FINAL REPORT:
Swinomish Tribal Community's *Bioaccumulative Toxics in Native American Shellfish* project: 2002-2006

PROJECT ACTIVITIES: TECHNICAL ASPECTS

The hypothesis of the project is that Swinomish people are exposed to low level, bioaccumulative toxics when participating in subsistence gathering and consumption of local shellfish. This project is unique in that it is a project that is both initiated and managed by a tribe and thus successfully represents the ability of Native American communities to conduct technically and culturally competent research that recognizes and upholds Native values.

The four specific aims of the project are listed below. After each specific aim, project activities are described.

Specific Aim #1: Determine the types and concentrations of bioaccumulative toxics present in locally-harvested shellfish

Project activities related to Specific Aim #1 are detailed in the *Contaminant Results and Risk Report* (2006); a summary is provided here. Past investigations had found several toxics in water, sediments, and tissue samples in and adjacent to Reservation tidelands. Based on the literature review findings, the project chose to analyze for 7 heavy metals—arsenic, copper, cadmium, selenium, mercury, lead and nickel, polychlorinated biphenyls (PCB) aroclors and the WHO list congeners, polycyclic aromatic hydrocarbons (PAHs), selected dioxins/-furans, chlorinated pesticides, and butyltins.

In the spring of 2002, 16 composite samples of sediment, 16 composite samples of butter clams (*Saxidomus giganteus*), and 16 composite samples of native littleneck steamer clams *(Prototheca staminea*) were collected on and near the Reservation. The following year, 2003, nine (9) composite samples of Dungeness crabs were collected a local harvest sites. Quality assurance and sampling procedures followed the Puget Sound Estuary Program's 1997 publication, *Recommended Guidelines for Sampling Marine Sediment, Water Column, and Tissue in Puget Sound.*

AXYS Analytical Laboratory resected and homogenized the muscle tissues of the clams and crabs. The hepatopancreas of the crabs was resected and analyzed separately from the muscle tissues. AXYS analyzed for PCB congeners and dioxins/-furans in the sediment and tissue samples. The Washington State Department of Ecology's Manchester Environmental Laboratory (MEL) conducted analyses for the heavy metals, butyltins, chlorinated pesticides, PCB aroclors, and PAHs.

EPA Region 10 provided data validation of the analyses. The data validator found that all of the samples were analyzed in accordance with the method specifications. The data, as qualified, were acceptable and can be used for all purposes. The project toxicologist performed risk assessments by evaluating the data as individual species as well as for a

combined "seafood basket" of clams, crabs, and salmon. The primary risk drivers were PCBs, arsenic, and dioxins/-furans, with lesser contributions from mercury and other heavy metals, chlorinated pesticides, and PAHs. Risks from eating 100g (3.5 ounces) portions of each species daily for life (for a total of 300 grams per day, a consumption rate reflective of current Swinomish practices) are in the range of concern because non-cancer risks for adults and children are above the reference guideline of 1 (ranging from 3 to 20), and lifetime cancer risks are in the range of 1 in 1000 people. Risks from eating a subsistence level consumption rate, one desired by many Tribal members and guaranteed by Treaty, would be higher.

Project personnel performed "seafood diet interviews" to determine the current and desired fish consumption rates in the Swinomish community. Swinomish developed the methodology for the seafood diet interviews as an alternative to fish consumption surveys because data collection and analysis methods used in the previous studies may have led to inaccurate results based in inappropriate questions and survey methods not congruent with tribal knowledge transfer pathways. Moreover, because each Tribe is unique, data from one Tribe may not be reflective of another Tribe. Using a combination of ethnographic and quantitative methods, the seafood diet interviews collected data on current consumption rates (which are suppressed), as well as desired consumption rates if barriers such as lost access, prosecution, lack of time, awareness of contaminants, and mistrust did not exist. The interviews are complete and initial analysis of the data provided a current consumption rate that is used in the Swinomish risk assessment. Additionally, Swinomish commissioned a report on historic subsistence consumption rates. Both the historic consumption report and the seafood diet interviews are project components that were not included in the initial specific aims, but deemed important by project personnel after the project was underway. The historic rates report is complete and awaiting approval for publication in 2007. Because the seafood diet interviews require additional analysis, the results are not included in the risk assessment report. The project personnel expect to publish the interview findings as a subsequent project in late 2007.

Specific Aim #2: If health risks are identified, to effectively communicate those risks in a culturally appropriate manner

Although the risk assessment found some differences between butter clams, steamer clams, and crabs, these differences were not significant, so the recommendations provided to the Swinomish community are location-based, not species-based. The following recommendations were given:

- Station 9 on March Point should not be used at all
- Skagit Bay sites are somewhat more preferable to Fidalgo and Padilla Bays
- Heavy-use areas around marinas, ferry docks, and industrial areas should be avoided
- The crab hepatopancreas should always be removed before cooking and eating
- Intake of locally gathered clams and/or crabs should be limited to an average of twice a week (assuming 3 or 4 ounce portions for children and 8 ounce portions for adults).

This information was distributed in the community, along with maps (included in the risk assessment report and at the end of this report), in the tribal monthly newsletter, Kee-yoks, on the Swinomish website, www.swinomish.org, at community gatherings, and on the Swinomish cable station, SWN96. The project also disseminated information on how to prepare seafood that would reduce exposure to contaminants, such as avoiding the hepatopancreas in crab, and cutting the skin and brown fat from fish filets before cooking. The overall message, however, stressed the importance of continuing to harvest and eat traditional foods such as seafood because the health benefits—physically as well as mentally, and spiritually--outweigh the risks. Like many other Native American communities, the Swinomish view health as an integration of these factors that cannot be assessed separately. As several respondents said in the seafood diet interviews, "it's food for the body and food for the spirit."

Based on the information from the seafood diet interviews and the historic consumption report, the message that the benefits of seafood outweigh the risks was depicted in the *13 Moons* book. The book illustrates the traditional Swinomish calendar, guided by annual moons, and the natural resources harvested during each moon.

A workshop was given at the Swinomish primary care clinic about the risks and benefits of eating seafood and recommendations for preparation methods that practitioners could pass this knowledge on to patients.

The Swinomish Environmental Education Program was initiated. The mission of the Swinomish Environmental Education Program is to employ Swinomish values to inform local communities about the importance of natural resources. This program has several facets, involving outreach and education with both children and adults in the Swinomish and in the local surrounding communities. Since children are excellent educators of their parents, monthly interactive presentations are conducted in local schools, after-school programs (e.g., the La Conner Boys and Girls Club), and Swinomish youth programs. The Swinomish Environmental Educator employs educational toolkits such as Tox in a Box®, Enviroscapes© and videos. The Environmental Educator worked with adults at local gatherings such as annual beach bakes, a traditional Swinomish event, at the Swinomish annual health fair and at regional events such as the Anacortes Marine Ecology Days and the Penn Cove Shellfish Festival. Partnerships with many of these local nonprofit and community organizations have been formed (e.g., with People for Puget Sound). Evaluation forms received from both students and teachers alike are overwhelmingly positive.

Environmental education and outreach that have been conducted include monthly articles in the Swinomish monthly newsletter, Kee-yoks. Articles provided updates about the project as well as tips to reduce exposures to toxics in the home. Project personnel have also focused on video production since film and television constitute two of the most widely used forms of news acquisition and entertainment by Tribal members. The Swinomish cable channel, SWN96, has aired public service announcements and short creative pieces created by the Environmental Education Program and the Swinomish youth through a program called Native Lens. Native Lens supports the growth and

expression of Indigenous youth through digital media making. Twelve dedicated youth were guided through a rigorous instruction in the world of digital media. As the youth developed basic technology skills, the program challenged them to think critically about media content, and uses the collaborative process of digital filmmaking to teach leadership, teamwork, and artistic inquiry. Short films created through Native Lens have received numerous awards from film festivals across the country--Seattle, San Francisco and New York. After completion of the Native Lens workshop, a group of Swinomish youth was given an "assignment" to film a piece related to the local environment. The youth created *Slow Burn*, a story about what is it like to grow up on the Swinomish Reservation in the shadow of large petrochemical facilities. Both poignant and humorous, the film premiered to a packed audience in February 2006 at the local Lincoln Theater. The film has received rave reviews by both Swinomish and local community members, and the youth are now at work creating a full-length feature.

Throughout the project, the Swinomish Videographer has documented all aspects of the work. Sample collection events, advisory board meetings and educational presentations have been collated into a video narrative of the project. This video serves as a visual equivalent to the written programmatic final report and may be used as a guidance piece by other tribes who are planning similar projects. The video will be distributed to the project's advisory boards—the technical advisory board and the tribal advisory board. The technical advisory board provided aid and insight on issues such as toxicological data and effects on policy implementation for federal agencies. The tribal advisory board comprises representatives from other Puget Sound area Tribes. The tribal advisory board was primarily set-up to share findings with other Tribes who face similar issues.

Project personnel deemed outreach and education to individuals outside the Swinomish community who work in risk assessment important as well. More than 25 presentations about this project have been given at meetings and conferences (see the Final Evaluation of the project for a full list of presentation citations). Types of meetings range from local gatherings of non-tribal community members such as the Skagit Marine Resources Committee and the Skagit Beachwatchers to regional conferences such as the Puget Sound Georgia Basin Conference (twice), to national meetings hosted by organizations such as the American Public Health Association, the Society for Environmental Toxicology and Chemistry, the Society for Risk Analysis and the Society for Applied Anthropology.

Specific Aim #3: If health risks are identified, to develop mitigation measures

The project has consistently drawn attention to the virtues of eating seafood and practicing cultural activities, while recommending harvest locations that are less contaminated. However, location advisories are risk avoidance measures and are only useful as an interim solution to the long-range goal of risk reduction. Long-term use of risk avoidance measures such as consumption advisories is detrimental to the Tribe because it implies that it is acceptable to negate treaty rights and access to harvesting because of third-party actions. This is simply not acceptable. Nor are beach closures because they imply that it is acceptable to the Tribe to gather and eat less traditional foods. The long-term risk reduction strategy is ensuring that traditional foods such as

seafood are available and free of contaminants to the degree that allows harvest and consumption at desired levels, not at the current suppressed levels.

Specific Aim #4: If health risks are identified, to confirm major health problems on the Reservation that may be related to eating contaminated shellfish, and develop hypotheses between the health problems and toxics found

The fourth specific aim was not fulfilled due to the lack of statistically significant data. Unfortunately, the Federal Government, as well as the Tribes, have failed to maintain a robust health assessment and health statistical data system for Tribes in-congregate and individually. The Indian Health Service, the federal agency mandated to oversee to tribal health care, has some regional data that summarize categorical rates for hospitalization, medical visits and other medical utilization. However, the data is nearly 10 years old and incidence data is sorely missing for all chronic and acute diseases except for TB.

Next, we investigated a second potential source of data--the Washington State Vista Database. This database can determine county specific incidences of reportable diseases, mortality, and causes of hospitalization. The data can be stratified by race, including American Indian. However, race miss-classification is not corrected for in the raw or statistical data, and the number of Native Americans living in Skagit County is not robust enough to produce statistically relevant results for the County, let alone the Swinomish Tribe.

The Swinomish Clinic was able to provide data on the most frequent diagnoses and the top 20 diagnostic categories. Incidence data is difficult to obtain because of the coding used at the clinic. The data available was not sufficient to develop hypotheses between the health problems and the toxics found.

EVALUATION AND DISCUSSION

The mid-term (2004) and final project (2006) evaluations provide an independent view of the project's successes and difficulties. Please see these reports for a more in-depth discussion of the project outputs and outcomes.

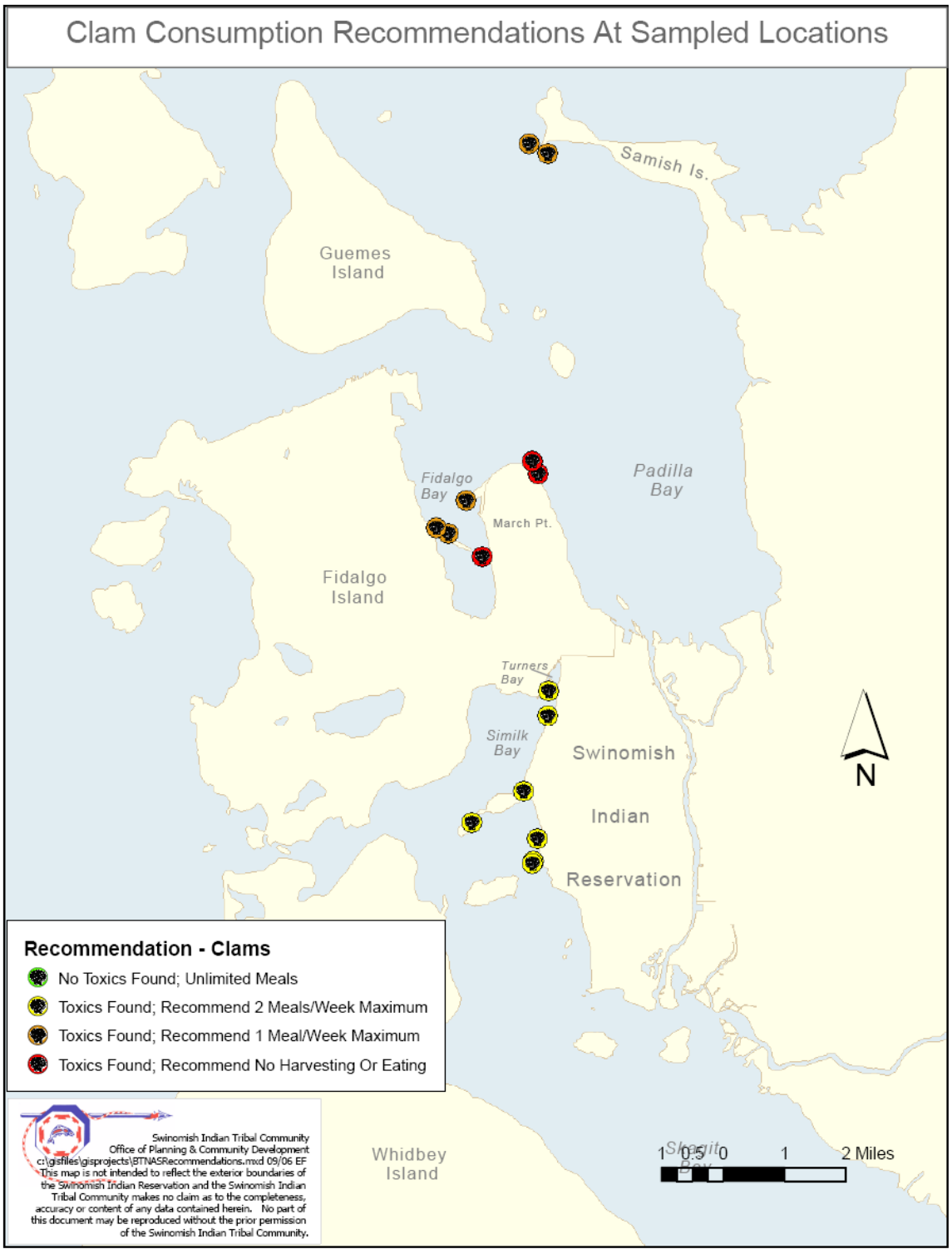
The research performed in this project provides two primary types of benefits. 1) The research provides *technically credible data* regarding the types and concentrations of bioaccumulative toxics in sediments, clams and crab in central Puget Sound, Washington State. Many of the sample locations had never been tested before, so the data will enhance the existing knowledge base of the health and status of Puget Sound. 2) The research provides *culturally credible data,* and demonstrates that Native American communities have the expertise and capacity to carry out a project such as this, and are also uniquely positioned to infuse culturally appropriate and competent aspects into a primarily western science research framework (e.g., creation of the seafood diet interviews to obtain more accurate consumption data; education and outreach activities). However, although some project components were successful in enacting culturally appropriate activities, the risk assessment portion of the project ultimately failed to

provide culturally credible data because the rigidity of the current risk assessment framework does not recognize the Swinomish definition of health.

Risk assessment frameworks as currently practiced include only toxicological data, legal requirements as defined in the Federal Registrar, and exposure policy. Factors such as effects to socio-cultural health are absent. Yet in Native American cultures, human health, ecological health, and cultural health are inseparable components that must be assessed together. Failure to recognize this produces narrowly focused risk assessments that delineate only one component of the integrated tribal web of life, thereby failing to capture the inter-dependencies that characterize conceptualizations of culture, the environment, and human health. Equally important, current risk assessment models exclude important health factors that cannot be quantitatively assessed, such as participation in spiritual ceremonies, intergenerational education opportunities, and traditional harvesting practices. In order to remedy these shortfalls, an extensive overhaul of the risk assessment model is required, one that shifts away from the current model and towards the concepts of multi-dimensional health and well-being.

Peer Reviewed Publications:

Judd, N. L., C. H. Drew, et al., 2005, "Framing scientific analyses for risk management of environmental hazards by communities: case studies with seafood safety issues," Environmental Health Perspectives 113(11): 1502-8.


Clam Consumption Recommendations At Sampled Locations
Samish Is.
Guemes Island
Fidalgo Bay
Padilla Bay
March Pt.
Fidalgo Island
Turners Bay
Similk Bay
Swinomish
Indian
Reservation
N
Recommendation - Clams
No Toxics Found; Unlimited Meals
Toxics Found; Recommend 2 Meals/Week Maximum
Toxics Found; Recommend 1 Meal/Week Maximum
Toxics Found; Recommend No Harvesting Or Eating
Swinomish Indian Tribal Community
Office of Planning & Community Development
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Whidbey Island
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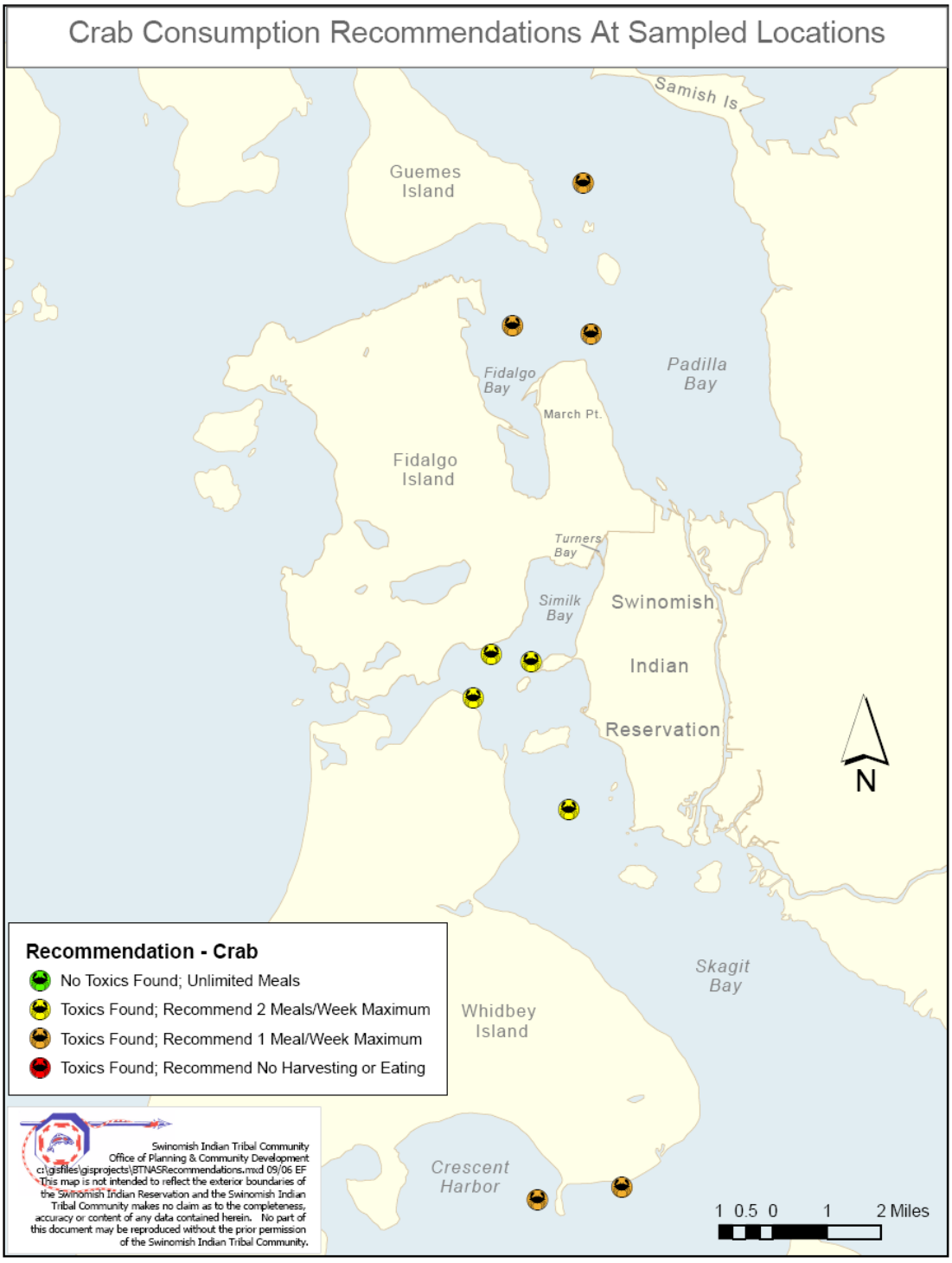
Crab Consumption Recommendations At Sampled Locations
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Crescent Harbor
Recommendation - Crab
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Toxics Found; Recommend 2 Meals/Week Maximum
Toxics Found; Recommend 1 Meal/Week Maximum
Toxics Found; Recommend No Harvesting or Eating
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