Central Valley Joint Venture Implementation Plan Update – Shorebird / Habitat Workshop

California Landscape Conservation Cooperative (CA LCC) Sponsored Workshop

Who: Central Valley Joint Venture Shorebird and Waterbird Working Group + LCC collaborators + guests

When: April 9th, 2014 10:00 – 4:00

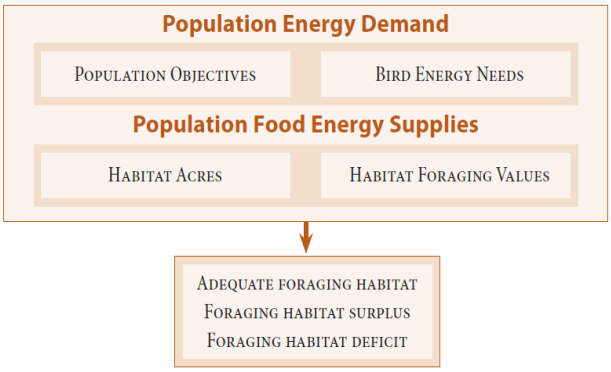
Where: Delta Conservancy, 1450 Halyard Drive, Suite 6, West Sacramento

Goal: Discuss application of newly acquired data, recent published literature, on-line data resources, and current modeling efforts, including those supported by the California Landscape Conservation Cooperative, to update the Central Valley Joint Venture (CVJV) Implementation Plan for non-breeding shorebirds. The group will make key decisions to guide the planning process.

Agenda and Notes

I. **Introductions and Background** 10:00 – 10:30

1) Introductions, goals for day, and agenda review (Hickey, 15 min)
   a) Attendees: Ruth Ostroff (FWS), Danika Tsao (DWR), Mike Wolder (FWS), Craig Isola (FWS), Rodd Kelsey (TNC), Jeanne Brantigan (TNC), Orien Richmond (FWS), Laura Shaskey (TNC), Khara Strum (PBCS), Mark Reynolds (TNC), Lara Sparks (CDFW), Kevin Petrik (DU), Dean Kwasny (NRCS), Elliott Matchett (USGS), John Eadie (UCD), Dennis Woolington (FWS), Matt Reiter (PBCS), Kristin Sesser (PBCS), Monica Iglecia (Aud), Rob Doster (FWS), Dave Shuford (PBCS), Greg Yarris (FWS), Catherine Hickey (PBCS).
2) CVJV Implementation Plan Update timeline and process (Ostroff, 10 min)
   a) CVJV board had a retreat on March 18, 2014. Results from the retreat were distributed to the workshop. The board outlined the process for updating the Implementation Plan (IP) and identified driving forces impacting the next IP. There will be another meeting in the future and a doodle poll. Currently no formal timeline has been set by the CVJV board to complete the revision of the IP.
3) Conservation planning framework (Hickey, 5 min)
   a) We chose to use the energetic approach similar to waterfowl for setting shorebird population objectives in the Central Valley of California (CVC) in the 2006 IP. Using this approach again will enable the IP to more easily address drought and climate change.



b) Description of TRUEMET.

c) Planning Basins: Sacramento Valley, Delta, San Joaquin, Tulare.

i) Discussion: Yarris – Do we want to include Suisun Marsh? (We did not in the past.) No decision yet

II. **Population Energy Demand** 10:30 – 11:15

1) **Population Objectives** (Iglecia & Strum, 30 min)

a) Review IP 2006 objectives and methods

i) Population estimates were derived from Shuford et al. 1998, CVC-wide surveys conducted from 1992–1995.

ii) Species included: mostly wetland dependent, so Killdeer and Long-billed Curlew likely under-represented, and Mountain Plover not included

iii) Increased population estimates by 50% for winter over those from Shuford et al. (1998)

iv) Increased population estimates by 2x for fall and spring migration over those from Shuford et al. (1998).

v) We do not have clear reasons for assumptions iii and iv. We did not have guidance at a national level. Maybe increased estimates because most of habitat lost.

b) Review new info available to possibly incorporate into new estimates

i) eBird, CVSS, Andres et al. 2012, NWRs: San Luis, Sacramento, Pixley, Kern.

c) Central Valley Shorebird Survey (CVSS)

i) Objective: a coordinated monitoring program to obtain long-term trends, habitat associations, and effectiveness of management practices.

ii) Sampling: stratified by area that had a 30% chance of being flooded at any time. Surveys: 63 transects, ~24 volunteers.

iii) Data: online in California Avian Data Enter (CADC) so easy to use and manipulate.

iv) Findings to date: CVSS has good coverage–(~10%) of Shuford et al. 1998 estimate of 211,000 shorebirds in Nov, there is slightly different habitat coverage.

v) Recommendations: a) use CVSS to track shorebird population trends in winter, b) track species composition to revise food energy requirements, c) can use CVSS to estimate shorebird populations after another few years.

d) Question: Revise population objectives based on new information?

e) Discussion: Petrik – do you know how much habitat CVSS surveys so you could extrapolate using that data? Reiter – there has been an increase in rice flooded so are there more, for ex, Dunlin than there used to be? Kelsey – Are we in a place to go about recalibrating CVC objectives, extrapolated from CVSS, and then decide how large we want the population estimate to be? Reiter – it would be hard to use CVSS data from Nov for migration windows, since timing or use patterns are different. Data so far suggests population numbers are stable in winter. Petrik – can we look at a place like Sac NWR and look to see if there are changes there and then make a decision on what to change? Wolder – quite a bit of habitat change has happened in the CVC. And are we basing population estimates on habitat estimates? Hickey – Yes. Reynolds – what are the population trends and are we trying to help alleviate any declines? We don't have clear goals like the waterfowl groups do. Reiter – before we agree to change the population objectives, maybe we should dig further into TRUEMET and see if we are close to objectives before we decide to increase the objectives. Group – Do habitat objectives drive population objectives, or do population objectives drive how much habitat we need?

f) DECISION – Let's go through TRUEMET first, and decide whether to revise at another time.

2) **Bird Energy Needs** (Iglecia, 15 min)

a) Weighted body mass estimate

i) Body mass used to calculate Daily Energetic Requirement (DER) per bird calculated for each 15-day period. Average body mass was calculated for each of the 4 Survey Periods (summer, fall, winter, spring) weighted by species composition.

b) Energetic need

i) Period: Mar 1 to May 12, assumed increased energy needs by 33%. Where did we get 33% and where can we cite this? Hickey–think we got it from the Loesh paper from the MAV. Kelsey–Let's make sure that we lay out all the logic for items like this.

ii) DER: derived from caged birds (Oystercatcher, grey plover, turnstone), this is proportional to Basal Metabolic Rate (~2x BMR).

c) New data: Brand et al. 2014 in San Francisco Bay (SFB) calculated DER. They used *field* metabolic rate (3x more energy to be wild), incorporated body mass, and accounted for invertebrate assimilation rate. This is better because a) it accounts for free-living birds, b) we can incorporate connectivity of habitats and climate change into these models, c) uses species similar to CVC. This updated equation will result in a significant increase (~85%) in the amount of energy needed by individual birds. However, it is only a 36% increase if the original TRUEMET included assimilation in the food availability side of the model.

d) Question: Revise species composition based on new information (for weighted body mass)?

e) DECISION – Let's evaluate with new data to see if there has been a change in composition.

f) Question: Revise estimated energetic need based on new published literature?

g) Discussion: Reiter – We can incorporate the new equation into the new TRUEMET models. Reiter will be working on this and can use low (old) and high (new) estimates for comparison. Petrik – Eadie may have some work similar to this (how much flight matters and how far they may need to fly) so could possibly use waterfowl model structure. Reiter – Great, because birds in Sacramento Valley (SV) have to fly around more than birds in Grasslands per the recent telemetry study on dowitchers and dunlin.

h) DECISION – Yes. Reiter will work on this.

III. **Population Food Energy Supplies** (11:15 – 2:00, with lunch break)

IV. **Habitat Acres**

1) What cover types are in what basins and how have they changed? We need to map avian food sources, likely more than just wetlands and rice, such as corn and cotton.
2) Equation in TRUEMET : Habitat available = Acres * % flooded * % in shorebird depth
3) Acres in Wetlands (Petrik)
   a) New layer that uses 2009 imagery for rice and wetlands–wanted to look at planted vs. flooded rice. The 2006 IP set proportion flooded uniformly across all basins.
   b) Mapped planted rice and winter-flooded rice and found large discrepancies- e.g. almost all rice in Yuba is flooded, other areas like Placer County- low percentage of flooded rice.
   c) How secure/stable is the rice habitat? Sutter and southern Colusa are more apt to rotating to other crops, but it depends on economic factors.
   d) Seasonal and semi-permanent wetlands: looked at Jan for peak winter flooding, looked at May and June to identify persistent spring water.
   e) They digitized wetland boundaries. Previous efforts assumed whole field would be flooded, but now they can look at actual flooded boundary. This allowed them to map potential wetlands and which actually ARE flooded in winter. The 2006 IP likely assumed MORE wetlands than there actually are, although more wetlands have been restored since then.
   f) Discussion: Woolington – what about reverse cycle wetlands (flooded Feb to Sept)? They are not common, but shorebirds may heavily use these kinds of wetlands. Brantigan– when is the 2006 IP data from? Petrik– 1996 to 2003.
4) Acres in Agriculture (Kelsey)
   a) Impetus, include birds in water demand applications for counties. Quantify all the potential agricultural lands for birds.
   b) Suitable crops – used CropScape (regular acquisition, but not very accurate, but ok)
   c) They put all 256 crops into classes, as suitable and unsuitable. To eliminate misclassification noise, they put 6 years together to. For the layer, they used only consistent or relatively stable fields/crops. Only included fields greater than 40 acres and slope <2%.
   d) This created a suitability map which helps identify where to possibly create or enhance habitat, the palette on which we can deliver habitat AND… how to calculate how much water one would need to create those habitats.
   e) And for every one of those crop types, they are looking at WHEN it might be available. When is the window of opportunity to create waterbird habitat?

f) What will this offer the update to the IP? How much water will it take for each basin or irrigation district? This should give us a spatial and temporal map of water demand. This is still a work in progress.

g) Discussion: Yarris– Fallow fields could be a huge opportunity. Kelsey– Yes, they are hard to capture with this dataset, but we could look for patterns of fallowing for certain types of crops and certain areas of the CVC. Reiter – do you think these maps could serve as the base acreage for this IP or is this layer too whittled down? Kelsey– Yes, this was our way to eliminate classification error and this would be a good estimate of base acreage. Petrik– we really need to get a good idea of how much to trust CropScape using county-level agricultural statistics. Kelsey– yes. Iglecia – how are the estimates of wetlands? Kelsey– DU's estimates of wetlands would be better.

h) Question: Use these new habitat data layers to get new estimates of habitat availability?

i) DECISION: Yes these should be updated, DU has wetland data, TNC is working on agricultural data. It will be important to cross CropScape data with actual county-level ag statistics.

5) Water distribution and flooding schedules (Reiter)

a) 2006 IP used flooding schedules. Proportion of each cover type flooded per planning interval. (21 planning intervals).

b) Using Landsat imagery of CVC + Suisun, from 2000–2011, looked for open water across the 21 intervals.

c) Flooding schedules for 3 crops: rice, corn, field crops. So far, imagery analysis suggests rice flooding schedules very similar to IP. Analysis shows small amounts of flooded corn and field crops in SJ and Tulare. These were not in the IP, but they are used by shorebirds.

d) We recommend using these new empirically driven flooding schedules to come up with what proportions of these crops are flooded. Some changes: rice is flooded later and quicker. Also should consider several variations of flooding schedules.

e) Discussion: Petrik–rice dries much quicker now than in IP schedules. Reiter - February is on the to-do list, so we should have that data in the future. Isola – on federal refuges, the drawdown of semi-permanent ponds is in June/July and provides more shorebird habitat than flooding up of seasonal ponds in that time. Wolder – refuges are starting to move toward later draining of semi-permanent ponds into early to late August.

f) Question: Revise which agricultural cover types to include?

g) DECISION: Yes, the work Reiter and Reynolds are doing will feed into this.

h) Question: Revise water distribution and flooding schedules?

i) DECISION: Yes, the work Reiter and Reynolds are doing will feed into this.

6) Optimal water depth for shorebirds (Sesser)

a) 2006 IP assumed a) that optimal water depth for shorebirds was >0 to 10cm based on Safran et al. 1997, and b) that 100% of available flooded habitat acres are within optimal depth range for shorebirds.

b) Work by Elphick & Oring 1998 and Strum et al. 2013 suggest the depth range is broader, and that >0 to 15cm captures ~80% of the probability of shorebird occurrence in water depths (with some greater than 15cm).

c) Question: Revise definition of suitable water depth for shorebirds?

d) Discussion – A majority of the habitat will always be managed at depths >15cm, so why not be conservative and keep suitable depth at below 10cm? That would ensure you are providing habitat for the smaller peeps, too.

e) DECISION: No, do not broaden suitable water depth. Keep at >0 to 10cm.

7) Water depth ratios – habitat availability (Sesser)

a) 2006 IP did not empirically account for depth ratios in habitat availability.

b) Flooded Rice: There have been several studies that would provide data on water depth ratios. Depth data from Nov to Mar for 4 years, and a small amount of data in April/May during rice planting season.

c) Other agriculture: potentially some depth data from Staten Is. on corn.

d) Wetlands: There is little to no depth data. Definitely assume less than 1. Grasslands have shallower water than SV. Isola/Kelsey – could potentially use LIDAR to get topography and calculate depth using staff gauge readings at full pool. FWS has topography data for more recent restorations. Shaskey has data on Llano Seco. Orianne Taft has data from the grasslands, but it at least has average depths.

e) Question: Analyze/create water depth ratio data to better account for habitat availability?

f) DECISION: Yes, using the depth ratio data, let's re-evaluate and agree on a couple of depth ratios. A sub-group will form to work on getting wetland depth ratio summarized. Shaskey, Petrik, Isola, Sesser, others?

8) Wetland constraint

a) 2006 IP: at least 50% of all waterfowl energy needs to come from managed wetlands in each basin (50% minimum, can be more). Reasons: both biological and socio-economic.

b) CVJV favors habitat complexes that provide a mixture of agriculture and wetland resources. But, agriculture is more uncertain and "less secure" in IP.

c) There are threats to the security of flooded rice.

i) Not as valuable as other crops such as orchards

ii) Water rights are valuable and can be sold.

iii) Trends in post-harvest treatments: reduced flooding, increased disking (~50% last year), increases in non-flood options such as baling, and now a study from UC Davis shows that financially, it costs the same to flood or not.

d) Options if want to keep using agriculture to meet population targets? Use more agricultural easements? Create or emphasize incentive programs such as WHEP?

e) Question: Revise the 50% of reliance on wetlands or increase that?

f) Discussion: Yarris – what are the habitat values of agricultural vs. wetlands? Especially if post-harvest treatments change the value of that habitat? Reiter – How is this constraint included in the TRUEMET modeling?

g) DECISION: TBD

V. **Habitat Foraging Values** (30 min)

1) Current values and assumptions (Strum, 5 min)
   a) Used Loesch et al. 2000: 20 kg/ha biomass and 17.4 kj/g provided by inverts (assumed to be all chironomids) in CVC managed wetlands AND winter-flooded rice. The geographic scope of this estimate is derived from is still unknown.
   b) Considerations of Loesch: all habitats assumed the same, temporality unknown, assumes assimilation rates chironomids are the most important.
2) Literature review and key data sets
   a) Lots of variation in Mississippi Alluvial Valley (MAV) data
   b) Lots of variation in CVC datasets, depending on time frame and study objectives. There is evidence of temporal variation.
   c) What can be used to inform the CVJV model? There are different types and qualities of invert data: density → Biomass → Energy. ENERGY is the input into TRUEMET
   d) Recommendations: use PB's data to get biomass and energy values from rice fields and compare with previously published values, take into account temporal variation, and use multiple values in TRUEMET.
   e) Discussion: Eadie – reluctant to use the standing crop data since we do not know how many inverts already consumed (it is what is left over, not what the habitat is providing). Also, we don't have a good idea of whether decreases in inverts are a result of depletion by predators or slow of growth because of cold. Isola – his thesis (with Safran) had exclosures, so they could come up with better biomass data available to birds. Severson's data may not be comparable because they were young wetlands and experimental. Eadie – can we reverse engineer this? It would get us a ballpark of what the need is for waterbirds. It may be worthwhile if PB invert data was reliable and therefore how far we should go with bomb calorimetry, etc.
   f) *Question: Update foraging habitat values for rice and wetlands?*
   g) DECISION: Yes. An invertebrate subgroup should form (Strum and Sesser to help)
   h) *Question: Calculate biomass and energy from Point Blue's recent invert samples?*
   i) DECISION: Hold on this for now because not sure we need it. Although there is so few data out there, it could be worth the effort.
   j) *Question: Modulate depletion assumptions?*
   k) DECISION: Yes. An invertebrate subgroup should form (Strum and Sesser to help)

VI. **Scenarios** (2:00 – 3:20)

VII. **Drought** (30 min)

1) DU waterfowl assessment (Petrik)
   a) Looked at rice, wetlands, corn.
   b) Normal year (assume 25% of the dry rice is plowed too deep for waterbirds to get at the waste rice, silage corn does not provide waste grain)

c) The scenarios tick down the amount flooded rice and wetlands and decrease summer flooding (which decreases food supply in winter)
d) What it means: as you go down the scenarios… food is depleted earlier and earlier, when the waterfowl and shorebirds are all still in the valley and need to fatten up for migration and breeding season. In an extreme water year, food could be depleted as early as early December.
e) Big picture: How does this redefine the base/normal year? Does decreased winter flooding of rice become the norm after a prolonged drought because people get used to it?
f) Discussion: Kelsey – would scenario 6 be catastrophic? What is the setback to the populations, only 1 year or more years? Eadie – this CVJV has not taken into account any kind of survival rate, or whether the birds would move and would other regions be able to make up for it? Woolington – this could affect crop depredation issues or disease issues (avian cholera losses have gone down, but drying wetlands could reverse this). Kelsey – How does the IP deal with all the unknowns? Perhaps a chapter on adaptive management with clear guidelines on what data we should collect in order to monitor populations. Eadie – suggest all bird groups in the CVJV need to get together and come up with an explicit series of scenarios that they will all use.
g) DECISION: Hickey – we will not decide on the different scenarios today, but we will form a sub-group, across species groups, to come up with scenarios to consider. Yarris – I will organize a formal scenario planning group that includes both waterfowl and shorebirds. This Scenario subgroup includes: Yarris, Wolder, Brantigan, Reiter, Petrik, Isola, Eadie.

2) Flooding schedules (Reiter)
a) How do flooding schedules (distribution and extent of open water) change in years with drought?
b) Look at 2013-2013 and compare flood schedule with previous drought years (since 2000)?
c) How does drought affect water management strategies for wetland managers?
d) What is the impact of drought on non-breeding waterbirds?

3) Daily energetic requirements (Reiter)
a) Question: Do we need to think about changing the DER based on region and time period since birds have to move around more in SV?
b) Discussion: Kelsey – do we think the two samples (SV and GEA) are representative of the region itself, or the habitats the individual birds use/were caught on? Reiter – probably pretty representative.
c) DECISION: If we have the data, it is worth looking into.

VIII. **Future/Climate change** (20 min)

1) Water supply and allocation (Matchett)
a) Study develops necessary data and adapting and applying the Central Valley Water Evaluation and Planning (WEAP) model to investigate impacts of various climate, urbanization, and water management scenarios on habitats and ecology of waterfowl and other waterbirds in the Central Valley.

b) For each scenario, water supplies and demands are modeled in WEAP to estimate resulting landscape change. The amount, timing, and location of supported waterbird habitats based on these results are then included in bioenergetics models to evaluate adequacy of food supplies to support waterfowl populations under each scenario.

c) Two bioenergetics modeling approaches are being used: 1) the traditional TRUEMET accounting of waterfowl food supplies and population demands; and 2) a spatially-explicit, ABM approach developed by Eadie and staff that allows an evaluation of not only changes in the amount of habitat, but also changes in the spatial and temporal distribution of those habitats.

d) Agent-based Model (ABM) that more directly accounts for bioenergetics costs of changes in spatial distribution of habitats tends to project earlier food deficits than TRUEMET. Consequently, based on ABM, we might observe a food deficit beginning earlier and in more scenarios than what is estimated based on TRUEMET.

2) *Question: What is the necessary sequence of running different types of scenarios?*

3) *Question: What is the process for determining priority drought and climate change scenarios to assess?*

4) DECISION: Hickey – we will not decide on the different scenarios today, but we will form a sub-group, across species groups, to come up with scenarios to consider. Yarris – I will organize a formal scenario planning group that includes both waterfowl and shorebirds. This Scenario subgroup includes: Yarris, Wolder, Brantigan, Reiter, Petrik, Isola, Eadie.

IX. Timeline and next steps

1) Timeline for completion: Draft by the end of this calendar year
2) Review of action items and assignments: Green is an action item embedded above.
3) Subgroups
   a) Wetland depth ratios
   b) Invertebrates
   c) Scenarios for drought and climate change
4) Notes
   a) Keep Tulare folks in the loop, even if they are not present to participate.