ENVIRONMENTAL & STATISTICAL CONSULTANTS

2725 NW Walnut Blvd, Corvallis, OR 97330
Phone: 307-214-2799 ◆ www.west-inc.com ◆ Fax: 307-637-6981

TECHNICAL MEMORANDUM

Date: February 18, 2022

To: Mary Ellen Winborn, Director – Clallam County Department of Community Development (DCD)
Greg Ballard, Senior Planner – DCD

From: Todd Mabee and Leigh Ann Starcevich – Western EcoSystems Technology, Inc. (WEST)

Subject: 3rd Party Review of the Dungeness Bay Oyster Farm Avian Monitoring Plan

INTRODUCTION

Western EcoSystems Technology, Inc. (WEST) was contracted by Clallam County Department of Community Development (DCD) to conduct a 3rd party review of the Avian Monitoring Plan (Plan) for the Jamestown S'Klallam Tribes (JST) Dungeness Bay Oyster Farm. The scope of work consisted of two objectives and their associated tasks (listed below).

Objective 1: Understand all the inputs that impact monitoring capacities of JST's oyster farm.
Tasks:

1. Meet with Tribal staff to gain understanding of the goals and limitations of the Plan, including:
    a. limitations and requirements placed by the USACE Standard Permit that restrict Tribal accesses to the lease area where the oyster farm is located;
    b. limitations due to a Oct. 1 – May 15 closure of tidelands managed by the Dungeness National Wildlife Refuge (Refuge);
    c. year-round monitoring needs to assess if oyster operations are impacting migratory shorebirds and waterfowl that utilize the Refuge tidelands;
2. Gain complete understanding of oyster farm operations, and requirements of site access and activities.

Objective 2: Review all inputs and provide Clallam County DCD with technical comments on the Avian Monitoring Plan.
Tasks:

1. Review the scientific approach identified in the Plan, with the focus on monitoring of shorebirds and waterfowl in response to the permitted operational activities, to assess impacts to the Refuge.
2. Review the inputs and comments provided by USFWS and Olympic Peninsula Audubon.

3. Provide a written report to Clallam County DCD staff with comments and/or recommendations regarding the Plan. Specifically, the scientific approach to address monitoring of shorebirds and waterfowl to assess potential impacts of oyster farm operations on the Refuge.

RESULTS

Objective 1

WEST staff met with JST staff virtually on December 10, 2021 to address Objective 1. During this meeting, JST staff described the oyster farm operations, the limitations on operations because of the closure period (Oct. 1 – May 15), the conditions of the USACE Standard Permit, and the objectives of the Plan. This meeting accomplished its objective of informing WEST staff of all inputs that impact monitoring activities at the JST oyster farm.

Objective 2

WEST staff reviewed the Plan and comments from the USFWS and Olympic Peninsula Audubon Society. Below we state the goals and objectives of the Plan and then summarize comments and recommendations for the Plan.

The goal of the Plan is to acquire observational data on avian-shellfish aquaculture interactions, with a focus on shorebirds and waterfowl, to assess potential disturbance associated with JST oyster farm work activities and generate data toward a long-term dataset that can be used to evaluate bird-habitat interactions associated with shellfish farm activities and inform farm management decisions. The specific monitoring objectives are to:

- Develop a simple, scientific approach to monitor and evaluate the effects of oyster cultivation on habitat use by shorebirds and waterfowl.
- Generate data toward a long-term monitoring dataset that allows for assessment of shorebird & waterfowl behavior and habitat use within the shellfish aquaculture lease area.
- Establish adaptive management measures to respond to any identified adverse responses of shorebirds and waterfowl.

General Comments

The Plan adequately describes the sampling design and methods intended to answer the monitoring objectives stated above. Observational studies, such as the one proposed in the Plan, are a reasonable study design for answering the questions of interest although ecological sources of variation (such as weather conditions, light conditions [i.e., day vs night]) decrease the ability to detect disturbance effects from oyster farm activities. Adequate sampling may help address this issue; therefore, the first year might be considered a “pilot study” to collect data that could be used to determine if adjustments in sampling intensity would help better meet the objectives of the Plan. Added clarity on the specific types of data analyses to be used would be

helpful, as currently the Plan only indicates the calculation of annual data summaries and no specific analyses to assess effects.

The Plan also includes adaptive management measures to respond to any identified adverse responses of shorebirds and waterfowl to operations. The inclusion of an adaptive management plan into the Plan minimizes the potential for repeated adverse responses to birds. Overall, the Plan provides an adequate approach to accomplishing the Goal stated in the Plan. General and specific comments provided in this memo are intended to increase the likelihood of accomplishing the stated objectives of the Plan.

Specific Comments

- Spatial Sample Units:
    - The first year of sampling could be treated as a "pilot study" to determine if three plots/area is an adequate sample.
    - Monitoring plots could be selected with a spatially balanced sampling method (e.g., generalized random tessellation stratified, or GRTS, sampling [Stevens and Olsen 2003, 2004]) to allocate the plots more broadly across the sampling area and reduce the chance that plots are spatially clustered.
- Monthly Observations
    - Trained observers are needed to identify shorebirds in winter and the level of observer skill may dictate whether data can be analyzed as "target species" or "species groups". Comparing counts between the trainer and trainee would help ensure observers are able to identify and count target species. In addition, consistent training would help to standardize detection rates of birds that will allow accurate and precise trend estimation over time.
    - Eelgrass observations: the differences in sampling methodology between the eelgrass vs. the on-bottom bag and beach oyster areas may confound the ability to make direct comparisons with these counts. The spatial distribution of birds throughout the sampling areas will influence the ability to make accurate comparisons.
    - Clarify if there is a protocol to prioritize which target species are sampled first (if multiple target species are present in a monitoring plot).
    - Because farm activities will occur at night between October and March, seasonal effects will be confounded with the effects of diurnal vs. nocturnal surveys.
        - Differences in detectability may be managed by analyzing diurnal and nocturnal data separately or by considering effects of time of day/season on both means and variances of counts. If habitat use differs by season or time of day among shorebirds species, then comparisons of results across seasons or time of day may reflect patterns of use rather than impacts of farm activities.
        - Nocturnal surveys may be impractical because of safety considerations and technological limitations. Available, cost-effective night-vision technology will be unlikely to resolve species at a minimum distance of 200 m. Identification of species groups (particularly counting small

species of shorebirds) could also be challenging at this distance, especially from a boat. An alternate survey methodology (e.g., use of cameras) may be needed during nocturnal hours.

- Measurement Variables
    - Presence/absence and Count Data
        - If presence and count data were collected before farm activities began and then again after farm activities have been completed, then the immediate effects of the farm activity on habitat use could be estimated more directly.
        - Quantify level of disturbance of farm worker activities by recording the duration of activity and number of workers involved.
    - Behavioral Observations
        - Disorientation in response to headlamps/lights: If low tides occur during nocturnal hours, the use of traditional lights could influence the behavior of birds and will confound the ability to determine the true behavior of birds. Using spotlights with infrared lenses (if available) would eliminate this confounding factor.
        - Consider length of time needed to measure behavioral observations, particularly to resume pre-disturbance behaviors.
        - If counts of individuals by species and instantaneous behavior cannot be accurately obtained for the calculation of proportions, the collection of ratio scale data may be considered. Ratio scale data should include a true zero class so that presence/absence can be established. Alternatively, counts from smaller survey areas may provide the basis for more accurate counts, especially when nocturnal surveys are conducted.
- Adaptive Management & Mitigation Measures
    - Suggest defining “adverse response/negative response” before data collection. Will there be “thresholds” to determine when an adaptive management measure/mitigation response is warranted? For example, will one adverse response require mitigation or will patterns of adverse responses be needed before mitigation is needed?
- Data Analysis
    - Quantitative Assessments
        - Relative abundance/density:
            - Careful review of the data will be needed to determine an appropriate analysis. Techniques used to assess the effects of disturbances on habitat that do not account for correlation in space and time may lead to erroneous inference (Zuur et al. 2007).
        - Flushing frequency: Clarify in methods if flushing is to be measured.
        - Nominal data: Clarify if this data is collected on individuals, species, or species groups?
    - Qualitative Assessments

- Summarize the various behavioral responses by disturbance activities in a contingency table and compute a chi-square test of association to determine if the any behavioral responses are associated with disturbance activities. For multiple comparisons among levels of behavioral responses and disturbance activities, consider appropriate hypothesis tests that avoid spurious test results (Anderson et al. 2001).
- Ensure time is accurately recorded for video so that behaviors can be matched with disturbances.

REFERENCES

Anderson, D.R., Burnham, K.P., Gould, W.R. and Cherry, S., 2001. Concerns about finding effects that are actually spurious. Wildlife Society Bulletin, pp.311-316.

Stevens, D. L., and A. R. Olsen. 2003. Variance estimation for spatially balanced samples of environmental resources. Environmetrics 14:594-610.

Stevens, D. L., and A. R. Olsen. 2004. Spatially balanced sampling of natural resources. Journal of the American Statistical Association 99(465):262-278.

Zuur, A., Ieno, E.N. and Smith, G.M., 2007. Analyzing Ecological Data. Springer, New York, New York.