

<b>INITIAL CLEAN-UP (1/1)</b>		
<i>Techniques / objectives / procedures</i>	<i>Equipment needed</i>	<i>Factors to be considered</i>
<p><b>1. Natural clean-up</b> <span style="border: 1px solid black; padding: 2px;">➤ Datasheet n°01</span></p> <p><i>Aim: to prevent additional environmental damage caused by unnecessary intervention</i></p> <ul style="list-style-type: none"> <li>- site surveying</li> <li>- monitor the evolution (regular surveying of the marsh and the pollution)</li> </ul> <p>To be considered as a priority especially in the case of a small or moderate pollution</p>	<ul style="list-style-type: none"> <li>- small flat-bottomed boat (possibly)</li> </ul>	<ul style="list-style-type: none"> <li>- high ecological sensitivity of this type of site</li> <li>- very low load-bearing capacity</li> <li>- the ecological impact of response can be more harmful than that of the oil itself</li> <li>- intervention should only be considered in the case of deposits of large slicks of heavy fuel oil or in the case of buried pollutant</li> <li>- call upon the services of an expert botanist</li> </ul>
<p><i>Prior operation</i></p> <ul style="list-style-type: none"> <li>• <b>Preparation of pathways and storage points</b></li> </ul> <p><i>Aim: limit the harmful effects of intervention especially due to pedestrian and vehicle traffic: reduce and channel traffic, define, cordon off and protect pathways and storage sites.</i></p>	<ul style="list-style-type: none"> <li>- stakes, tape etc.</li> <li>- ground protection (pathways and storage points): geotextile, sheeting, wickerwork fencing, planks etc.</li> </ul>	<ul style="list-style-type: none"> <li>- ecological sensitivity</li> <li>- definition according to the sensitivity of the vegetation (ask an expert botanist)</li> </ul>
<p><b>2. Manual recovery</b> <span style="border: 1px solid black; padding: 2px;">➤ Datasheet n°09</span></p> <p><i>Aim: to remove clusters of pollutant, polluted debris and large accumulations of oil, especially when easily accessible (this phase is generally the only one)</i></p> <ul style="list-style-type: none"> <li>- on foot</li> <li>- from small boats</li> </ul>	<ul style="list-style-type: none"> <li>- manual tools: forks, shovels, scrapers, rakes etc.</li> <li>- bins, stretchers etc.</li> <li>- artificial pathways (duckboard, driving tracks, geotextile grating)</li> <li>- small flat-bottomed boat, floating pontoon etc.</li> <li>- possibly quad bike for support</li> </ul>	<ul style="list-style-type: none"> <li>- personal health and safety (protective clothing)</li> <li>- organisation of teams: accurately define the response procedure and the different positions</li> <li>- sensitivity to trampling</li> <li>- selectivity</li> <li>- supervision by a botanist</li> </ul>
<p><b>3. Hosing</b></p> <p><i>Aim: to move accumulations of mobilisable pollutant towards a collection point, either in the form of a depression (pool, channel) or on the water (floating boom)</i></p> <ul style="list-style-type: none"> <li>- (case 1) by <b>flushing</b> with very low pressure <span style="border: 1px solid black; padding: 2px;">➤ Datasheet n°12</span></li> <li>- (case 2) by <b>flooding</b> through a laminar flow <span style="border: 1px solid black; padding: 2px;">➤ Datasheet n°13</span></li> </ul>	<ul style="list-style-type: none"> <li>- small supply pump, possibly floating pump</li> <li>- fire or impact hose</li> <li>- high speed transfer pump supplying several hoses</li> <li>- perforated tube ("fountain")</li> <li>- artificial flow</li> <li>- small flat-bottomed boat, floating pontoon etc.</li> <li>- light floating boom</li> <li>- containment (floating boom), recovery (pumping, sorbents or landing nets) and storage means</li> </ul>	<ul style="list-style-type: none"> <li>- very often problematic water supply: contain water in trenches or seawater reservoirs</li> <li>- potentially destructive effect of hosing (pressure)</li> </ul>
<p><b>4. Pruning</b> <span style="border: 1px solid black; padding: 2px;">➤ Datasheet n°27</span></p> <p><i>Aim: to cut back and remove the aboveground parts of heavily oiled or smothered plants, in order to reduce the impact and remove the source of chronic contamination</i></p> <ul style="list-style-type: none"> <li>- on foot</li> <li>- from the water</li> </ul>	<ul style="list-style-type: none"> <li>- manual cutting tools (sickle, scythe, pruning shears, strimmer etc.)</li> <li>- weed cutter</li> <li>- big bags</li> <li>- artificial pathways</li> <li>- small flat-bottomed boat</li> <li>- evacuation means (stretchers, boat, quad bikes for support etc.)</li> </ul>	<ul style="list-style-type: none"> <li>- only in the case of heavy pollution and upon recommendation by a botanist (who organises and oversees the worksite)</li> <li>- variable effects (beneficial to harmful) according to the species and the seasons</li> <li>- potential new arrivals of pollutant</li> <li>- frequentation or otherwise by avifauna</li> <li>- safety and organisation of personnel</li> </ul>

<b>FINAL CLEAN-UP (1/1)</b>		
<i>Techniques / objectives / procedures</i>	<i>Equipment needed</i>	<i>Factors to be considered</i>
<p><b>1. Drainage</b> <span style="float: right;">➤ <b>Datasheet n°18</b></span></p> <p><i>Aim: to free the pollutant trapped in the ground and the vegetation by digging small trenches converging at a lower collection point, in the form of a depression (pool, channel) or on the water (floating boom)</i></p> <p>This technique can be optimised by the use of hoses:</p> <ul style="list-style-type: none"> <li>- (case 1) by <b>flushing</b> with very low pressure <span style="float: right;">➤ <b>Datasheet n°12</b></span></li> <li>- (case 2) by <b>flooding</b> through a laminar flow <span style="float: right;">➤ <b>Datasheet n°13</b></span></li> </ul>	<ul style="list-style-type: none"> <li>- shovels, spades etc.</li> <li>- containment system (light sorbent booms, improvised filter dams in channels etc.)</li> <li>- recovery means (absorption, pumping)</li> <li>- small supply pump, possibly floating pump</li> <li>- fire or impact hose</li> <li>- high speed transfer pump supplying several hoses</li> <li>- perforated tube ("fountain")</li> </ul>	<ul style="list-style-type: none"> <li>- only on marshes heavily polluted by fluid oil</li> <li>- very often problematic water supply: contain water in trenches or seawater reservoirs</li> <li>- destructive effect on the ground if the pressure is too high</li> </ul>
<p><i>Systematic complementary operation:</i></p> <ul style="list-style-type: none"> <li>• <b>effluent recovery</b> <i>Aim: to stop the pollution from spreading by installing a recovery system</i></li> <li>- on the water <span style="float: right;">➤ <b>Datasheet n°14</b></span></li> <li>- on the foreshore <span style="float: right;">➤ <b>Datasheet n°15</b></span></li> </ul>	<p>(should be adapted to suit the pollutant and the site)</p> <ul style="list-style-type: none"> <li>- containment equipment: floating or shore-sealing booms, pits etc.</li> <li>- recovery and evacuation means pump, sorbents etc.</li> <li>- settling and storage tanks</li> </ul>	<ul style="list-style-type: none"> <li>- tide</li> <li>- agitation of the water body</li> </ul>
<p><b>2. Resurfacing</b></p> <p><i>Aim: to cause large accumulations of pollutant stuck to the bottom to refloat, so as to recover them at the (sub)surface (skimming, absorption, landing nets etc.)</i></p> <ul style="list-style-type: none"> <li>- (case 1) via light <b>underwater mixing</b> <span style="float: right;">➤ <b>Datasheet n°16</b></span></li> <li>- (case 2) via any other low intensity mechanical agitation of the water at the (sub)surface: using an agitator, propeller, ventilator or by bubbling</li> </ul>	<p>(<i>assess in accordance with the type of marsh and the viscosity of the pollutant</i>)</p> <ul style="list-style-type: none"> <li>- small flat-bottomed boat, pontoon</li> <li>- small supply pump, possibly floating pump</li> <li>- fire or impact hose</li> <li>- compressor</li> <li>- agitator, propeller, ventilator</li> <li>- containment (floating boom), recovery (pumping, sorbents or landing nets) and storage means</li> </ul>	<ul style="list-style-type: none"> <li>- personal health and safety (protective clothing and rescue measures)</li> <li>- destructive effect on ground and vegetation if the pressure is too high: create low to very low pressure or agitation on the water body</li> <li>- organising resources: accurately define the response procedure and the different positions</li> </ul>
<p><b>3. Scarification</b> <span style="float: right;">➤ <b>Datasheet n°28</b></span></p> <p><i>Aim: to facilitate natural degradation of oil</i></p> <ul style="list-style-type: none"> <li>- breaking of hardened oil</li> </ul>	<ul style="list-style-type: none"> <li>- manual tools: rakes, scarifiers</li> </ul>	<ul style="list-style-type: none"> <li>- presupposes intervention several months after the spill</li> </ul>
<p><b>4. Bioremediation</b> <span style="float: right;">➤ <b>Datasheet n°29</b></span></p> <p><i>Aim: to accelerate natural breakdown of oil by bacteria and other micro-organisms</i></p> <ul style="list-style-type: none"> <li>- spreading bioremediation agents</li> </ul>	<ul style="list-style-type: none"> <li>- bioremediation agents</li> <li>- spreader</li> </ul>	<ul style="list-style-type: none"> <li>- only on light or residual pollution</li> <li>- opportunity for implementation (assess according the procedures defined by experts)</li> <li>- efficiency and toxicity of the product</li> <li>- monitoring initiative.</li> </ul>