Table 1: Definition of Control

Parameter	Consideration/Constraint	Influence	Plant type
Water uses and functions	identify uses, values or functions of each water body to determine which if any may be at risk from invasive aquatic plants or nuisance growths of native and non-native plants - control tools and management strategies must be compatible with water body uses - water uses and conditions change and must be considered during the planning for each control operation	the uses of each water body must be identified and prioritized in order to develop management objectives - management objectives and water uses influence the tools and strategies best suited for aquatic plant control which in turn influence the spatial extent and duration of control	E = emergent S = submersed F = floating Plant types are listed if their control is a primary consideration or influenced by this control consideration
Navigation and access	river channels or boat ramps blocked, areas of lakes inaccessible	frequent inspections and rapid response are necessary to sustain commercial navigation in rivers and canals - frequent inspections and control as necessary to conserve recreational access and navigation	E, S, F
Transportation	floating plant masses jam against bridges and may cause structural damage or erosion around pilings	frequent inspections and rapid response are necessary to prevent damage associated with aquatic vegetation, especially tussocks and floating islands	E, S, F
Flood control	plant masses can block or impede water flow in river channels, canals, lake outfalls, or flood control structures	frequent inspections and control of invasive plants that may impact flood control to the lowest feasible level - control native and non-invasive plants as necessary to conserve flood control	E, S, F
Potable water	plants clog water intakes	frequent inspections and control of plants as necessary to prevent disruption of water supply - herbicides must have potable water tolerance, set-back distance, or concentration limit	S, F
Irrigation	plants clog water intakes, impede water flow in ditches, canals, and rivers	ensure herbicides are compatible with irrigated crops, may need to treat when crops not in field, find alternate irrigation supply	E, S, F
Livestock watering	plants do not usually impact ability for watering livestock from water bodies	if herbicides used, may need to remove livestock from water body shoreline, find alternate watering source	E, S, F
Downstream uses and needs	plant masses prevent water releases for downstream uses like drinking, irrigation, wetland restoration, estuaries	control plants to provide downstream water - herbicides must be compatible with downstream uses - coordinate control with water releases - frequent releases may dilute or draw off herbicide concentrations	E, S, F
Recreation	identify and assess recreational uses within the system	aquatic plants may enhance or hinder recreational activities within a water body that may be seasonal or year-round	
Boating	plants can restrict access and boating activities	select control methods and frequency to accommodate types and amounts of boating - inboard/outboard motor, sailing, canoe/kayak, rowing shell, etc.	E, S, F
Fishing	plants can block access to fishing areas - plants provide habitat to support fisheries and at high densities and cover can impair fish and wildlife habitat	manage invasive plants to conserve or enhance native plants - select herbicides that are compatible with fishery – try to time control to minimize impacts with bedding and increased activities like	E, S, F

		tournaments, weekends, holidays, etc.	
Hunting	plants can block access to hunting areas - plants provide habitat and food source, especially for some waterfowl	manage invasive plants to conserve or enhance native plant habitat - plan control to minimize impacts with hunting	E, S, F
Swimming	plants can cover swimming areas, increase danger of entanglement and drowning	select control method compatible with swimming or control during low or no swimming periods	E, S, F
Skiing	plants can impede boat operation and increase danger of entanglement and drowning	keep designated ski / boating areas free of aquatic plants	E, S, F
Wildlife viewing	plants can block access to wildlife viewing areas and view of wildlife	work with wildlife management agencies to ensure access to wildlife areas is acceptable - keep designated areas open for boat access	E, S, F
Fish and wildlife management	identify and assess wildlife uses and needs within the system - while moderate levels of plants may provide essential habitat or forage, too many plants may cover nesting, bedding and forage areas	aquatic plants and control operations may enhance or hinder wildlife management activities within a water body that may be seasonal or year round	
Endangered species, including habitat and forage/prey	plants may provide essential habitat for endangered species - conversely, plants can cover nesting, bedding and forage sites as well as impair habitat for forage animals - ex: in Florida, waterhyacinth may outcompete native plants essential for Everglades Kite nesting as well as cover their prey (apple snails) causing them to abandon nests	understand types and seasonality of endangered species as well as forage/prey habitat requirements, select control tools and timing compatible with endangered species	E, S, F
Fishery	moderate levels of diverse plant communities are generally viewed as favorable for many sport fish populations - monocultures of nuisance or invasive plants can crowd out beneficial native plants, cover bedding sites, stunt or eliminate some fish populations, reduce dissolved oxygen leading to fish kills	select control methods compatible with fish management objectives for water body - ex: do not drawdown during spawn; repeated harvesting may reduce young of year sport fish, ensure herbicide is compatible with primary fish management objective, avoid formation of extensive surface mats of submersed or floating plants and large submersed plant treatments with contact-type herbicides during hot water/low oxygen periods	E, S, F
Waterfowl hunting	plant monocultures can crowd out or cover beneficial native plants	if possible, control plants well in advance of or after hunting season	E, S, F
Non-game wildlife	plant monocultures can crowd out or cover beneficial native plants or cover nesting and foraging sites	identify areas or species of concern with wildlife management agency and select control tools and timing compatible with non-game species managed in the water body	E, S, F
Habitat	plant monocultures can crowd out or cover beneficial native plants	control invasive or nuisance plant populations to conserve or enhance diverse beneficial native plant assemblages	E, S, F
Nesting / foraging	plant monocultures can cover fish bedding sites, interfere with rookeries, cover or exclude prey or forage animals and plants	control invasive or nuisance plant populations to conserve nesting and foraging sites, ensure control tools are compatible with important forage plants and animals	E, S, F

Vegetation planting project	invasive and nuisance plant growth can cover or crowd out newly planted vegetation	prevent invasive or nuisance plants from covering revegetation projects, select control tools and timing that are compatible with planted species	E, S, F
Mosquito control	invasive floating plants and surface mats of submersed plants are ideal mosquito breeding sites	control invasive and nuisance plant mats, especially in quiescent waters in urban areas to reduce mosquito habitat	S, F
Control feasibility	various parameters influence whether or not a plant can be effectively controlled including; available tools, water body physical and chemical conditions, and plant susceptibility and growth stage	list and consider all control tools that have been proven successful in the water body in question or in similar waters and conditions - integrate the best tool or tools compatible with water body uses, functions, and conditions, that meet management objectives into the control program	
Potential for control			
Available methods	list all plant control tools that have been demonstrated effective in controlling plant(s) in question - demonstrated through documentation, contact with experienced managers that have effectively applied that control strategy	integrate tools into control plan that have been demonstrated to be effective - if tool is new, unproven, experimental, etc., approach implementation as operational research and convey to stakeholders the level of control anticipated and level of confidence in achieving control	E, S, F
Biological	usually refers to releasing an animal species including fish, arthropods, or pathogens to suppress or control target aquatic plants to some extent	effectiveness may vary from suppression to complete control so target plant susceptibility and management objectives must be clearly evaluated and conveyed to stakeholders	E, S, F
Fish – grass carp	generalist feeder that may control target and non-target plants - prefer some plant species over others - sterile, triploid chromosome variety available - mobile river fish that may need to be contained with physical or electric barrier - may control plants for up to a decade - may require permit from fish and game agency - extremely difficult to remove and determine population size in system after stocked (easier to add more if needed than to remove after stocking)	test to ensure that only sterile triploid carp are released - ensure target plant is susceptible to grass carp, stock at the lowest feasible level - consider controlling target plants with other methods first to reduce biomass - install containment strategy - identify non-target susceptible plants - develop integrated strategy to augment control - stock 10”-12” fish in cooler months to reduce losses from predation, heat stress, and low dissolved oxygen - stocking rate can change significantly, ex: if water levels increase or decrease after stocking or sudden natural declines in vegetation (shading, etc.) can cause “overstocked” situation	S, F
Arthropods	most classical biological control is conducted with insects - agents must be approved by the USDA as well as state regulatory agencies prior to release to ensure host specificity - agents may reproduce in self-sustaining populations or may need additional releases to sustain sufficient levels to suppress or control plants	impacts from insects may range from no observable control to decimation of target plant depending on insect species, plant type and climate at release site - predation from native animals (birds, fish, wasps, etc.) may influence the biocontrol population size and therefore the level of stress, suppression, or control achieved	E, S, F
Pathogens	some plant pathogens, especially fungi can stress aquatic plants - commercially available pathogens (bioherbicides) are under research evaluation	naturally occurring outbreaks may increase efficacy of herbicide treatments, ex: water hyacinth control in some Florida waters	E, S, F

Chemical Herbicides	chemical herbicides must be registered for aquatic use by the USEPA and state regulatory agency - permits may be required from state or local governments before using registered herbicides	sites and maximum rates are regulated by the federal and state label - susceptible plant species and lower than maximum use rates are determined through laboratory and operational research	E, S, F
Contact/systemic	herbicides fall into two general categories, faster acting contact type herbicides that the kill the portion of the plant to which they are applied, and slower acting systemic type herbicides that translocate within the plant killing the entire plant including the roots	faster acting or contact type herbicides may be more conducive to controlling submersed plants in flowing waters - slower systemic herbicides may be more suited to large-scale treatments to minimize oxygen consumption during plant decomposition	E, S, F
Liquid/pellet formulation	herbicide formulations fall into two basic formulations; liquid or aqueous, and solid pellets, flakes, wettable powders, or granules	liquid formulations are usually less expensive and are a better choice in waters with thick soft sediments where pellets can sink, diminishing effectiveness - pellets applied in slow flowing waters with firm substrates sustain prescribed concentrations for longer periods	E, S, F
Plant growth regulators	PGRs do not kill, but rather suppress growth of target aquatic plant	herbicides at low rates may provide some plant growth regulation - may lead to increased resistance in plants if not killed - application of this control strategy not well developed	S
Mechanical			
Harvester	removal of plant mass from water body - may control non-target plants and animals - various designs, sizes, and hauling capacity available – may provide immediate control of small scale plant problems	may fragment and spread target plant - must find disposal sites - removes target and non-target plants and animals - more efficient harvesters may harvest larger fish and wildlife that cannot escape path - efficiency may be increased with barges to shuttle plants to disposal site – may create turbidity in shallow waters	E, S, F
Barge mounted hoe/dragline	removal of dense mats of plants and floating islands	removes dense masses of vegetation and other material from canals and river channels as well as bridges and flood control structures - may fragment and spread target plant - must find disposal sites - may remove target and non-target plants and animals	E, S, F
Shredder	various designs are available to shred floating masses of herbaceous and woody plants and floating masses or islands of sediments	used for emergency restoration of access, navigation, or flood control attributes as well as around bridges - generates fragments that may spread invasive plants - controls all plants and animals in control area - may require additional shredding or harvesting of materials that float back to the surface - may generate extensive turbidity - drops mater on bottom - not advisable for repeated use at boat ramps, navigation channels, residential shorelines, etc.	E, S, F
Rotovator	underwater apparatus or arm extending from barge with rotating tines to tear plants from sediments	generates fragments and may spread invasive plant infestation - may need to harvest uprooted plants - disturbs sediments and may generate extensive turbidity	E, S
Cultural/Physical			

Barriers	passive devises to cover target plants, or to contain plant fragments, turbidity, herbicide-treated water - may be highly labor intensive to install/remove	may be used in small areas where other options are less practical	E, S
Benthic	fabric laid over plants on substrate - must anchor to bottom - place over live plants or control plants to substrate and place barrier to control re-growth	evaluate potential impacts to target and non-target plants and animals - may need to clean barrier to prevent plant growth on top	E, S
Curtains	vertical barrier in the water column to minimize water exchange from one site to another - can either be manufactured curtain to prevent water exchange to contain herbicides, or a strip of plants left on the edge of harvest or shredding sites to contain fragments or turbidity	prevent or reduce herbicide dilution and turbidity in flowing or open waters	E, S
Benthic rollers	devise usually anchored to a piling or dock to roll over plants and sediments	may be effective on small scale - needs power source and frequent monitoring	E, S
Drawdown	water control structure must be available - reducing water levels to accommodate aquatic plant control must be compatible with other uses and functions of the water body - consider ability to refill water body after drawdown	drawdowns need to last for several months - must be complete to desiccate plants - best applied in winter to include impacts from freezing - compatible with prescribed fire for emergent plant control - try to avoid during fish spawn, waterfowl hunting, endangered species nesting foraging - partial drawdowns during growing season may allow invasive or nuisance submersed plants to colonize into deeper waters expanding the problem - incomplete drawdowns may allow wetland plants like cattail or willow to reach nuisance levels	E, S, F
Desiccation	extreme drawdown must be of sufficient duration to dry target plants and preferably sediments - not appropriate during wet or growing season	plants that produce underground tubers (hydrilla) or extensive seed bank (water hyacinth) are not well suited to control by drawdown - in some areas floating islands may develop upon re-flooding and may need to be controlled	E, S, F
Freezing	freezing enhances desiccation and amount of control	drawdown needs to expose sediment to reducing insulating effect from water - conversely, summer drawdowns can increase spread of invasive (torpedograss) or native plants (willow) can expand to nuisance levels	E, S, F
Prescribed fire	planned burning of emergent vegetation to reduce standing crop - burning must be compatible with surrounding land use	reduces standing crop and stimulates re-growth in some species - be prepared to follow up with other methods including herbicides upon re-flooding – may not be practical in urban areas or near high traffic highways	E

Flooding	flush floating plants or mats of plants out of system or into uplands, - increase water level to shade and stress submersed plants	raising the water level to flush and strand floating plants or mats of plants into uplands is an option in waters with flood control structure and few to no houses or structures along shoreline - other flooding methods include lowering water levels to treat submersed plants, then re-flooding to reduce light and further stress plants - some emergent plants (torpedograss) can be controlled by dewatering, burning, and re-flooding to suppress re-growth	E, S, F
Dredge – barge mounted	large-scale dredging operation that removes rooted plants and sediments - sediments returned to water column or pumped to settling basin	may miss plants - may fragment and spread plants - may increase turbidity	S
Dredge – diver assisted	hand-held suction devise controlled by underwater diver using snorkel or SCUBA - dislodge plants by hand and place into suction lift to screen plants onshore or on attending barge	labor intensive - effective in small areas where other methods are not practical - may cause or may be impeded by siltation / turbidity	S
Dyes	artificial dyes like natural tannins color water, reducing light penetration to control or suppress submersed plant growth	may provide submersed plant and algae suppression in small areas where water flow, volume, and exchange are low	S
Hand pulling	removing plants by hand - includes tossing rakes or hand-held cutting blades to sheer plants	immediate control - labor intensive - may be suitable for new infestations around boat ramps, docks, trash rakes at water intakes, pumps, etc. - may use rakes and cutting blades to clear small areas of plant material - creates fragments that may spread plants to other areas	E, S, F
Shearing - chains, etc.	includes any of a number of devises that are dragged through rooted stands of plants including chains pulled by hand or steel bars towed by boat or barge	labor intensive - disturbs sediments - creates fragments and turbidity - may need to clear obstructions - used in some canal systems where most plants may be considered undesirable and substrate habitat is a low concern	E, S
Waterbody parameters			
Hydrology			
Water depth	water depth can influence the cost and duration of control - water control structures can give the flexibility of reducing and increasing water depths to accommodate control	re-growth of submersed plants to the surface is faster in shallow waters - do control costs, methods, etc. warrant short term control? - control of submersed plants with herbicides requires treating much or all of the water column - shallow water should be less costly to treat than deep water - increasing the water depth after a submersed plant herbicide treatment reduces light penetration enhancing the amount and duration of control	E, S
Water volume	important for herbicide control since effectiveness of many herbicides is dependent upon sustaining a prescribed concentration	reducing water volumes before herbicide treatments for submersed plant control can save money and increase efficacy - increasing water volume before use of herbicides to control submersed plants can dilute concentration and reduce or negate control efficacy	S

Water flow	static vs. moving water can play an important role in selecting control methods	important in determining pelletized vs. liquid formulation herbicides - dilution from flow may be too great to apply herbicides, especially slow acting systemic compounds - flow may dictate urgency of control, ex: to keep floating plants from clogging flood control structures or jamming against bridges - keeping flow unimpeded may impact ability to contain grass carp with conventional physical barrier	E, S, F
Springs / sinkholes	related to flow	groundwater may dilute or dissipate herbicides	S
Tidal influence	tides can raise or lower water levels and volumes, can flush herbicides, and regulate plant growth	may dilute herbicide concentrations by adding water volume at high tide or flush herbicides out of treatment area as tide recedes - depending on salt content, may preclude use of some herbicides not registered for use in brackish or marine waters - may restrict access for herbicide spray boats, harvesters, barges, etc. due to low (grounding) or high (bridge clearance) water level - invasive plants may not reach problem level if salt content sufficiently high - ex: hydrilla in brackish water - may favor invasive species tolerant to low salinities - ex: Eurasian watermilfoil	S
Water chemistry			
Dissolved oxygen	oxygen is needed to sustain aquatic life and decompose organic sediments and detritus - warmer water holds less dissolved oxygen than cooler water	check oxygen level prior to herbicide use - slow acting or systemic herbicides or treating smaller areas with contact type herbicides can reduce amount of plant decomposition and demand on oxygen to avoid stressing or killing fish - try to conduct large-scale plant management in cooler months before plants reach peak biomass (more oxygen / less decomposition)	S, F
pH, alkalinity, and hardness	these parameters may be important in determining invasiveness of plants in certain waters - ex: water hyacinth and hydrilla do not grow as well in low pH waters - pH, alkalinity, and hardness modify performance of certain herbicides	low alkalinity and pH increase copper toxicity to fish - high pH decreases efficacy of flumioxazin herbicide for submersed plant control - hard water binds with glyphosate and reduces efficacy	S
Nutrient content	nutrient content in aquatic macrophytes and in the sediments may be re-suspended in the water column after controlling aquatic plants - nutrients are released from decomposing plants and in shallow waters, sediments may be stirred by wave and water currents	nutrient content may be a concern when planning large-scale management - some nutrients are released by decomposing plants - removing plants from the system to remove nutrients may not be cost-effective since aquatic plants are mostly water - sediment nutrient re-suspension may be significant after the calming effects of plant cover is removed	S, F
Water transparency	water transparency affects the amount of and depth to which light penetrates the water column to stimulate submersed plant growth and growth of new emergent plant shoots	generally, submersed plants grow faster in waters with higher transparency with all other factors being equal - conversely, lower transparency can retard growth of submersed plant shoots	S

Color / tannic content	highly colored or tannic water limits light penetration and can suppress submersed plant growth	submersed plant recovery after control can be retarded in highly colored or tannic waters - anticipate increased submersed plant control duration	S
Turbidity / suspended particles	turbid water limits light and suppresses submersed plant growth	submersed plant recovery after control may be retarded in highly turbid waters - suspended clays and organics can neutralize diquat and fluridone herbicides	S
Algal type and concentration	some algal blooms can suppress submersed plant growth either through light attenuation or perhaps allelopathy with blue-green blooms	treating large areas of submersed plants during a planktonic algae bloom may perpetuate or enhance the bloom	S
Sediment characteristics			
Composition - sand, clay, organics	sediment type plays an important role in plant growth as well as control, especially chemical options	clay sediments inactivate diquat herbicide, high levels of organic sediments can adsorb fluridone herbicide	S
Sediment depth / location	check sediment type and thickness prior to herbicide treatments	thick soft sediment layers can reduce or negate pelletized herbicide formulation efficacy - harvesting in shallow waters above flocculent sediments may result in turbidity problems	S
Potential for re-suspension	extensive plant cover, especially submersed plants, can retard organic sediment decomposition or allow suspended particles to settle out of flowing water forming thick flocculent layer	diquat herbicide is inactivated by suspended clay particles - high suspended organic particle content can reduce fluridone herbicide efficacy - removing calming effect of plants (after control) may allow water flow or waves to agitate sediments, especially in shallow waters, re-suspending sediments and associated nutrients - result may be increased turbidity or algae bloom - agitation from harvester paddle wheels can increase turbidity in shallow waters with flocculent sediments	S
Plant physiology			
Plant origin/growth characteristics	problem plants in a proposed control area should be characterized as native or exotic, and if exotic, they should be characterized as either a nuisance under the conditions present in the water body, or an invasive species in that region	the invasiveness and extent of the plant in the region influences the intensity of control - ex: a newly discovered plant that may be invasive in waters across the region may trigger eradication efforts - a native plant that interferes with boat ramp access may be beneficial throughout the rest of the water body triggering only local control	E, S, F
Native plant	a plant species that evolved in the general region where it is now found	a diverse assemblage of native plants is generally viewed as favorable - native plants do not generally impair natural waters, they may present problems to various uses and functions of the water body on a local scale - problems associated with native plants are often generated by watershed alterations including stabilized water levels and increased nutrient content - plants native to a region can cause problems in man-made waters like shallow canals or aqueducts where presence of any plant species may be considered undesirable or problematic	E, S, F

Exotic / alien	a plant that has been transported to a region in which it did not evolve	exotic plants do not necessarily cause problems in the ecosystems in which they have been introduced - causes of problems may be similar to those associated with native plants and therefore may be localized	E, S, F
Invasive	a plant that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health – even if an invasive plant species does not cause problems in one waterbody, it may serve as a contamination source for adjacent waters that may be more conducive to invasion	newly discovered populations of invasive plants should be considered for eradication or containment - delays may allow spread within infested waters or to additional waters - invasive plants may not be invasive in all cases - ex: water milfoil may cause problems in clear, shallow, stabilized waters, but may not be problematic in deep or turbid lakes or reservoirs with widely fluctuating water levels	E, S, F
Plant growth stage	plants are susceptible to various control methods based on current weather and growth conditions	most herbicides need actively growing plants to be effective - new growth is generally easier to control with herbicides than mature plants with high starch reserves and larger rhizome / root mass	E, S, F
Target plant / non-target	it is important to understand the growth stage of target plants as well as commingled non-target plants	consider controlling target plant while non-target plants are dormant or after they have produced seeds and are senescing - control target plant while infestation is still low to minimize effects on desirable comingled native plant species	E, S, F
Plant susceptibility	plants must be susceptible to control tools to avoid wasting valuable time and money	evaluate effectiveness of control tools through literature reviews or contact with managers with similar problems and conditions - plant susceptibility may change from one control event to the next related to such parameters as plant growth stage or water conditions	E, S, F
Target plant / non-target	prior to initiating aquatic plant control in systems where a diverse native plant community is desired, it is important to identify non-target plants to develop control programs that conserve or enhance these species	impacts to non-target plants can be reduced through selection of control methods, timing of control, using lowest feasible herbicide rates, and controlling target plants, especially invasive plants, before they become widespread and require large-scale control efforts - ex: stocking sterile grass carp early after an infestation of susceptible plants or reducing plant biomass prior to stocking allows the lowest number of fish to be released lessening non-target plant control	E, S ,F
Potential for re-growth			E, S, F

Target / non-target	control operations may be expensive - evaluate the potential for re-growth for proposed control methods or strategies	consider cost-effective control measures that selectively control target plants while conserving or enhancing non-target species - evaluate cost-effectiveness of proposed control - ex: controlling a new infestation of hydrilla or Eurasian watermilfoil in two feet of water in an attempt to eradicate may be cost-effective - controlling widely dispersed and established hydrilla or EWM in two feet of water where re-growth to the surface may take 1-2 months may not be cost-effective management	E, S, F
Climate			
Weather	daily weather conditions	rain may wash off herbicides before they are effective - treat early in day during summer months in thunderstorm prone areas - check weather report prior to herbicide applications for wind and rain forecast - several cloudy or rainy days after a large submersed plant treatment with contact herbicides may result in substantial dissolved oxygen reductions	E, F, S
	seasonal weather conditions	use caution applying systemic herbicides requiring 2-3 months of contact in areas impacted by tropical or seasonal monsoonal weather - take advantage of winter dieback by controlling plants before they become a problem in spring or summer	S
Light intensity	an important plant growth factor along with temperature	some herbicides' primary breakdown pathway is via photolysis; efficacy may be reduced in the summer or in shallow clear waters - consider with water transparency for predicting submersed plant growth along with herbicide selection and treatment timing - light intensity triggers tuber production in hydrilla	S
Water temperature	temperature influences plant growth and the amount of dissolved oxygen in the water column as well as microbial activity important for decomposing plant material and degrading some herbicide compounds	warming winter and spring temperatures can trigger plant growth, important for herbicide uptake especially in submersed plants - warmer water holds less dissolved oxygen than cooler; important for planning size of herbicide treatment and mode of action (fast acting contact vs. slower systemic)	S, F
Other considerations	in addition to physical parameters, there are human values to consider when deciding the level of aquatic plant control to attempt on a water body	these influences do not necessarily reflect the level of control that may be achieved, but rather the will of stakeholders to commit to attempting some level of control effort	

Cost	value judgment - does the anticipated outcome of controlling or not controlling plants justify expenditure?	the benefits of control must justify control expenditures - control must meet reasonable management objectives, including duration of control, restore or conserve uses and functions of water body, protect public health and safety, etc.	E, S, F
Anticipated amount of control	aquatic plant control is complex and many stakeholders have a rudimentary understanding of available tools and realistic control expectations - the public usually expects control to resolve impaired uses or functions of water bodies - responsible aquatic plant managers and researchers must clearly convey to stakeholders why they select or support control options as well as the anticipated amount and duration of control	management objectives should address anticipated extent of control - control includes the level of impact to the standing crop as well as underground roots, rhizomes, tubers etc. that influence ability of the plant to recover; therefore, control also includes the degree of impact to the problem-causing plant, the time to alleviate impaired uses, and the expected amount of time control will last; i.e. time until water uses may again be impaired	
Spatial – acres, % of water column	control area includes the coverage of plants to be controlled, expressed in acreage, square meters, etc. - also includes the percent of the water column in which plants are controlled, expressed as percent volume infested - can also include the below ground portion controlled (runners, roots, corms, tubers, etc.)	control using different tools or applied to different plant species provides variable results - managers must select tools that provide a level of control that satisfies management objectives and convey this reasoning or expectations to stakeholders	E, S, F
Duration			
Time to achieve control	depending on the method(s), the amount of time to achieve control may be immediate or may take months or longer, if achieved at all	control methods may provide immediate relief of a problem (ex: harvesting adjacent to flood control structures or bridge pilings) or take months (ex: systemic herbicides, biological controls)	E, S, F
Length of control in time	the applied control method(s) as well as environmental parameters impact the duration of control achieved - ex: control may be achieved in a matter of a few days to a few weeks, but plants may re-grow to problem levels within a month	control may last a few days to several years depending on method and water body conditions - ex: a summer contact type herbicide treatment of hydrilla or torpedograss growing in 1-2ft of water may only last a few weeks before plants refill the water column while a winter fluridone treatment in 12-15 feet of water may prevent hydrilla from growing back to the water surface for 18-24 months	E, S, F
Suppression	includes reducing plant vigor as well as flowering, seed production	many biological controls as well as plant growth regulators stress plants but by themselves may not provide a level of control that meets management objectives or stakeholder expectations	E, S, F
Water body values at risk	assess various uses of water bodies and estimate economic and environmental costs as well as impacts to human health if plants are controlled or not controlled	assists in establishing management objectives as well as level of control and choosing control options	E, S, F

Alternative water body	if plant control cannot be achieved in a water body, identify any alternative waters to serve the uses and functions	this is a temporary solution while eradication or management efforts are being devised or applied in a water body - access to the infested water body may be closed during eradication efforts or control delayed in infested waters while higher priority waters are managed, especially if other nearby waters are available - efforts should be made to resume use of water body as soon as possible	E, S, F
Contractor / equipment availability	ensure availability of contractor and equipment to address all anticipated control possibilities	have back-up labor and equipment contractors available - securing contracts can take time which may be critical for eradication or in emergency situations – large-scale control operations or operations in waters with multiple uses and functions may have very narrow windows of opportunity to implement	E, S, F
Control history in similar waters	apply control tools or management strategies with proven or demonstrated effectiveness and compatibility with uses and functions of system	monitor efficacy of each control event - determine causes of poor or no control and avoid repeating - for new infestations look to successes or failures with various control options in waters as similar as possible to proposed control site	E, S, F
Coordinate with stakeholders	control operations should be developed with stakeholders that have expressed interest in understanding the intricacies of aquatic plant control - the public should be notified through some means of any use restriction of impending herbicide control operations	stakeholders may view aquatic plant control and control tools from a single or less than holistic perspective - education and outreach efforts are important in addressing public concerns	E, S, F
Support – verbal, financial, in-kind	important tiebreaker for waters of equal importance when factors such as funding, technology, contractor availability, or cost/benefit ratios are insufficient to implement control projects in all water bodies - especially for lower priority uses or waters	work with all stakeholders to clarify management objectives - in low priority management waters, if support is high, then elevate to higher priority than equal priority waters where support is low or stakeholders oppose control	E, S, F
Public	level of verbal support from homeowner or public or private stakeholders or associations	for equally ranked control project priorities, public support may elevate control projects, especially above projects where there is no support or open stakeholder opposition to control	E, S, F
Agency – federal, state, local	level of verbal, financial, or in-kind service support for controlling aquatic plants	external funding or services may elevate a control project to a higher priority above otherwise equally evaluated projects with no external assistance	E, S, F