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Wetlands Program Guidelines on Massachusetts Wetlands Protection Act and Water Quality Certification Provisions Regarding Salt Marsh Restoration Techniques, including. Ditch Remediation, Runnels, and Marsh Habitat Mounds
June 18, 2024

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Program Applicability: MassDEP Boston and Regional Wetlands Program staff, Municipal Conservation Commissions, state and federal resource agencies, Project Proponents, consultants, and others.

Supersedes Guidance: None

Approved by: Tim Jones, Acting Director, Division of Wetlands and Waterways

Purpose: MassDEP has developed this Guidance to clarify permitting requirements, improve the process, and improve efficiency of permitting and implementation of projects aiming to improve hydrology and assist restoration of tidal marshes through Ditch Remediation, Runnels, and Marsh Habitat Mounds under the Wetlands Protection Act and other related regulations. MassDEP acknowledges and appreciates the input provided by the Massachusetts Office of Coastal Zone Management, the Massachusetts Division of Fish and Game, and the other environmental organizations, consultants and stakeholders who contributed to this effort.

MassDEP recognizes that salt marshes provide valuable ecosystem services by sequestering carbon, mitigating impacts of coastal storms, filtering pollutants, and providing habitat for fish, shellfish, and coastal birds. However, salt marshes have been impacted over time due to former development, fill, and extensive agricultural and mosquito control practices. They are also becoming increasingly threatened by multiple stressors including sea level rise, intense storms, nutrient enrichment, limited sediment availability, crab herbivory, and invasive species. Salt marshes are at high risk of degradation due to increased periods of inundation, saturation, and subsidence which in turn affects the various species that depend upon the salt marshes for survival. In many locations, these impacts are exacerbated by a network of legacy ditches and embankments, which alter natural hydrologic function, increasing the risk of pooling and subsidence (sinking) of the marsh platform, and make the marsh more vulnerable to sea level rise. The Saltmarsh Sparrow (*Ammos Piza caudicula*), currently at risk of extinction, is particularly vulnerable to increased inundation due to the obligate nature of this species to utilize irregularly flooded areas for nesting sites. As a result, there is an interest in acting quickly to maintain, restore, and protect salt marshes and their valuable functions. The techniques of ditch remediation, runneling, and marsh habitat mounds were developed with the goals of reversing legacy agricultural impacts, restoring a more natural marsh hydrology, increasing ecosystem

function, and providing alternative nesting locations for Saltmarsh Sparrow. These projects, in addition to other restoration techniques, are intended to restore and maintain function of the marsh. Through restored function of the marsh platform, over time salt marshes are expected to persist longer than if no interventions were implemented. Other stressors unrelated to ditching and embankments will remain and continue to negatively impact the salt marsh, including nutrient enrichment, sea level rise, reduced sediment availability, and impaired tidal flow.

This guidance document is intended to clarify the information to be provided during design, permitting, construction and post-construction in order to demonstrate that a project meets existing regulatory performance standards of the Wetlands Protection Act (WPA) and Water Quality Certification (WQC) requirements. It outlines recommendations for ensuring that Project Objectives aligned with the intended restoration trajectory (restoration milestones) are properly established, any unanticipated adverse effects caused by the proposed project are identified and documented in a timely manner, and appropriate corrective actions are taken to address any unintended adverse effects and restore the salt marsh and its functions.

Site specific factors drive many of the salt marsh's natural processes, including tidal range, freshwater input, and location in the landscape. Marshes in different locations may exhibit distinct forms and functions. While this guidance provides general principles, it is crucial for proponents to consider the specific context of each marsh, its size, position in the landscape, and tidal range.

This guidance is intended to explain existing regulations. However, MassDEP is committed to developing regulatory strategies to encourage well-planned salt-marsh restoration projects designed to improve salt marsh condition.

Statutory and Regulatory Background:

- **M.G.L. c. 131 § 40:** Wetlands Protection Act and Regulations at 310 CMR 10.00
- **M.G.L. c. 21 § 26 through 53:** Massachusetts Clean Water Act and Regulations at 314 CMR 9.00, and Section 401 of the federal Clean Water Act and Regulations at **33 U.S.C. 1251.**
- Other federal, state, and local permits may be required. See Appendix B for further information. Also, a flowchart illustrating the full range of potentially applicable permitting needs for these types of projects developed by the EPA Southeast New England Program can be found at the following link (https://www.epa.gov/snep/navigating-salt-marsh-restoration-massachusetts-challenges-strategies-and-opportunities).

I. Background

This guidance is intended to address the following practices:

1. Ditch Remediation is the practice of placing salt marsh hay in legacy ditches, typically from historic agricultural or mosquito control practices. The purpose of this practice is to facilitate sediment accretion and regrowth of native vegetation within the ditch, including peat formation, to restore natural tidal flow/drainage in the salt marsh and prevent undersaturation of the root zone and marsh platform.
2. Runnels are shallow channel excavations used to allow impounded water on the marsh platform to drain and improve natural marsh processes (e.g., increase primary productivity). Construction methods may also involve compaction of material to create the drainage feature instead of excavation.
3. Marsh Habitat Mounds are a form of beneficial reuse of marsh peat (see additional beneficial reuse applications in Appendix A) excavated through runnel creation, or

removal of ditch plugs. These areas are intended to provide vegetated and elevated space above the elevation of daily tidal inundation with the intent to promote nesting for Saltmarsh Sparrow (*Ammospiza caudacuta)*. The Marsh Habitat Mounds may be created in isolation or may be an extension of existing high marsh patches and are designed to be no higher than the Highest Astronomical Tide.

Expanded definitions for ditch remediation, runnels, and sediment beneficial reuse such as marsh habitat mounds, as well as additional definitions can be found in Appendix A. These definitions can help with project design and provide more information. Figures illustrating the intended restoration trajectory of the above-mentioned practices are provided in Appendix C.

II. Wetlands Protection Act (WPA) – Regulatory Standards

The following specific regulatory provisions are relevant to these guidelines:

a) 310 CMR 10.24(8) contains provisions for certain Ecological Restoration Limited projects as to how the issuing authority should review and exercise discretion in approving a project. 310 CMR 10.24(8)(e)3 contains "Other" ecological restoration limited projects that are not described in 310 CMR 10.24(8)(e)1 or 2. Included in this category are projects that remediate historic tidal wetland ditching, restoration, enhancement or management of Rare Species habitat, and restoration of hydrologic and habitat connectivity. Ditch Remediation, Runnel and Marsh Habitat Mound projects designed for the sole purpose of salt marsh ecological restoration would most likely qualify under this Ecological Restoration Limited Project category. However, where specific categories exist, under 310 CMR 10.11-14, they may be approved in accordance with these provisions.

b) When work is proposed in Areas of Critical Environmental Concern (ACEC), 310 CMR 10.24(5)(b) allows projects to proceed if the project is considered an Ecological Restoration Project (under 310 CMR 10.11 through 10.14) or an Ecological Restoration Limited Project (under 310 CMR 10.24(8)). Certain surface waters within Areas of Critical Environmental Concern have been designated as Outstanding Resource Waters (ORWs) in accordance with 314 CMR 4.06 (see section below on 401 Water Quality Certification).

III. 401 Water Quality Certification - Regulatory Standards

Activities involving Ditch Remediation, Runneling and sediment beneficial reuse such as Marsh Habitat Mounds in Salt Marshes, including those in ORWs require a Section 401 Water Quality Certification Fill/Excavation permit pursuant to 314 CMR 9.04. Projects also proposing greater than 100 cubic yards of dredging will be authorized to conduct these activities in the same Fill/Excavation WQC. The WW26 combined application form may be used for Fill/Excavation and Dredge under 314 CMR 9.00, as well as for Chapter 91 Requirements. Proponents should discuss whether the individual project requires a fill/excavation or dredge WQC with the issuing authority.

IV. Mosquito Control Activity

Certain mosquito control activities (i.e., activities to drain, alter flow, or remove obstructions in wetlands or waters to eradicate mosquitos) are exempt from the WPA as stated in M.G.L. c. 131 § 40, but are not exempt under 314 CMR 9.00 for 401 Water Quality Certification. The applicability of this guidance for mosquito control projects is provided in Appendix A.

Restoring natural tidal hydrology in a salt marsh can in many instances reduce mosquito breeding habitat. Mosquito control staff also have knowledge and equipment that can be valuable as part of a salt marsh restoration project team. As Mosquito Control Boards are responsible for maintenance of mosquito ditches across the Commonwealth, it is recommended that the relevant Mosquito Control Boards within the project area are consulted prior to any activity intended to revegetate or remediate ditches.

V. Other Permits Applicable to Runnel, Ditch Remediation and Marsh Mound Projects

Additional permits and/or licenses such as Chapter 91, MEPA, CZM Federal Consistency review, and local bylaws also have a role in the state regulatory framework and should also be considered when permitting marsh restoration projects. More information and guidelines regarding these permits and licenses, and guidelines for projects receiving funding from the Massachusetts In-Lieu Fee (ILF) Program are provided in Appendix B. Potentially applicable permitting and timelines for salt marsh restoration projects, and types of projects are described in a document developed by EPA at the following link (https://www.epa.gov/snep).

VI. Notice of Intent and Water Quality Certification Application Submission

A Notice of Intent (NOI) must be filed with the local Conservation Commission with jurisdiction of the project site (unless exempt such as mosquito control activities cited in Section IV). Application for Water Quality Certification must be filed with MassDEP; both should include the following:

1. A General Project Description that clearly states the need for the proposed project activities. Proposed project alterations (temporary and permanent) should be described and quantified by wetland Resource Area. The applicant must show that the project qualifies as an Ecological Restoration Limited Project as defined in 310 CMR 10.00 (future regulation changes may include a permitting pathway as an Ecological Restoration Project). If a project is within a mapped polygon on the most recent Estimated Habitat Maps of State-listed Rare Wetlands Wildlife published by the MA Natural Heritage and Endangered Species Program (MNHESP), then MNHESP shall be consulted in accordance with 310 CMR 10.57.
2. A Map depicting the project area and the proposed activities. The map should clearly depict the different activities and areas requiring restoration. Proposed project phasing should be clearly shown on the map, if applicable.
3. A Project Plan Set depicting the proposed project activities, including, as appropriate:
    a. Existing and proposed elevation data [MassGIS Light Detection and Ranging (LiDAR) is sufficient but some proposed work may benefit from more precise elevation data to ensure positive drainage]. Proposed elevation data can be provided as a typical detail for each type of restoration feature proposed (e.g., cross-sections)
    b. Reach[1] sub-basin (i.e., drainage area) delineations associated with runnel and ditch remediation locations (USGS marsh units are acceptable, if appropriate, however, designs may rely on smaller subbasins

1 . Reaches can be defined numerous ways but for this Guidance a reach typically refers to the section or sections of tidal course located upgradient of a confluence of channelized flow paths. See Appendix C for an example Figure with USGS marsh units depicting reach sub-basins and runnel sub-basins.

c. Proposed runnel depth and width in feet, runnel sub-basin[2] size in acres, ditch remediation location and length, approximate number and size of marsh habitat mounds, and quantity of sediment for reuse with estimated cut / fill quantities. Exact locations of marsh habitat mounds and sediment placement areas can be reported in the construction period monitoring report and the as built plan

d. Proposed runnel categorization (e.g., temporary vs. permanent, various design sizes)

e. Embankment (soil berm) locations from historic alterations (e.g., agricultural embankments, mosquito control, etc.) to the extent feasible

f. Field-verified subterranean ditch voids (see Appendix A) to the extent feasible, including ditches that will not be remediated

g. Any mapped habitat by MNHESP including existing Saltmarsh Sparrow habitat as mapped or otherwise provided by MNHESP

h. Property boundaries - a separate plan sheet may be required for sites that include a number of smaller lots

i. Proposed temporary impacts associated with the restoration project (i.e., staging areas, pathways, mowing sites, etc.).

For the Project Plan Set, elevation data is integral to understanding key parts of the project. However, requiring elevation and locations beyond the LiDAR precision (vertical accuracy of 10 cm, digital elevation model cell size is 0.5 meter) should be limited to key project areas to avoid cost prohibitive data collection. More precise elevation data for existing conditions and proposed conditions (as well as as-builts) should be limited to the upstream and downstream thalweg/cross – section of runnels. Furthermore, specific runnel and ditch remediation design details can be categorized by proposed elevations, size, and/or depth with a representative example and cross-section.

All elevation data should be submitted in accordance with the North American Vertical Datum (NAVD) 1988 and be absolute or relative based on a benchmark established outside of the marsh by a Professional Land Surveyor. The Project Plan Set should be submitted in an electronic format [e.g., Portable Document Format (PDF)] that can be easily reviewed. All supplemental design details requiring specific software (e.g., ArcGIS Online, AutoCAD, Excel) should also be submitted and memorialized as an exported PDF. Professional Engineer sealed plans are recommended[3] to the extent practicable for tidal creek restorations (See Appendix A) and should include representative runnel (i.e., the start of a constructed channel or pilot channel) cross-sections of existing and proposed conditions (WPA Form 3, Section D.4.) with longitudinal profile elevations.

4. An Analysis demonstrating that the proposed project activities have been designed to incorporate all feasible measures to avoid or minimize adverse impacts to wetland resource areas and the interests of the Wetlands Protection Act to the maximum extent feasible.

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2. Runnel sub-basin may be a subset of the reach sub-basin when the runnel serves to extend the existing reach, or alternatively runnel sub-basins may equal the reach sub-basin (see runnel definitions). See Appendix C for an example Figure on runnel sub-basin delineations.

3 - While this recommendation does not include development of hydraulic geometries (Williams, 2002), proponents may choose to develop hydraulic geometries to better understand geomorphologic trajectories for monitoring expectations and corrective action plans. If used, MassDEP recommends that the minimal runnel size be constructed, and that the runnel not be constructed to the assessed end-point channel size, to achieve desired conditions.

5. A Baseline Conditions Data Collection Plan At a minimum, site-specific baseline data should be collected over at least one or two monthly tidal cycle(s). Other baseline metrics (e.g., target hydroperiods for vegetation, accretion rates, etc.) may cite peer reviewed literature if applicable. Site-specific baseline condition data may be collected prior to filing the NOI or as part of the proposed project work however the need for the project must be justified. Baseline data may include but is not limited to some or all of the following:

    a. Descriptions of plant communities (such as species type and density) hydrology, groundwater measurements, and soil characteristics.

    b. An evaluation of historic and existing conditions, including nearby less-disturbed areas or previously restored areas as reference wetlands if available, as it relates to the extent and severity of the impairment(s).

    c. Existing extent of natural resource areas (i.e., salt marsh, open water, tidal creeks etc.) to the extent that historic topographic maps, aerial photos, and other evidence are available and are necessary to define project limits.

    d. Existing anthropogenic impacts including mosquito ditches, agricultural embankments, agricultural ditches, areas of fill, and flood control devices such as sluice gates and weirs.

    e. Evidence of subsidence, water pooling, over-saturation, or over-draining of the marsh platform, and/or stressed vegetation[4] to the extent that aerial imagery, previously collected data, and other evidence are available.

    f. Subterranean ditch void (see Appendix A) locations. Evidence[5] suggests that runnel designs should minimize the intersecting of these ditches to prevent their reanimation / drainage potentially contributing to further marsh collapse. By ensuring that each runnel or channel segment falls within an existing ditching pathway, the probability of inadvertently intersecting an open void is greatly reduced.

    g. Existing naturally formed pools and pannes in the proposed impact areas to the extent that aerial imagery, previously collected data, and other evidence are available. Natural pools developed from natural processes play an important role in aquatic habitat for plants, fish and waterbirds and should be preserved as part of restoration efforts.

    h. Existing tidal range for the site with estimated elevations provided for Mean Lower Low Water, Mean High Water and Mean Higher High Water.

    i. Existing groundwater data and hydroperiods for representative areas of the salt marsh within the project area including healthy marsh, oversaturated marsh, and undersaturated marsh. To avoid cost-prohibitive data collection, hydroperiods can be developed for representative areas in the marsh and then applied to remaining marsh areas if applicable. The data collected from these representative areas will be used to characterize and understand the groundwater dynamics in other areas of the project. If this approach is used, the categorization of representative areas should allow for project-wide demarcations of healthy marsh, oversaturated marsh, and

4 - Burdick, D., G. Moore, C. Peter, S. Adamowicz, G. Wilson. (2020). Mitigating the Legacy Effects of Ditching in a New England Salt Marsh. *Estuaries and Coasts*, *43*, 1672-1679.

5 - Raposa, K.B., Weber, R.L., Ferguson, W., Hollister, J., Rozsa, R., Maher, N. and Gettman, A., 2019. Drainage Enhancement Effects on a Waterlogged Rhode Island (USA) Salt Marsh. *Estuarine, Coastal and Shelf Science*, *231*, p.106435.

undersaturated marsh with representative locations supported by field-derived hydroperiods and aerial photos.

j. Existing vegetation data including dominant plant communities (such as short-form and long-form *S. alterniflora*, and *S. patens*) and the presence of *Ruppia maritima* in representative existing natural pools and pannes within the project impact area. Transects or other established methods may be used.

k. Discussion of how impacts to Saltmarsh Sparrow habitat or other important species habitat may be limited by conducting early consultation with NHESP, implementing Time of Year restrictions, and limiting removal (mowing) within any one growing season.

6. Project Objectives (desired post-construction conditions of the site) should outline an intended restoration trajectory and progression from the Baseline Conditions for areas of the marsh with identified degradation (e.g., undersaturation, oversaturation, etc.). Specific indicators collected in the Baseline Conditions Data Collection Plan will be the same indicators with restoration target values. The Project Objectives also serve to interpret the Post-Construction Monitoring results in which progress is measured. Any deviations from the intended successional trajectory should be captured in the Corrective Action Plan in order to redirect the project trajectory back towards the Project Objectives. For example, a Project Objective may be to decrease the hydroperiod at the root zone by reducing water levels at mean low tide by 10 cm; which would be compared against the Baseline Conditions Data Collection Plan that includes groundwater monitoring collected over at least one or two monthly tidal cycle(s); or to drain pools that are causing marsh dieback and subsidence, which would be measured by documenting pre- and post-project size of the pool, and progress on regrowth of vegetation in the drained area.

7. A Construction and Post-Construction Period Monitoring Plan that includes:

   a. A Wetland scientist(s) who will serve as the project's Environmental Monitor(s) (EM). This person or persons should have a minimum of 5 years of experience and be competent in coastal wetland ecology, and salt marsh species and their habitats (rare species consultation with MNHESP may be required). Experience with salt marsh restoration is desirable.

   b. A construction schedule and EM's oversight schedule along with relevant phasing details, if appropriate. The construction schedule should reflect Saltmarsh Sparrow presence from mid-May through September and their active nesting period between late May and early August so activities should be restricted during this timeframe, and an acknowledgement should be included stating that no existing or previous nesting areas will be impacted (i.e., no transference of existing well-developed thick thatch layer to new areas). For projects installing habitat mounds, an overall project goal should be a net increase in overall suitable nesting area within 1 year of treatment.

   c. All responsible roles/parties should be listed in the Plan with assurances that all equipment operators and site contractors will be trained in site methodologies and competent to perform the work. Specific names and contact information should be provided to the Issuing Authority prior to construction.

   d. A description of how visual and photographic inspections will occur and be documented to determine if changes have occurred that require corrective action such as clogging of ditches or over draining.

e. A plan for assessing project performance using objectives (e.g., post-construction conditions of the site compared with baseline and objectives) which, at a minimum, includes annual submittals for the first three years. Collected datasets should be used to show Project Objectives are being met or identifying deviations from the Project Objectives. Communication with the issuing authority should be established following the first three years to determine compliance with Project Objectives and/or to assess corrective actions needed. In accordance with 310 CMR 10.05(6)(d), the issuing authority may issue an Order for up to five years where special circumstances such as monitoring salt marsh restoration projects are set forth in the Order of Conditions.

8. A Corrective Action Plan that includes:

   a. Measures to reestablish healthy marsh condition following unintended outcomes such as clogging of runnels resulting in ponding, inadequate hay in ditch remediation areas, deterioration of or lack of appropriate vegetation on marsh mounds, observation of ponded water in unexpected locations, temporary impacts persisting, etc.

   b. A schedule with thresholds at which monitored metrics trigger corrective activities upon detection.

   c. Activities should be categorized into inadvertent adverse impacts (typically unforeseen or not a natural outcome of dynamic marsh process) or maintenance (resulting from natural dynamic processes) so that the Issuing Authority can better review which activities should be considered for further review or approved with minimal review. Additional information on the Corrective Action Plan is in the following section.

VII. Post – NOI Submittal Expectations

1. Construction Period Monitoring Reports should be submitted in accordance with the Monitoring Plan identified in Section VI. During the Construction Period, visual inspection of the entire site is recommended to ensure that construction is occurring as the design intended. Specific monitoring, data collection, and reporting should be conducted on representative areas to demonstrate what is being observed throughout the entire site. Unlike Post-Construction Monitoring Reports, Construction Period Monitoring Reports do not assess the project's trajectory towards meeting Project Objectives. The goal of the Construction Period Monitoring Reports is to document design implementation and to identify any and all deviations from the design occurring from contractor mishaps, severe weather events, or other unforeseen scenarios. In the event of a deviation from the design, the recommended course of action should be corrected in the field and documented in the monitoring report or otherwise discussed with the Issuing Authority to determine if a Corrective Action is needed. See Section VII(c)2 for further information on Corrective Actions. The recommended level of effort for Monitoring includes:

   a. Inspections need to occur regularly throughout the construction phase of the project, and until the site is stabilized. Each Runnel, Ditch Remediation and Marsh Mound must be inspected at a sufficient frequency to ensure that the newly constructed features are stable and functioning as intended (e.g., no clogs, additional or relocated ponding, erosion etc.). Inspections must be done in the field; however, some may be done by aerial survey if desired. Care should be taken to avoid trampling and overuse impacts from repetitive ground surveys in addition to best practices to avoid transfer of invasive species on equipment and sampling gear.

b. At a minimum, biweekly monitoring reports should be submitted to the Issuing Authority(s) by the EM(s) during active construction that summarize the site activities located within wetland resource areas and confirm that all activities are in compliance with the *Order of Conditions* and other related permits. The reports should include, but are not limited to, a description of construction status, activities completed and overall site conditions; the condition of construction mats (if utilized); any adverse effects and recommendations of any corrective actions to be taken and how to prevent similar problems in the future (see discussion of Corrective Action Plan below). Biweekly reports should report on active construction during that period and do not need to be submitted during phases of construction where work has been interrupted.

c. Following construction but prior to site stabilization, the EM(s) should submit construction period monitoring reports during and immediately after the growing season and if necessary, after large and acute disturbance events (coastal storms) to document that the site is stabilizing towards the design condition or to identify if corrective action is needed (or in the event of a coastal storm, if corrective action is desired). These reports should be submitted until such time that disturbed areas are stabilized and functioning in accordance with the project plans and Project Objectives, as determined by the Issuing Authority. Additional information about the Corrective Action Plan is located in Section VII.

d. During construction, if deviations in design are determined necessary due to site-specific considerations, they should not exceed 15% of the project's total temporary and permanent impacts and should be documented in the construction period EM reports with plans as applicable.

2. As-Built Plans should be submitted following the construction of the project to document that the installation conforms to the design plans, and to record any deviations. The Plan/Report should include elevations collected from a benchmark established by a Licensed Surveyor with NAVD 1988 elevations and locations for runnel inverts and cross sections for the most upstream and downstream locations including all subsidence basin breach locations. This information may be collected immediately following construction or post-construction once the site is stabilized. GPS Units or other suitable methods may be used. Completed work for ditch remediations, and sediment reuse (such as marsh habitat mounds), should be documented with qualitative and/or descriptive documentation to avoid cost prohibitive requirements.

3. Post-Construction Monitoring Reports should assess metrics that identify successful trajectories or transition towards Project Objectives, along with any potential deviation away from attaining the Project Objectives. In general, collection of data may include some or all of the following: photographs, documentation of vegetation characteristics such as species type, percent cover, density, and species richness along transects or at stations or other methods, sediment accretion calculations, hydroperiod assessments, etc. The entire site should be routinely inspected, but monitoring can be conducted on representative areas to convey overall project success For example, in oversaturated areas, the Project Objective of the runnel may be to decrease the depth of permanent inundation by a specific depth (e.g., 4 cm) or a decrease in the duration of inundation by a specific percentage (e.g., 15% less time inundated) within a subsidence basin when applicable. The discussion below provides a general outline of example monitoring

considerations for each restoration technique; however, it is not comprehensive and may require additional or different site-specific considerations:

a. Ditch Remediation

   i. Objective: Gradually eliminate the ditch from receiving tidal flow to reduce excessive drainage and further oxidation. Short-term objectives include an increase in groundwater levels and vegetation establishment on a trajectory towards conversion of the ditch to a vegetated marsh platform. Long-term objectives include increases in marsh elevation through sediment accretion.

   ii. Monitoring: The remediated ditches should be inspected for shallowing of the ditch and native vegetation reestablishment. In locations where multiple ditches are being remediated, the initial remediation can lead to excessive ponding before water is redistributed to the open ditches or creeks. These locations should be monitored for ponding on the marsh platform itself, in addition to inspection and monitoring within the ditch itself.

b. Runnels

   i. Objective: For runnels, the objective is typically to reduce oversaturated areas. Effective treatment of the oversaturated area would result in a reduction of unvegetated areas and/or open water with an increase in native vegetative cover relative to the baseline conditions. The target hydroperiod for the oversaturated areas to be drained should be identified and should reduce the inundation frequency, duration, and depth so that it does not exceed the hydroperiod of the existing vegetated marsh platform. For runnels (and accompanying ditch remediation) that involve tidal creek restorations, the goal is to monitor to ensure the trajectory, slope, and geometries are aligning with design expectations.

   ii. Monitoring: A combination of tidal hydrology, groundwater, and vegetation should be monitored to assess runnel success. For runnels (or the conversion of an existing ditch) serving as tidal creek restorations [see Definition of Runnel in Appendix A (application c)], the channel geometries and slope should be monitored against expectations outlined in the Project Objectives. For runnels serving to extend or expand the tidal course [see Definition of Runnel (application a and b)] monitoring should also include assessments of:

      1. Over-draining of the root zone within and adjacent to the runnel which can lead to oxygenation of peat and exacerbate subsidence and elevation loss. This could occur if the design density of the runnels is too high or if the runnel excavation depth is too deep.

      2. Hydroperiods of the runnel sub-basin conducted with a water-level logger or piezometer in the same location as the Baseline Condition Data to compare with the Project Objectives. Hydroperiods can be affected by both runnel density and depth of excavation. To avoid cost-prohibitive data collection, hydroperiods can be developed for representative areas in the marsh and then applied to remaining marsh areas for monitoring if applicable.

      3. Long-term trajectory for the runnel (temporary vs. permanent). Some runnels will be designed as temporary (excavated above the root zone) while others will be designed to be permanent

(excavated below the root zone). However, even if designed to be permanent, some runnels may become clogged or naturally fill in over time.

Inspections of the excavated sediment from runnels should ensure that any sediment not proposed for marsh mounds is thinly applied or scattered on the marsh at a maximum depth of no more than 5 centimeters.

c. Marsh Habitat Mounds

i. Objective: Marsh Habitat Mounds should be appropriately stabilized, including vegetation with dense native marsh plants, at an appropriate elevation/design relative to the tidal range. Nesting individuals utilizing the habitat would be ideal but shouldn't dictate the success of the habitat restoration itself.

ii. Monitoring: Marsh mounds should be monitored (which may include visual assessment) for evidence of movement, erosion, or subsidence of the underlying marsh platform. Vegetation should be monitored to determine if supplemental plantings are needed if revegetation of the marsh mound has not occurred within the desired timeframe. Hydrologic conditions should also be monitored to ensure that the elevation of the marsh habitat mound is sufficient for the tidal range at the treated location, allowing appropriate time periods without substantial flooding during the breeding season.

4. MassDEP recommends that issuing authorities' staff or members review Category 1 corrective actions prior to implementation by the applicant to assess potential impacts and benefits and use a streamlined review approach for Category 2 activities by including such activities as part of any Order of Conditions. Category 1 Corrective Actions should include a justification (e.g., improved elevation data). Review of Category 1 Corrective Actions should be completed as soon as possible to ensure corrective action activities are not delayed. Corrective Action Notifications should be submitted to the issuing authority in accordance with the Corrective Action Plan and with the associated monitoring report. Corrective Actions should be categorized into one of two categories:

a. Category 1: Inadvertent adverse impacts caused by the project (typically unforeseen or not a natural outcome of dynamic marsh process); and

b. Category 2: Maintenance (resulting from natural dynamic processes).

Examples of activities that may fall within each category include, but are not limited to:

i. Repairing unintentional construction impacts (Category 1)

ii. New and/or repair of runnels or ditches that function as Tidal Creeks (Category 1)

iii. Any change in design by moving or adding new ditch remediation locations, or runnels with runnel sub-basins exceeding 0.8 acre (Category 1)

iv. Addressing adverse impacts to salt marsh condition (e.g., marsh collapse due to intersection of subterranean ditch voids) (Category 1)

v. Unclogging of lateral extension/headward expansion runnels with runnel sub-basins less than 0.8 acre (Category 2)

vi. New lateral extension/headward expansion runnels with runnel subbasins less than 0.8 acre. A revised Project Plan Set should be submitted (Category 2)

vii. Adding hay to ditch remediations (Category 2)

viii. Maintenance of marsh habitat mound (Category 2)

ix. Removal of invasive species (Category 2).

Any corrective actions requiring major construction remobilization (including excavators and/or other construction equipment) should include a revised construction schedule with subsequent Construction Inspection and Monitoring Reports as recommended in Section VII (c). Following the Issuing Authority review of Corrective Action, the general process should be:

i. Action is taken to correct the condition,

ii. Follow up monitoring with reports (follow the initial Post-Construction Inspection and Monitoring Plan schedule unless the new construction schedule requires a large deviation) submitted to the Issuing Authority

iii. Process is repeated until Project Objectives are achieved or until the Order expires.

VIII. More Information

For additional information or inquiries regarding this Guidance, project proponents and readers are encouraged to reach out to the following contacts:

- Major Projects and Policies Unit – MassDEP Boston Wetlands Program
- MassDEP Northeast Regional Office Section Chief
- MassDEP Southeast Regional Office Section Chief.

MassDEP requests that project proponents conducting runnel, ditch remediation and marsh mound projects submit their monitoring data to MassDEP for web posting at:

MassDEP
Wetlands Program
100 Cambridge Street, Suite 900
Boston MA 02114

Information may also be emailed to david.hilgeman@mass.gov or christina.y.wu@mass.gov.

Appendix A –Definitions

1. Ditch Remediation is the practice of placing salt marsh hay in legacy agricultural and mosquito control ditches to facilitate sediment accretion and regrowth of native vegetation. The goals of this practice are to restore natural tidal flow/drainage in the salt marsh and prevent undersaturation of the root zone and subsidence from oxidation. Ditch Remediation may also involve removal of blockages (man-made or natural) in the ditch to facilitate remediation of the entire ditch (not to be confused with Runneling) in locations where clogged ditches are causing oversaturation, marsh die-off, and subsidence.
2. Runnels are a shallow channel excavation used to allow impounded water on the marsh platform to drain and improve natural marsh processes (i.e. movement of sediment, increase primary productivity). Construction methods may also involve compaction material to create the drainage feature instead of excavation. There are categories of runnels:
    a. Headward Extension: Extending the primary channel the full extent of the reach sub-basin (i.e., drainage area)
    b. Lateral Expansion: Centralizing flow patterns to the primary channel with a perpendicular (i.e., lateral) reach
    c. To unclog an existing tidal creek or serve as the start of a constructed channel that is allowed to transform to dimensions more suitable for its associated drainage area and position in the marsh (i.e., a pilot channel) for the establishment of a tidal creek, ideally consistent with the original layout of the tidal course.
3. Beneficial Reuse of Excavated Sediment and Peat: Sediment availability is critical to the ability of the salt marsh to keep up with sea level rise. Any excavated, clean, sediment (mainly peat) from project activities (which does not include imported dredged material from other locations), such as runneling, or unclogging existing tidal creeks and ditches, should be beneficially used in the local marsh to increase microtopography features. Below are two tested ways to beneficially reuse the excavated sediment and/or peat. Other methods may be developed in the future and adopted into this guidance in coordination with MassDEP.
    a. Marsh Habitat Mounds: small areas intended to provide vegetated and elevated areas above the elevation of daily tidal inundation with the intent to promote nesting primarily by Saltmarsh Sparrow (*Ammospiza caudacuta)*. The Marsh Habitat Mounds should not be created in isolation, but instead used to extend existing high marsh patches, should not be designed to extend above Highest Astronomical Tide.
    b. Elevation Enhancement: sediment may be spread thinly across the marsh surface, when the material excavated lacks the structural integrity or is unsuitable to be formed into Marsh Habitat Mounds. Spread sediment should be no more than 5 cm at any spot, a minimum of 3 meters from creeks and ditches, and should be spread in a patchy pattern to allow for quick recolonization.
4. Tidal Course is the collection of drainage features such as channels, creeks, and gullies (descending in size, but ascending in location within the tidal course) that collectively serve to allow tidal flow into, through, and out of the marsh during the tidal cycles and to allow freshwater input. Similar to inland systems, the tidal course geometry (depth/width/cross sectional area) expands as the course flows downstream. However, unlike inland systems, tidal course subbasins are not always defined by topographic boundaries and are more heavily influenced by hydrodynamic processes. In areas where Tidal Courses have become obstructed, projects may propose re-opening or clearing Tidal Courses to improve exchange of water and sediment.

5. Tidal Creek: The drainage features and reaches of the tidal course that are more substantial in size. A tidal creek in Massachusetts typically begins at a point where it drains (or has an upgradient sub-basin size) between 0.80 acre and 1.85 acres[6&7] but every marsh is different. In the absence of submitted analysis for where tidal creeks begin, the recommended threshold for defining where tidal creeks begin is a drainage area of 2.47[8] acres and the downgradient tidal course tidal creeks have a well-understood channel trajectory (slope / channel size) although there may be exceptions.

6. Tidal Creek Restoration is the restoration of a Tidal Creek, which has sustained positive topographic relief[9] (i.e., longitudinal slope) and predictable channel geometry (width/depth/cross section)[10]. Tidal creek restorations can occur in the following ways:

   a. A runnel is constructed to create an undersized pilot channel. The expectation is that the runnel will expand to a depth, width, and cross-sectional area that is in equilibrium with the remaining portion of the tidal course, however, this may occur to a lesser extent in systems with smaller tidal range.

   b. Flow within an existing ditch/tidal course reach is consolidated when adjacent ditches are remediated. The outcome of the consolidated flow and the adjacent ditch remediation(s) will increase the existing ditch/tidal course upgradient sub-basin. The expectation is that the existing ditch/tidal course reach will adjust naturally and over time to a depth, width, and cross-sectional area that is in equilibrium with the remaining portion of the tidal course.

7. Subterranean Ditch Voids are entire features or segments of ditches that maintain a hollow or open void in their center, despite becoming vegetated on the surface, making them not easily observed on the marsh platform. Undisturbed, the subterranean ditch void fills with water. When portions of the ditch void are exposed, as may occur when runnels intersect the void, the now open void segments can act as shallow drains that draws the groundwater out of the surrounding marsh and can contribute to marsh subsidence or collapse. In a restoration design, the locations of subterranean ditch voids should be identified to avoid intersecting them. See Section VI.5.e. for further information.

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6 - Rinaldo, A., Fagherazzi, S., Lanzoni, S., & Marani, M. (1999). Tidal networks: 2. Watershed Delineation and Comparative Network Morphology. *Water Resources Research*, *35*(12), 3905-3907.

7 - Parker River reference site located at 42.723690° North, -70.795156° West.

8 - This value was determined with proponents as a compromise to reduce the permitting burden of typical engineering plan set development and requirements.

9 - Perillo, G. (2019). Geomorphology of Tidal Courses and Depressions. Coastal Wetlands, 221-261.

10 - Williams, P. B., Orr, M. K., & Garrity, N. J. (2002). Hydraulic Geometry: A Geomorphic Design Tool for Tidal Marsh. Channel Evolution in Wetland Restoration Projects. Restoration Ecology, 10(3), 577-590.

Appendix B- Information on Other State Permits Applicable to Runnels, Ditch Remediation, and Marsh Habitat Mound Projects

Chapter 91 (M.G.L. c. 91)

Jurisdiction 310 CMR 9.04 – Coastal areas subject to M.G.L. c.91 and the Waterways Regulations include all present and former submerged lands, filled tidelands and lands subject to tidal action up to and including the historic high-water mark (HHWM). The HHWM is the high-water mark which existed prior to human alteration of the shoreline.

Activities Requiring a Permit 310 CMR 9.05(2) – A Chapter 91 permit is required for any dredging, (including backfilling of dredged materials), beach nourishment, subaqueous placement of unconsolidated materials below the low water mark, installation of temporary structures to be in-place not to exceed six months and the potential to impair public rights in tidelands, or test projects.

Activities Requiring a License 310 CMR 9.05(1) – A Chapter 91 license is required for any construction, placement, excavation, addition, improvement, maintenance, repair, replacement, reconstruction, demolition or removal of any fill or structures, not previously authorized, or for which a previous grant or license is not presently valid. In the context of salt marsh restoration, this typically includes the placement (as fill) of plant material within existing ditches or placement of materials dredged from runnel creation as habitat mounds.

Water Dependency 310 CMR 9.12(2)(a)15. – Salt marsh ecological restoration activities including ditch remediation, runnels and construction of marsh habitat mounds are regulated under Chapter 91 as water-dependent use projects.

Activities within an Area of Critical Environmental Concern (ACEC) 310 CMR 9.40(1)(b) – Improvement dredging or the placement of fill within an ACEC may be allowed under Chapter 91 only if the work is part of an Ecological Restoration Project and/or meets the other specified criteria.

Typical salt marsh restoration activities subject to Chapter 91 include the placement of salt marsh hay (i.e., Ditch Remediation) or the construction of Marsh Habitat Mounds. The placement of salt marsh hay or any other unconsolidated material seaward of existing mean high water is regulated as fill (310 CMR 9.02), regardless of the natural or man-made genesis of a ditch for mosquito control or agricultural purposes. The placement of such fill requires a Chapter 91 Waterways License, pursuant to 310 CMR 9.05(1)(a). The construction of marsh habitat mounds is regulated as fill (310 CMR 9.02) and requires a Chapter 91 License, pursuant to 310 CMR 9.05(1)(a).

MEPA (M.G.L. c. 30 § 61)

The Massachusetts Environmental Policy Act (MEPA) Office within the Executive Office of Energy and Environmental Affairs (EEA) conducts environmental reviews of public and private projects requiring approvals by state agencies and certain municipal authorities (“Agency Action” under MEPA). “Agency Action” can mean Agency undertaking a project, or involve Permits, Land Transfers, or Financial Assistance from an Agency. As stated in MEPA regulations, the purpose of the MEPA program is to “provide meaningful opportunities for public review of the potential environmental impacts of projects for which Agency Action is required, and to assist each Agency in using (in addition to applying any other applicable statutory and regulatory standards and requirements) all feasible means to avoid Damage to the Environment or, to the extent Damage to the Environment cannot

be avoided, to minimize and mitigate Damage to the Environment to the maximum extent practicable." 301 C.M.R. 11.01(1)(a); see also M.G.L. c. 30, § 61.

Any project that requires Agency Action and meets or exceeds any MEPA review threshold under 301 CMR 11.03 is subject to MEPA review. If the project meets/exceeds a "mandatory EIR threshold," review will consist of the filing of an Environmental Notification Form (ENF) to MEPA for public review, and, thereafter, the filing of one or more Environmental Impact Reports (EIRs). Effective December 24, 2021, a project that meets/exceeds any review threshold (not just mandatory EIR thresholds) and is located within a designated geographic area ("DGA") (at least 1 mile) of an Environmental Justice (EJ) Population as shown in EEA's EJ Mapper[11], must also undertake a full EIR review process.

Effective January 6, 2023, the MEPA Office amended its regulations at 301 CMR 11.01(2)(b)4. to streamline review of projects that qualify as (full) Ecological Restoration Projects under the WPA regulations at 310 CMR 10.11-10.14. For such projects, a Notice of Ecological Restoration Project may be filed with MEPA in lieu of an ENF, and, unless the EEA Secretary thereafter requires the filing of an ENF or other review process, the project may proceed to subsequent permitting. A project that is located within a DGA of an EJ Population must also undertake outreach and address potential impacts to those populations in the Notice of Ecological Restoration Project filed with MEPA[12].

The streamlining provisions under new 301 CMR 11.01(2)(b)4. do not apply to Ecological Restoration Limited Projects under 310 CMR 10.24(8) and 10.53(4). However, consistent with past practice, such projects may file an Expanded ENF with MEPA and request a waiver of the requirement to file an EIR as set forth in 301 CMR 11.11. Projects located within a DGA of an EJ Population are not eligible for an EIR waiver but may request that a "Rollover EIR" be allowed under 301 CMR 11.05(9). A project proposing one or more salt marsh restoration techniques addressed by this guidance should demonstrate consistency with the best practices outlined herein if it intends to seek to streamline MEPA review procedures.

Mosquito Control Activity

Certain mosquito control activities (i.e., activities to drain, flow, or remove obstructions in wetlands or waters to eradicate mosquitos) are exempt from the WPA as stated in M.G.L. c. 131 § 40. Some mosquito control activities align with restoration activities, and, in these cases, mosquito control projects may involve restoration work as defined in Section I (above), and still qualify under the WPA exemption. For those projects proposing mosquito control work with or without this restoration work, the discharge of dredged or fill material in the salt marsh must fulfill the requirements of the 401 Water Quality Certification regulations (see 314 CMR 9.04). All mosquito control projects proposing these restoration activities are recommended to follow this guidance. These types of projects may include, but are not limited to, projects permitted through the 2023 U.S. Army Corps of Engineers (USACE) General Permit 10: Aquatic Habitat Restoration, Establishment, and

11 - https://mass-eoeea.maps.arcgis.com/apps/MapSeries/index.html?appid=535e4419dc0545be980545a0eeaf9b53
12 - Further explanation of the MEPA review process for Ecological Restoration Projects is available here: https://www.mass.gov/info-details/streamlined-process-for-ecological-restoration-projects.

Enhancement Activities, and the 2023 USACE General Permit 22: Reshaping Existing Drainage Ditches, New Ditches, and Mosquito Management.

Mosquito control projects within salt marsh that involve ditch maintenance and clearance, ditch, or channel creation, or that alter habitat by impacting hydrology or aquatic ecosystems likely require a USACE Dredge and Fill Permit. All mosquito control activities requiring authorization from the USACE for a Section 404 Dredge and Fill Permit, require a Section 401 Water Quality Certification and are also subject to a federal consistency review pursuant to the Coastal Zone Act and the associated coastal zone management program. The MA Office of Coastal Zone Management (CZM) recommends that proponents of all mosquito control projects involving activities that could potentially impact coastal resources or areas within the state's coastal zone consult with CZM to ensure that state standards are met.

Mosquito reduction activities including reshaping of drainage ditches are included in the 2023 USACE General Permit 10. However, mosquito reduction activities that are combined with restoration work may fall under USACE General Permit 22 (see USACE General Permit here: https://www.nae.usace.army.mil/Portals/74/docs/regulatory/PermitsIssued/2023/General%20Permit/2023_MAGP_20230601-%20FINAL.pdf?ver=fPs0hlHZsKVhjMUMzMvkZg%3d%3d).

Coastal Zone Management (CZM) Federal Consistency Review

Salt marsh restoration projects in Massachusetts are subject to CZM federal consistency review, which ensures that they comply with federal laws and policies regarding coastal management. This review process is mandated by the Coastal Zone Management Act and requires proposed projects in coastal areas to be consistent with the objectives of the state's coastal management program and federal coastal management policies. For salt marsh restoration projects, CZM evaluates various factors such as impacts on coastal resources, water quality, wildlife habitat, and public access. The review aims to assess the project's potential effects on coastal resources and determine whether it aligns with the state's coastal management goals, including the preservation and enhancement of salt marsh ecosystems. Through this process, CZM ensures that salt marsh restoration projects contribute to the overall health and resilience of coastal areas while minimizing adverse impacts on the environment and coastal communities.

The CZM Coastal Permitting Guide can be found here: https://www.mass.gov/info-details/environmental-permitting-in-coastal-massachusetts.

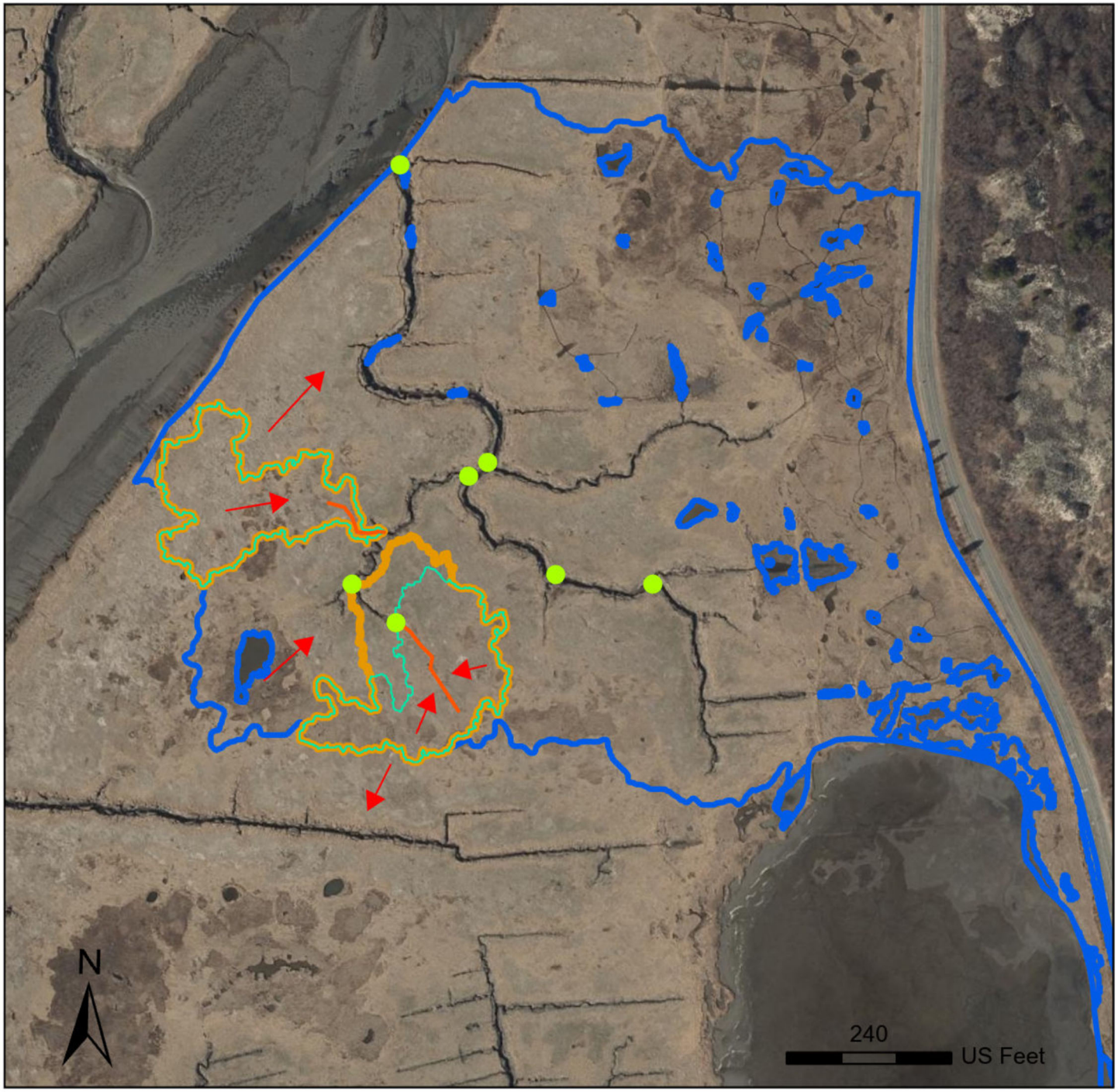
Massachusetts In-Lieu Fee (ILF) Program

The Massachusetts In-Lieu Fee (ILF) Program is an approach to compensate for unavoidable impacts to wetlands and water resources resulting from development projects under the Army Corps of Engineers Section 404 Dredge and Fill Permit requirements. The ILF Program is administered by the Department of Fish and Game and allows proponents to provide financial contributions to support wetland restoration, enhancement, and preservation projects instead of undertaking direct mitigation efforts on-site. These financial contributions are pooled into a fund and used to implement wetland restoration and conservation projects across the Commonwealth.

Salt marsh restoration projects funded by the Massachusetts ILF Program should follow the below guidelines:

- Proponents may use the baseline condition assessment developed for their mitigation project plan provided it follows the Baseline Conditions Data Collection Plan recommendations outlined in Section VI. 5.
- Proponents may address the Project Objectives outlined in Section VI. 6. of this guidance in the Ecological Performance Standards in their mitigation project plans
- Proponents should incorporate the recommendations described in the Corrective Action Plan Section VI.6. and 8 of this guidance in the Adaptive Management Plan within their mitigation project plan
- Regarding the Construction and Post-Construction Period Monitoring Plan described in Section VI. 7.e. of this guidance, proponents may use the monitoring and reporting schedule established in their mitigation project plan for this purpose provided it is consistent with these recommendations.

Appendix C- Figures



Legend

- Runnel Sub-basin
- USGS Marsh Unit*
- Example Reach Sub-basins (not all sub-basins are shown)
- Proposed Runnel
- Drainage Direction
- Examples of confluences/ intersections of channelized flow

Note: A reach refers to a section or sections of a tidal course located upgradient of a confluence of channelized flow paths. Therefore, there are sub-basins corresponding to each confluence (not all confluences are identified in this figure).

Runnel sub-basin may be a subset of the reach sub-basin when the runnel serves to extend the existing reach (e.g. example on the right = headward expansion runnel), or alternatively runnel sub-basins may equal the reach sub-basin (e.g., example on the left = lateral extension runnel).

This figure is for illustrative purposes only and may not represent real conditions.

MassDEP

Figure 1. Sub-basin illustration (May 2024)

*Ackerman, K.V., Defne, Z., and Ganju, N.K., 2021, Geospatial Characterization of Salt Marshes for Massachusetts: U.S. Geological Survey data release, https://doi.org/10.5066/P97E086F.

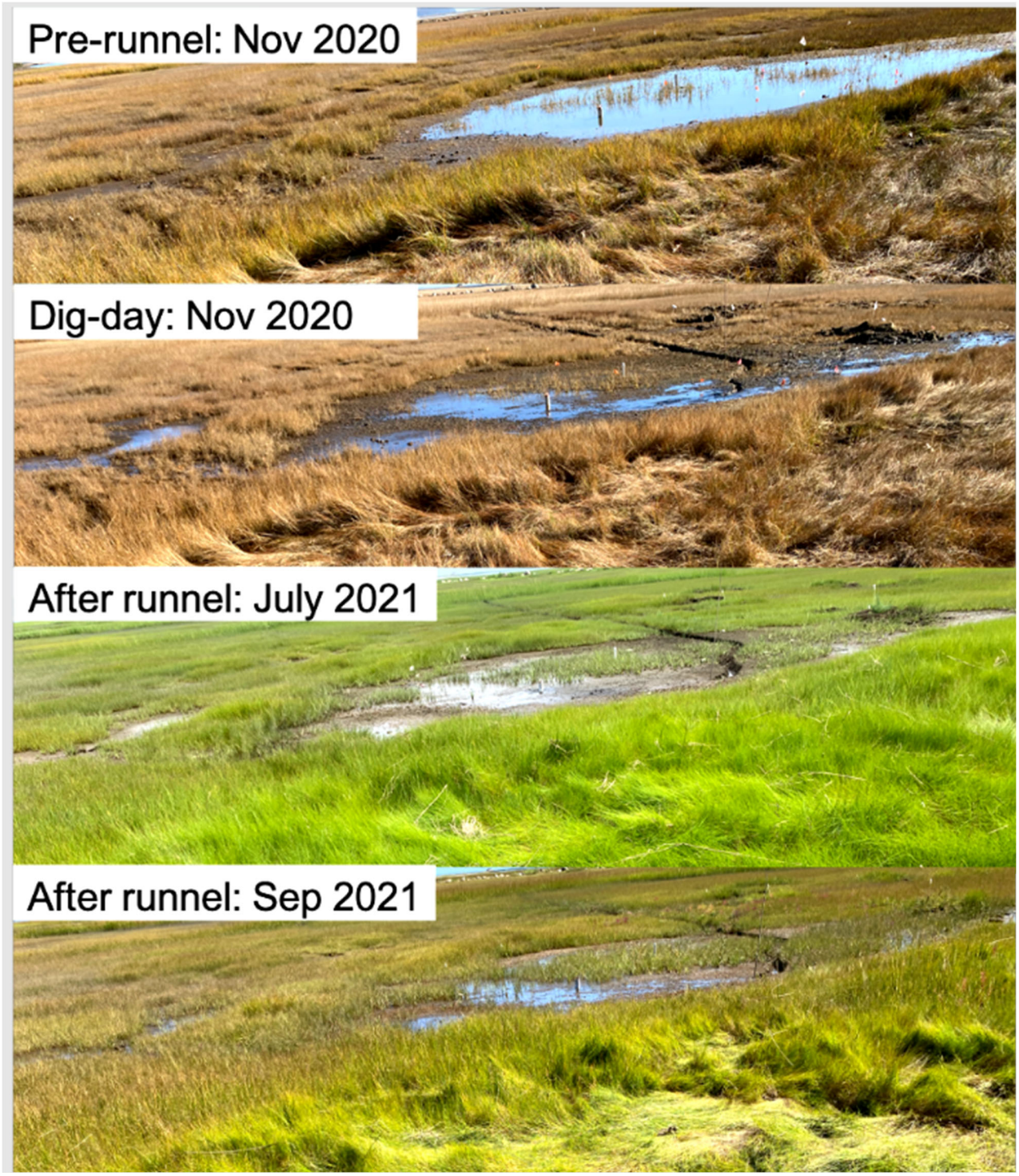


Figure 2. The intended restoration trajectory of constructing runnels in a salt marsh. Source: https://alicebesterman.weebly.com/salt-marsh-climate-adaptation-runnels.html

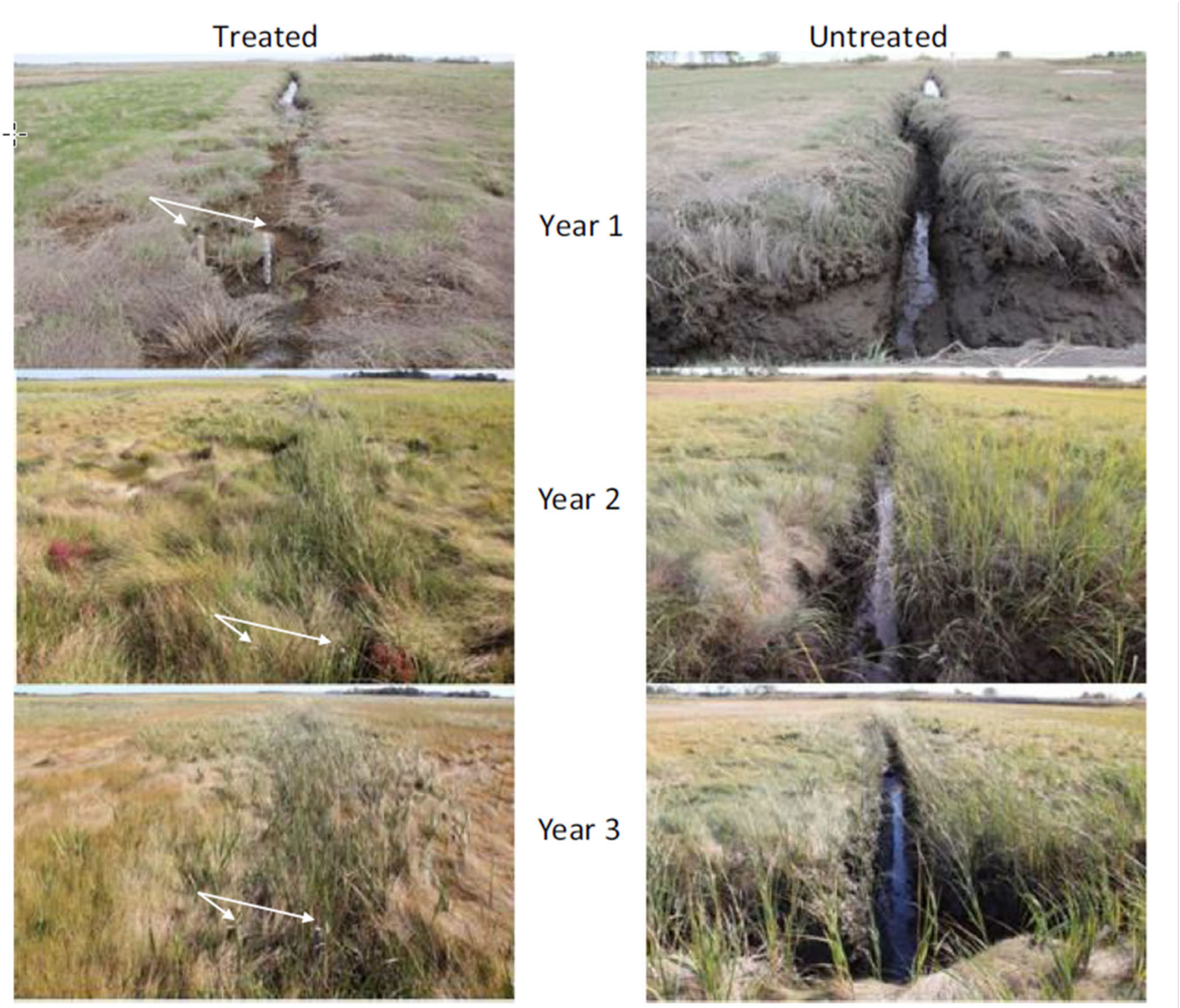


Figure 3. The intended restoration trajectory for ditch remediation illustrated by a comparison of treated versus untreated ditches. Source: Burdick et al. 2020[4].

Figure 4. The intended restoration trajectory of marsh habitat mounds in a salt marsh. Source: U.S. Fish and Wildlife Service Northeast Region At Risk Species Webinar Series, Restoration of tidal hydrology impacted by legacy human impacts and accelerated sea level rise, Presented by Wenley Ferguson, Save the Bay, April 21, 2023.