Kelp Recovery Working Group Meeting 2: Create Recommendations
Thursday August 2nd 2018
9:00am - 4:30pm
3rd Floor Conference room at GFNMS office

Meeting Notes

Attendees: Cynthia Catton, Sarah Allen, Tom Ford, Francesca Koe, Bibit Traut, Rebecca Flores-Miller, Cyndi Dawson, Javier Silva, Barbara Emley, Yann Herrera, Sheila Semans, Mark Carr, Tom Bell, Abby Mohan, Steve Lonhart, Jan Freiwald, John Largier (phone)
Staff: Sara Hutto, Rietta Hohman, Jenn Gamurot

Meeting Objectives:
  - Reflect on what has been discussed and learned thus far; provide relevant updates
  - Review the results of the site selection criteria survey and the information/data gaps
  - Identify immediate and near-term bull kelp recovery options in the context of variable future conditions (scenarios)
  - In topic teams, develop draft recommendations for facilitating the recovery of bull kelp populations along the Sonoma/Mendocino coast

Reflections Roundtable
Need to provide some clarity and refinement to what can be done with resources in hand now, versus what we would like to be done if more resources become available, especially for Sanctuaries, we have to be realistic. However, some other organizations like OPC do have pots of money available, so it is very important to outline what needs to be done to advance kelp recovery even if it is not currently feasible.

Cynthia is excited for this meeting to discuss and map out the recommendations and begin the foundation of the report. What we are doing will be critical for informing future steps. Just had joint CDFW/Sanctuaries survey on the north coast; it was an incredible week of diving and discussions between the two groups. Got feedback from a bull kelp geneticist; looking at diversity. Had recreational harvesting event in Albion, recreational divers got 60,000 purple urchins, commercial got 78,000, got a commercial composting facility involved.

Mark Carr asked about the purpose of the site selection group. When identifying application of criteria, are you identifying the purpose and management question? Cynthia said it was specifically for recovery actions, not necessarily for monitoring. The idea is about the combined satellite drone monitoring program. Restoration could include enhancing spore production. An interesting opportunity is to look at persistent kelp beds and asking why they are distinct from the other sites. Must also look at who addresses that question, as the drone won't tell you what aspects of those sites make them different. We will have to look at seafloor maps and ecology. Cynthia sees it as an analysis of data that we already have. It's not just about where they are,

also looking at if there are other sites that we could identify with similar characteristics that we could focus on.

Cyndi asked if we have physical, biological data on why those beds are there? Cynthia - we have drone monitoring. We have a host of other data that can be brought in to analyze.

Javier asked if there has there been monitoring of urchin removal projects in Albion and Ocean Cove. Cynthia said that they have been tracking the effort, though there are still lots of urchins on Ocean Cove. Jan from Reef Check is going out also. It's a little early to see bull kelp popping up in response to that. This is the start of a continual harvest at these sites to create an area where bull kelp can thrive. Attempts are being made to make a clearing in the area to ensure that nothing else is coming in Let's also make sure that nothing else is coming in.
Javier suggested that there may be something else to be looked at in addition to just taking out the urchins. Cynthia is working with Mike Graham to be able to check if there are spores in the are; it is a question of whether spores can be dispersed to the cleared area.

Sheila noted that the amount of bycatch from commercial divers is small. Cynthia estimated multiple hectares. The urchins vary in size. Having some kelp bycatch may be typical.

Francesca noted that the events galvanize a community and bring people together to help with recovery. 96 recreational divers and 9 commercial divers participated. Commercial divers got smaller ones than the rec divers. Cynthia didn't see a big change from last year to this year.

Tom Ford asked about the density; it is about 500-1,000 per square meter. Peak abundance is within 20 feet. The areas that the commercial divers are clearing are smaller.

Cynthia noted that this was the first event at Ocean Cove; the divers were not as focused and didn't get as much accomplished as at Albion. At Albion they have commercial and recreational divers working together to expand on an area. It is a process to lower the density and maintain them. Recreational harvesting is one tool to get us there; in combination with commercial is a better route.

Cyndi noted that the recommendations are going to matter and will set expectations in the community. There is a worry that the emergency regulations will set an expectation. We should be aware that the recommendations will be uptaken by the community.

Mark noted that this group should produce recommendations that engage the community in working on the problem. The groups will mostly work together as the 3 topic teams have a lot of overlap. Bibit noted that as a working group we need to talk about the system including climate change and genetics to put more teeth to the recommendations

Abby noted that there are rumors and miscommunication in the maritime community often with misinformation. Therefore, it is helpful to have organized community involvement for events. We should ensure there is a good place to direct people to and to have consistent messaging.

Scenarios and Recovery Options
Cynthia led the discussion about scenarios and recovery options, with best case, worst case, and interim case scenarios. This can inform the context and provide some bounds for the recommendations. Lot of uncertainty in the ocean and our future.

Best case scenario (2019-2020)
- "Urchin crash". Mark noted that urchin barren areas are losing their urchins in central CA. Best case would be that life takes its course and urchins are wiped out; a storm comes through; disease. We are seeing signs of distressed urchins. We are now in this phase where additional recruitment dynamics will play into sites. The timing of the crash relative to spore production is important in terms of how the kelp will rebound. This may lead to bull kelp recovery (in 2019-2020) if urchins were the only thing hindering kelp.
- Sufficient nutrients, favorable conditions for kelp, unfavorable conditions for predators.
- Recent "perfect storm" was unfortunate fluke. The larvae side has to be a component of the best case scenario.
- Comes down to three aspects: supply of urchin larvae, existing urchins, and growth of kelp
- Kelp come back indefinitely after 2020, persist into the future

Worst Case Scenario (for bull kelp)
- Persistent adult urchins and continual recruitment
- Persistent warm water/more frequent warm water conditions (Link to "Increasing Coupling Between NPGO and PDO Leads to Prolonged Marine Heatwaves in the Northeast Pacific" (provided by Tom Bell) http://www.o3d.org/manu/papers/PDFs/Joh-2017-Increasing-Coupling-Between-NPGO-and.pdf
- Non-native algal and other space-occupying species
- No refugia for kelp (no pockets with favorable conditions)
- Insufficient spore bank
- Spore limitation from local refugia/exclusion
- Managerial efforts and restoration are ineffective (*must define what that means)
- Ecosystem services provided by a kelp forest are gone

Interim Scenario
- Locally persistent islands of kelp refugia needing maintenance
- Episodic oceanographic conditions (different than historic)
- Move towards nutrient availability following this new trajectory of ocean climate conditions (bottom up); moving towards incompatibility
- Expect more variability (frequency and amplitude)

- More uncertainty about kelp forest resilience (Performance metrics important here)
- Shifts in ecological dynamics (coupling and decoupling of ecological relationships

When do we know which scenario we are going down? (Question for monitoring folks)

<u>Topic Teams</u>

Community Engagement (Jenn)

1) *Document current community engagement efforts and develop recommendations for how to involve the community in recovery efforts (consider citizen science, community-led urchin removals, tribal engagement, etc.) and document current efforts*

   Current and future Community Engagement Efforts/agencies/messaging audiences
- Community and public recreational fleet captains (Abby)
- Tribes - Seaweed gatherers and indigenous harvesters, tribal water consortium in Northern CA, North Coast Resource Partnership tribal representative (Javier)
- Tribal communications with government agencies (Javier)
- The Sea Ranch Association
- Campgrounds/State Parks
- Gualala Arts Center, Point Arena Library
- CDFW
- GFA (Francesca)
- Bodega Marine Lab
- OPC
- Chamber of Commerce
- General public/recreation
- Abalone divers
- Newspapers (SF Chronicle, NYT, Point Arena Light, Ukiah, Press Democrat, Marin IJ, do editorial, consistent messaging/story, educating the community as a whole
- Bay Model
- Fisherman areas/locations
- Suki Waters/kayaking locations
- Kids in the classroom
- TNC- project for citizen science, link on Noyo site, to get people who are seeing and doing things to report it (dead abalone, stand of bull kelp, rec divers taking urchin, commercial diver take) this is not working very well- Francesca says this might be a few steps beyond where we are now…..

   Draft Recommendations
- Provide consistent messaging to all organizations/agencies
- Create a "Kelp Binder" with information, docent book with photos/visuals
  - Here is a great example of the docent book presentation binder we need printed to pass out to relevant organizations:

https://noyocenter.org/wp-content/uploads/2018/05/HtK-training-all-how-we-got-here.pdf

- Create an image library (Sheila has some PDFs; put more images, photos in)
- Help other organizations understand how the kelp issue is connected/related to issues they care about (i.e. Audubon Society). Draft a blurb about how the kelp issue impacts other species
- Create an internal kelp group shared Drive/portal with internal information, to continually update community with events etc; GFNMS/Ocean Climate program to own? State has started an open data portal/library. Assets could be in there. Cyndi has this.
- Information portal for outreach materials (CDFW has one; Cyndi can share).
- Share consistent information/messaging/videos through partner social media channels
- Find beneficial uses for urchins
- Translate outreach materials/presentations into various languages to reach out to wider audience
- Commercial divers can film what is happening underwater; stream through videos. 3D element is powerful. Shows the problem and how we can use that. Check with MARE/other partners for ROV footage that they may already have related to kelp
- Connection to climate change as part of the problem; showing land development/uses as drivers of stressors to estuaries/etc. Identify that humans are contributing; looking at better practices. Trying to get people to understand the larger picture; not considering urchins as the main villain. Encourage what people can do in their daily life

Products
- Talking points
- Shareable presentation
- List serve with community events/information portal
- Shared drive of visual assets
- Iconic social media-worthy photos and videos
- "Traveling roadshow" presentations to have a large number of people spreading the same message. Could do targeted date/time frame for peak interest (spring), dive shops
- Youtube channel to show/digital version of the presentation

2) Identify lead groups/agencies/stakeholder groups for community engagement/governance/who are the players, who needs to be involved, etc

See above

3) Develop consistent messaging, identify correct and consistent scientific elements to the story.
   - *Identify target audiences for messaging*
   - *Identify best methods to reach target audiences*
- Many levels of messaging. Target audiences include
   - Public,
   - Larger community,

- Recreational divers
- Informational cards, outreach materials
- Creating "buckets" for community to be involved with.
- "Urchinomics" - fatten up the urchins to be commercially useful. Our job is to make them usable

<u>Meta message: 4 building blocks to create the take-aways we want to deliver (the below is an example of the construct -- not *yet* wordsmithed)</u>
1) Place: Ecological, historical, cultural, economic significance for humans and species
    a) Northern California bull kelp forest is an underwater community with ecological, historical, economic, and cultural significance chock full of marine life
    b) Analogies/metaphors "what would California be without redwoods? Kelp forest?"
2) "Problem" *word to be changed: "Perfect storm: wasting disease of major purple urchin predator coupled with warming ocean conditions (warm water blob, el nino, "the blob" - a heat wave in our marine ecosystem) resulting in an unprecedented, dramatic, and startling 95% decrease of bull kelp forest in the last five years.
3) Why it matters: The kelp forest sustains and supports over hundreds of species, many of which are harvested and the tribes and fishermen rely on kelp forest for human subsistence, recreation, and entire economies.
4) Action: (how you can help), list organizations, Donate, Dive, Dine

Discussion:
- Based on audience needs, note where printed vs. electronic materials would be more effective.
- In messaging, highlight "adaptive restoration". We don't know the cause but we are trying to understand it more. Learning as we go. Being explicit with regulations. Want to tie in with climate change; meeting people where they are. "Increasing variability". Transparency in this adaptive learning. Public audience piece.
- Eliminate barriers for public to receive research, make research more accessible to public
- In terms of our topic team recommendations - the HOW we do it would mainly remain consistent but the WHAT would be driven out of directions provided by SITE SELECTION and MONITORING TEAMS (substantive content)

Site Selection (Rietta)

Major points of discussion:
1. Prioritize sites based on weighted categories:
    a. First - ecological significance (current and historical significance, isolated kelp beds, sediment, freshwater output sites), then areas to avoid (MPAs, culturally sensitive areas), then take into account positive additional aspects (public access, wave exposure, citizen science).
    b. Consider specific sites based on funding availability using weighted categories.
    c. If criteria group is weighted differently, provide clear reasoning.

d. Confirm with local and traditional knowledge.
2. Consider multiple layers of persistence - both historical and current - when looking at specific sites. Especially for Sonoma - rely on historical rather than current persistence.
    a. Consider that persistence may occur at different sites for different reasons.
    b. Need to define what constitutes the "persistence" layer.
3. If site selection criteria result in regional grouping, take additional positive aspects into greater consideration/apply higher weight.
    a. Make persistence criterion less stringent if necessary.
4. When specific recovery sites are chosen, a corresponding control site should be chosen at the same time.
    a. Learning from the recovery process is essential.
    b. MPAs may be considered controls to minimize influence of commercial and recreational take on monitoring.
5. Different types of recovery actions should be identified for different sites depending on the criteria for which they were selected.
6. Critical to keep both sport and commercial divers involved.
7. Proximity to public access points, or areas that could reasonably be reached by boat, are of significant importance.
8. Determine how best to link with data gaps and monitoring.
9. Genetic samples of kelp from Alaska through northern CA – despite the bottleneck we saw high genetic diversity.
10. Further discussion needed to identify specific process for recommendations.

Monitoring and Information Gaps (Sara)
At a bare minimum, the group agreed that scientists and managers must have annual remote-sensed surveys of kelp canopy cover (mechanism not specified) – ideally, we would develop satellite and drone methods in tandem to achieve required data frequency and resolution.

Satellite-based data:
- 10 meter resolution at least through European *Sentinel 2* satellite
- 30 meter resolution through Landsat – seasonal (4x per year)
- With both satellites, could have data every 2-3 weeks

Drone-based data:
Because satellites don't provide the resolution and scale of data needed to ask some critical questions, we also need drone data to ground-truth satellite data and provide finer resolution
Drones provide:
- Improved spatial resolution
- Ability to ID vulnerable areas that are not captured by satellite imagery – tied to specific locations (kelp refugia, urchin removals)
- Ability to ID areas that landsat can't capture, or in areas where you need more information, inform the MLPA process

- Spatial heterogeneity of reef structure
- Help identify persistent pockets of kelp for spore supply
- Species-specific resolution

The main constraint with drones is coastal access and permitting issues (primarily with Sanctuaries); liability would reside with the individual flying the drone. Though we are at least a decade away from being able to "mow the lawn" per se and collect large-scale data along the coast autonomously, the most effective way to gather drone-based data would be to decentralize the data collection and leverage 1) Scientists and contractors (experts) OR 2) drone enthusiasts (citizen science) to run specific tracks at a specified frequency. Scientists (Tom Bell, Kyle Cavanaugh) would provide best practices and methods to the users, and the users would submit their images on a drop box for analysis. This could be all web-based to prioritize sites and contact folks to get their images in. Tom Bell and his lab are already running the infrastructure – the desire is to scale up the collection. Track files can actually be sent to individuals with a log-in and the drone can run on autopilot collecting and transmitting the data. If we go the "enthusiast"/citizen science route, we would have two options:

1. Creating an organization like Reef Check to actually run a drone imagery program with training, etc.
2. Develop a crowd-sourcing website – this would be much more hands-off, less investment, less risk if the whole thing doesn't really catch on

We recommend a phased approach:
1. Create a post-doc opportunity to create best practices (info the users need including methods), build infrastructure (for receiving data), and develop the process.
2. Determine the best user
   a. "experts" – academics, contractors (different sensors – higher tech)
   b. Crowd-sourcing as an initial push and test
   c. Consider a "reefcheck" option depending on how b goes

Data Gaps:
1. Data to explain why some kelp patches are persistent when others are not (detailed biophysical, chemical, biological coupled monitoring)
   a. Landsat data
   b. Bathymetric data
   c. Chris Edwards (Rom's model)
   d. Need: in situ nutrient data – CTD moorings
2. Identify MPAs with and without persistent bull kelp beds as priorities for this monitoring
3. Explore potential for MPA network monitoring and any other monitoring efforts (e.g. Laura Rogers-Bennett) to fulfill science needs/objectives in understanding kelp dynamics and recovery.

Recommendations:

1. Expedite the processing and analysis of annual (at a minimum) satellite data for bull kelp along the Sonoma/Mendocino coast – engage CDFW and ONMS with what data products they need

2. Develop a large-scale drone monitoring program to complement satellite imagery
1. **Develop best practices for data collection including specific track-lines, altitude; advance image processing and analysis**
2. **Identify the user (UC scientists/experts, contractors, drone enthusiasts via crowd-sourcing, NGOs)**
3. **Specify product outputs that are needed to manage for bull kelp – engage the managers (CDFW, ONMS)**

3. Identify MPAs with and without persistent beds as priority locations for investigating the key characteristics that confer persistence of kelp beds.
- **Process landsat data since 1984 to establish a baseline and evaluate deviation from the baseline – all to define persistence**
- **Identify data to help answer the question of persistence (Landsat, Bathymetric, Chris Edwards' ROM model, *in situ* nutrient data - CTD moorings)**

4. Explore the potential for MPA network monitoring and other ecological monitoring efforts (e.g. Laura Rogers-Bennett abalone program) to fulfill science needs/objectives in understanding kelp dynamics and recovery.

5. For current urchin removal events:
- **ensure pre and post monitoring efforts**
- **be explicitly clear in writing as to the methods of removals and what is being monitored.**
- **Ensure effort is focused (commercial and recreational removals are conducted at the same locations)**
- **Ensure effective removals (completely clear a designated area)**
- **Ensure frequent removals so designated clearings remain clear**

6. All existing and future non-sensitive data (i.e. PII, tribal) related to these recommendations should be publically available, for example on data.cnra.ca.gov.

7. Use high-resolution drone canopy data to explore relationships of blade biomass with spore production (size of sori).

8. Leverage an existing website (Noyo? GFA?) to compile all public outreach information and data for scientists, and to coordinate urchin removal events.

Agree on first draft recommendations/Discussion

Steve - one of the most important things is to have a central website with public information. Contains outreach materials, consistent place to do that. (shows partnerships. Holds press releases, all pertinent information, report, etc)

Recommendations for restoration action will change. What will the recovery options look like? We may not know which scenario we're in until we do some restoration activities and document the response. Could also use monitoring data as a defining metric for which scenario we're in.
- In the near-term, activities should be scenario-independent and focused on how to leverage the community interest with sound scientific design incorporated into future removal events. We have to make the urchin removal events effective in order to answer the question of being spore limited or not. Need to design the removals in a manner to answer that question – focus on isolated rocky outcrops vs broadscale removals.

Leverage urchin removals to answer question of spore limitation. Impossible to answer this question right now due to seasonality of bull kelp recruitment – goal of this season is to figure out methods, and form relationships to set ourselves up for effective work in late winter/spring. The next "round-up" will be to test effective, long-term urchin removal. Messaging should be clear – summer removals are for urchin control, late winter/early spring removal is to test spore availability. Recreational removals at Ocean Cove (Sonoma) and Albion (Mendo); Commercial divers are working at 3 spots in Mendo (Noyo, Casper, Albion).