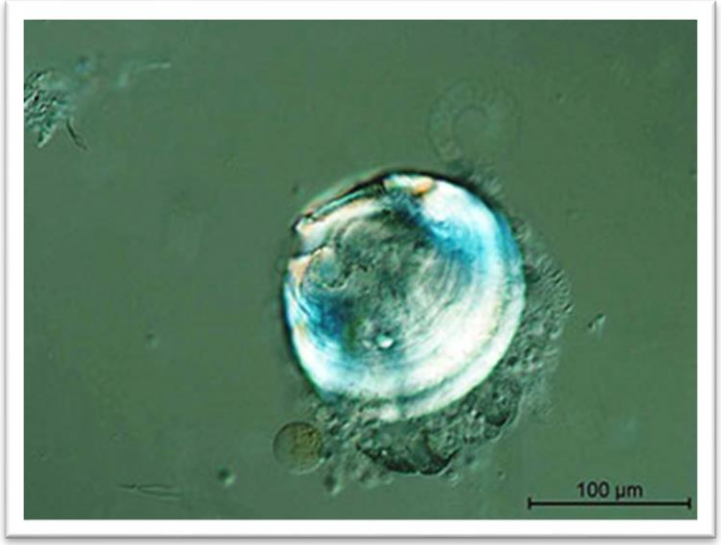
Monitoring – Artificial Substrate

Life Cycle Stage	Sampling Frequency	Sampling Period	Equipment Cost	Relative Cost
Juveniles & Adults	Monthly	Depends on water temperature	$50/substrate, lines	$$



Monitoring – Plankton Tow

Life Cycle Stage	Sampling Frequency	Sampling Period	Equipment Cost	Relative Cost
Veliger (larvae)	Once or twice per month based on water temp. and risk	Depends on water temperature	$350 Net, line, plus boat	$$$$



Recommended Monitoring

Recommended Minimum Dreissenid Mussel Early Detection Monitoring

	Calcium	Dreissenid Mussel Biology*	Monitoring**
24 mg/L	High	• Adult mussels survive long-term. • Reproduction and full life-cycle completion occurs. • Introduced veligers and other life stages can survive. • Calcium is not a limiting factor.	Plankton tows: • Twice per month at water temperature 16-24 °C (61-75 °F) • Once per month, 12-16 °C (54-61 °F) or 24-28°C (75-82 °F) Surface surveys (and/or artificial substrates if no existing surfaces) checked at least monthly.

15	Moderate	• Adult mussels survive long-term.
		• Reproduction can occur, but survivorship is reduced due to inadequate calcium for veliger development.
		• Survivorship increases as calcium increases up to 24 mg/L.
		• Minimum calcium required for veliger survival (> 0%):
		  ▪ 15 mg/L for zebra mussels
		  ▪ 18 mg/L for quagga mussels
		• Introduced late-stage veligers likely to survive.
			Plankton tows:
			• Twice per month at water temperature 16-24 °C (61-75 °F)
			• Once per month, 12-16 °C (54-61 °F) or 24-28°C (75-82 °F)
			Surface surveys (and/or artificial substrates if no existing surfaces) checked at least monthly

12	Low	• Adult mussels survive long-term. • Reproduction may occur, but veligers cannot survive. • Introduced late-stage veligers may survive and settle.	No plankton tows. Surface surveys (and/or artificial substrates if no existing surfaces) checked at least monthly.
	Very Low	• Adult mussels cannot survive long-term. • Reproduction does not occur. • Introduced veligers cannot survive.	No plankton tows. Surface surveys (and/or artificial substrates if no existing surfaces) checked at least monthly.

*Assumes suitable pH (>7.0) and salinity (<6 ppt).

**Refer to monitoring protocols at CDFW's Quagga and Zebra Mussels webpage for more information.

California Department of Fish and Wildlife, Invasive Species Program, September 2020

High: Calcium >24 mg/L

Dreissenid Mussel Biology

- Adult mussels survive long-term
- Reproduction and full life-cycle completion occurs
- Introduced veligers and other life stages can survive

Monitoring

- Plankton tows
  - Twice per month at water temp. 16-24 °C (61-75 °F)
  - Once per month, 12-16 °C or 24-28 °C
- Surface surveys (and/or artificial substrate if no existing surfaces) at least monthly

Moderate: Calcium 15 - 24 mg/L

Dreissenid Mussel Biology

- Adult mussels survive long-term
- Reproduction can occur, but survivorship is reduced due to inadequate calcium for veliger development
- Survivorship increases as calcium increases up to 24 mg/L
- Introduced late-stage veligers likely to survive

Monitoring

- Plankton tows
  - Twice per month at water temp. 16-24 °C (61-75 °F)
  - Once per month, 12-16 °C or 24-28 °C
- Surface surveys (and/or artificial substrate if no existing surfaces) at least monthly

Low: Calcium 12 - 15 mg/L

Dreissenid Mussel Biology

- Adults mussels survive long-term
- Reproduction may occur, but veligers cannot survive
- Introduced late-stage veligers may survive and settle

Monitoring

- No plankton tows
- Surface surveys (and/or artificial substrate if no existing surfaces) at least monthly

Very Low: Calcium <12 mg/L

Dreissenid Mussel Biology

- Adults mussels cannot survive long-term
- Reproduction does not occur
- Introduced veligers cannot survive

Monitoring

- No plankton tows
- Surface surveys (and/or artificial substrate if no existing surfaces) at least monthly

Example: Happy Valley Lake (Calcium = 28 mg/L)

Monitoring Method	Location(s)	Dates	Frequency	Agency
Plankton sampling	1. North boat ramp 2. South boat ramp 3. Dam 4. Outlet 5. Happy Valley Marina 6. Floatable Port-a-potties 7. Rush Creek inlet	May – October	Twice per month	Plankton sampling: Happy Valley Water District Sample analysis: CDFW- Bodega Bay Shellfish Health Lab
Surface surveys	1. North boat ramp and dock 2. South boat ramp and dock 3. Full length of dam from surface to 3' below surface	May – October May – October Year-round	Once per month	Happy Valley Water District
Artificial substrates	1. Sheriff boat dock	Year-round	Once per month	Happy Valley Water District

Management of Recreational Activities

- Inspections
  - Self, screening, trained staff
- Decontamination, dry time, exclusion, banding
- Gear cleaning stations
- Live bait restrictions or inspections
- Restrict access (locking gates)

Public Education and Outreach

- Posters and rack cards*
- Interpretive programs at waterbody
- Train staff to educate the public
- Information on your website
- Community presentations

*Available from CDFW

Annual Report Due March 31

- Summarize any changes in vulnerability
- Monitoring Results
  - Mussel monitoring
  - Water quality
  - Visitor use information
- Implemented Management Activities
  - Description of action, pathway(s) addressed and relevant details
- Due March 31, covering previous calendar year.
  - CDFW has a template.

Mussel Prevention Plan Review

Before you start

- Read the materials on our website
- Contact your regional scientist for advice

Review process

- Submit Plan to CDFW
- Comments returned
- Resubmit Plan
- CDFW acceptance letter
- Revision of Plan (as needed)

Questions and Discussion, Part 4

CA State Parks Division of Boating and Waterways Quagga and Zebra Mussel Infestation Prevention Grant (QZ Grant) Program (1)

Applicants for 2021 Grant Cycle must

- Include early-detection mussel monitoring data collected since March 2020, indicating that the reservoir is uninfested

Tier 1: Planning and Assessment Projects

- No letter from CDFW needed

Tier 2: Implementation Projects

- Must include letter from CDFW stating that Prevention Plan has been accepted

DBW's QZ Grant Program (2)

Examples of Fundable Projects/Tasks:

- **Tier 1:**
  - Preparation or revision of a Prevention Plan, Early-Detection Mussel Monitoring & water chemistry monitoring
- **Tier 2:**
  - Inspections/inspectors
  - Outreach, signage, training
  - Equipment such as decontamination equipment
  - Supplies such as bands
  - Monitoring discussed above,
  - Etc.

DBW's QZ Grant Program (3)

Early-Detection Mussel Monitoring (EDMM) – a grant covered task

- **Applicant:** Data type and frequency may be less extensive than required post award.
- **Grantee:** EDMM data will be required twice during the grant term. The type and frequency will be determined by CDFW, see CDFW's Chart: *Recommended Minimum Dreissenid Mussel Early Detection Monitoring.* Note: This may be a different monitoring prescription than in your CDFW-accepted Prevention Plan.

DBW's QZ Grant Program (4)

Subscribe to DBW's QZ Grant Notices at:

- http://dbw.parks.ca.gov/QZGrant

  Click on "Subscribe to QZ Grant Program Notifications"

- Pending available funding:
  - Grant notices will kick-off in January 2021
  - Application materials for the new cycle will be posted at DBW's website above, no later than February 2021
  - Application period expected to open in March 2021

Questions? E-mail: QZGrant@parks.ca.gov

Questions and Discussion, Part 5

How CDFW Regional Staff Can Help You

- Plan preparation
  - Identify potential vectors for mussel introduction
  - Suggestions for prevention measures
- Training
  - Monitoring methods
  - Watercraft inspections
  - Inspection tracking
- Water quality sampling (calcium)
- Mussel monitoring
- Plankton sample analysis
  - Must be approved in advance
- Educational materials

CDFW Resources

- Plan preparation
  - Guidance document
  - Template (optional)
- Monitoring
  - Monitoring protocols and datasheets
- Outreach/education
  - Boat cleaning guidebook
  - Rack cards and posters (printed and electronic)
- Available at www.wildlife.ca.gov/mussels

Tips for DBW Grant Applications

- Tier 1 or Tier 2
  - Talk to Regional Scientist ASAP
  - CDFW can help with monitoring and calcium data
- Tier 2 - Submit draft plan early
  - Ideally 2 months before DBW deadline
  - Allow time for comments, revisions, and acceptance letter

CDFW Contact Information

Region 1 - Northern Region

Counties: Del Norte, Humboldt, Lassen, Mendocino, Modoc, Shasta, Siskiyou, Tehama, and Trinity

L. Breck McAlexander

Louis.McAlexander@wildlife.ca.gov

Office: (530) 225-2317

Region 2 - North Central Region

Counties: Alpine, Amador, Butte, Calaveras, Colusa, El Dorado, Glenn, Lake, Nevada, Placer, Plumas, Sacramento, San Joaquin, Sierra, Sutter, Yolo and Yuba

Angie Montalvo

Angie.Montalvo@wildlife.ca.gov

Cell: (530) 333-7749

Region 3 - Bay Delta Region

Counties: Alameda, Contra Costa, Marin, Napa, Sacramento, San Mateo, Santa Clara, Santa Cruz, San Francisco, San Joaquin, Solano, Sonoma, and Yolo

Catherine Mandella & Michael Stuhldreher

Catherine.Mandella@wildlife.ca.gov;
Michael.Stuhldreher@wildlife.ca.gov

Region 4 - Central Region

Counties: Fresno, Kern, Kings, Madera, Mariposa, Merced, Monterey, San Benito, San Luis Obispo, Stanislaus, Tulare and Tuolumne

Robert Delmanowski

Robert.Delmanowski@wildlife.ca.gov

Office: (559) 243-4017 X-285

Region 5 - South Coast Region

Counties: Los Angeles, Orange, San Diego, Santa Barbara and Ventura

Eloise Tavares

Eloise.Tavares@wildlife.ca.gov

Office: (562) 342-7155

Region 6 - Inland Deserts Region

Counties: Imperial, Inyo, Mono, Riverside and San Bernardino

Ken Sankary

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Office: (760) 922-9094

Questions and Discussion, Final

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