Appendix E  Influence diagrams
Influence diagrams were completed for North Bay and South Bay representing linkages within near-term (2015-2029) and long-term (2030-2100) portions of their decision tools. For Suisun and Central Bay, only the near-term influence diagrams were completed.

E-1  North Bay
Conservation objectives are shown to the right, intermediate drivers in the middle, external drivers on the left, and action categories around the edges. Implicit intermediate drivers are shaded in gray – these were not included explicitly in the decision tool.

E-1.1 Subtidal and intertidal mudflats, near-term
Appendix E Influence diagrams
Section E-1 North Bay

E-1.2 Tidal marsh, near-term

External Drivers

- Extreme weather events+++ (rosy vs. not good)
- Sea-level rise effect+++ (small/predictable vs. wide-ranging/unpredictable)

Unless otherwise noted, categories are stable/increasing vs. decreasing

+++ = affects all intermediate drivers

Intermediate Drivers

- Freshwater inflow, hydrology, sediment dynamics***
- Marsh size, connectivity, complexity***
- Invasive & nuisance species

Indicators of tidal marsh

- Marshbird density
- Marsh mammal density
- Native fish diversity & abundance
- Acres dominated by native plants

Manage human disturbance

Manage vegetation

Manage sediment

Manage individual wildlife species***

Protect acreage***

Manage acreage***

*** = affects all indicators of tidal marsh
Appendix E Influence diagrams
Section E-1 North Bay

E-1.3 Managed wetland, near-term

Unless otherwise noted, categories are stable/increasing vs. decreasing

External Drivers
- Extreme weather events+++ (rosy vs. not good)
- Temperature & precipitation+++ (No change vs change in Patterns)

Intermediate Drivers
- Pond maintenance water levels***
- Levee physical integrity***
- Water salinity***

Indicators of managed wetlands
- Abundance of native fishes
- Shorebird richness & density
- Waterfowl density (divers & dabblers)

Manage sediment

Manage vegetation

Manage water***

Manage human disturbance

Manage individual wildlife species

Protect acreage***

+++= affects all intermediate drivers

*** = affects all indicators of managed wetlands
**E-1.4 Upland transition zone, near-term**

**External Drivers**
- Extreme weather events++ (rosy vs. not good)
- Temperature & precipitation++ (No change vs Change in patterns)

**Intermediate Drivers**
- Detrimental Levees and armoring / human development***
- Invasive & nuisance species***

**Manage water**

**Manage human disturbance**

**Manage sediment**

**Indicators of upland transition zone**
- Acres dominated by native plants
- Song sparrows & yellow throats (density)
- Refugia available at king tide (SMHM & CLRA)
- Herpetofauna abundance

**Protect acreage***

**Manage individual wildlife species***

**Manage vegetation**

++ = affects both intermediate drivers

+++ = affects all indicators of upland transition zone

*** = affects all indicators of upland transition zone

Unless otherwise noted, categories are stable/increasing vs. decreasing
E-1.5 Subtidal and intertidal mudflats, long-term

**External Drivers**
- Extreme weather events+++ (rosy vs. not good)
- Temperature & precipitation+++ (No change vs change in patterns)

**Intermediate Drivers**
- Sediment dynamics / supply***
- Hydrology / water supply***
- Invasive & nuisance species

**Indicators of subtidal & intertidal mudflats**
- Shorebird abundance
- Shellfish bed acreage
- Eelgrass bed acreage
- Forage abundance for diving ducks
- Salmonid abundance

**Manage human disturbance***
- Protect acreage
- Manage individual wildlife species

**Manage vegetation**
- Manage sediment

---

*** = affects all indicators of subtidal & intertidal mudflats

Unless otherwise noted, categories are stable/increasing vs. decreasing

+++ = affects all intermediate drivers
E-1.6 Tidal marsh, long-term

Appendix E Influence diagrams
Section E-1 North Bay

External Drivers

- **Extreme weather events***+++(rosy vs. not good)
- **Sea-level rise effect***+++ (small/predictable vs. wide-ranging/unpredictable)
- **Sea-level rise +++** (Approx. 55 cm vs. approx. 165 cm)

Unless otherwise noted, categories are stable/increasing vs. decreasing

+++ = affects all intermediate drivers

Intermediate Drivers

- **Freshwater inflow, hydrology, sediment dynamics ***
- **Marsh size, connectivity, complexity***
- **Invasive & nuisance species***

Manage human disturbance

Indicators of tidal marsh

- **Marshbird density***
- **Marsh mammal density***
- **Native fish diversity & abundance***
- **Acres dominated by native plants***

Manage vegetation

Manage sediment

Manage individual wildlife species***

Protect acreage***

+++= affects all indicators of tidal marsh
E-1.7 Managed wetlands, long-term

**External Drivers**
- Extreme weather events+++
  (rosy vs. not good)
- Temperature & precipitation+++ (No change vs change in Patterns)
- Sea-level rise +++ (Approx. 55 cm vs. approx. 165 cm)
- Manage sediment

**Intermediate Drivers**
- Pond maintenance water levels***
- Levee physical integrity***
- Water salinity***

**Indicators of managed wetlands**
- Density of native fishes per structure
- Shorebird richness & density per structure
- Waterfowl density (divers & dabblers)

**Manage sediment**
- Protect acreage***
- Manage individual wildlife species
- Manage human disturbance
- Manage vegetation
- Manage water***

+++ = affects all intermediate drivers
*** = affects all indicators of managed wetlands

Unless otherwise noted, categories are stable/increasing vs. decreasing.
Appendix E Influence diagrams
Section E-1 North Bay

E-1.8 Upland transition zone, long-term

External Drivers
- Extreme weather events++
  (rosy vs. not good)
- Temperature & precipitation++
  (No change vs Change in patterns)
- Sea-level rise ++
  (Approx. 55 cm vs. approx. 165 cm)

Intermediate Drivers
- Detrimental Levees and armoring / human development***
- Invasive & nuisance species***

Manage human disturbance

Manage water

Manage vegetation

Indicators of upland transition zone
- Acres dominated by native plants
- Song sparrows & yellow throats (density)
- Refugia available at king tide (SMHM & CLRA)
- Herpetofauna abundance

Manage sediment

Protect acreage***

Manage individual wildlife species***

Manage disturbance

 Unless otherwise noted, categories are stable/increasing vs. decreasing

+++ = affects both intermediate drivers

*** = affects all indicators of upland transition zone

= affects both intermediate drivers

++ = affects both intermediate drivers

+++ = affects both intermediate drivers
**Appendix E Influence diagrams**

**Section E-2 Suisun**

**E-2 Suisun**

**E-2.1 Subtidal and intertidal mudflats, near-term**

- **External Drivers**
  - Sea-level rise (constant)
  - Extreme storm events (rosy vs. not-so-great)
  - Extreme drought events (normal vs. more frequent & longer)

- **Intermediate Drivers**
  - Sediment dynamics & supply (Positive vs. negative effects on SAVs)
  - Inundation regime (optimal vs. suboptimal for biodiversity)
  - Salinity index (maintained or improved vs. worsened)

- **Indicators of biotic integrity in subtidal & intertidal mudflats**
  - Acreage native submerged aquatic vegetation (SAV)
  - Wintering shorebird abundance
  - Delta smelt abundance
  - Native shellfish distribution & acreage
  - Diving duck abundance

- **Manage water**
  - Manage sediment

- **Manage individual wildlife species**
  - Manage vegetation

- **Manage vegetation**

*Gray filled boxes are implicit parts of decision tool*
*Dashed lines represent negative effects; solid lines represent positive effects*

Unless otherwise noted, categories are increasing vs. stable/decreasing
E-2.2 Tidal marsh, near-term

- Gray filled boxes are implicit parts of decision tool
- Dashed lines represent negative effects; solid lines represent positive effects

unless otherwise noted, categories are increasing vs. stable/decreasing
E-2.3 Managed wetland, near-term

- Gray filled boxes are implicit parts of decision tool
- Dashed lines represent negative effects; solid lines represent positive effects

**Intermediate Drivers**

- **Manage water**
- **Manage sediment**
- **Protect/acquire acreage**

**Indicators of biotic integrity in managed wetlands**

- Salt marsh harvest mouse (capture efficiency)
- Wintering shorebird abundance
- Vegetation availability
- Diving and dabbling duck abundance

**Manage individual wildlife species**

- Hydrology (freshwater flow)
- Inundation regime (optimal vs. suboptimal for biodiversity)
- Salinity index (maintained or improved vs. worsened)

**External Drivers**

- Extreme storm events (rosy vs. not-so-great)
- Extreme drought events (normal vs. more frequent & longer)
- Sea-level rise (constant)
- Sea-level rise – (constant)

**Manage vegetation**

- Manage water
- Manage sediment
- Protect/acquire acreage
E-2.4 Upland transition zone, near-term

**External Drivers**
- Sea-level rise - (constant)
- Extreme storm events (rosy vs. not-so-great)

**Intermediate Drivers**
- Hydrology (freshwater flow)
- Sediment dynamics/supply (maintained or improved vs. worsened)

**Indicators of biotic integrity in managed wetlands**
- Native transition zone species (acres)
- Obligate tidal marsh bird diversity
- Salt marsh harvest mouse (capture efficiency)
- Plant species richness in vernal pools

**Manage**
- Water
- Acquire acreage
- Individual wildlife species
- Sediment
- Vegetation

**Human disturbance**

- Gray filled boxes are implicit parts of decision tool
- Dashed lines represent negative effects; solid lines represent positive effects

Unless otherwise noted, categories are increasing vs. stable/decreasing
Appendix E Influence diagrams
Section E-3 Central Bay

E-3 Central Bay
Colors of lines around boxes and colors of arrows indicate which action category is affecting each factor in the influence diagram. Fundamental objectives are the ultimate desired outcomes of the conservation effort (also referred to as conservation objectives in this report). Two binary levels or categories were assigned to each factor in the influence diagrams, and they are indicated within the diagrams below.

E-3.1 Subtidal and intertidal mudflats, near-term

Unless otherwise noted, categories are increasing vs. stable/decreasing

Intermediate Drivers
Disturbance***

Infrastructure & development

Freshwater inflow Adequacy (normal vs. abnormal)

High-quality substrate acreage

Invasive & nuisance species

Indicators of subtidal and intertidal mudflats
Total mudflat acreage

Subtidal water quality (stable/inc. vs. dec.)

Subtidal forage fish biomass

Structure-building SI acreage

Manage human disturbance

Manage sediment

Manage water

Manage native & non-native animals

Manage native & non-native plants

External Drivers
Extreme weather events*** (rosy vs. not good)

Air & water Temperature (normal/cooler vs. warmer)

*** = affects all indicators of subtidal & intertidal mudflats
E-3.2 Tidal marsh, near-term

**Intermediate Drivers**
- Disturbance
- Sediment **
- Freshwater inflow Adequacy **
- Contaminant Levels
- Infrastructure & development **
- Invasive & nuisance species

**Indicators of tidal marsh**
- Tidal Marsh Recovery Plan Criteria (met vs. not met)
- Plant & invertebrate biomass

**External Drivers**
- Extreme weather events **(rosy vs. not good)**

**Manage**
- Manage human disturbance
- Manage sediment
- Manage water

**Manage native & non-native animals**

**Protect Acres**

**Manage native & non-native plants**

**Unless otherwise noted, categories are increasing vs. stable/decreasing**

**= affects both indicators of tidal marsh**
E-3.3 Upland transition zone, near-term

Appendix E Influence diagrams
Section E-3 Central Bay

- Manage human disturbance
- Manage water

Intermediate Drivers
- Disturbance
- Freshwater inflow adequacy
- Infrastructure & development
- Invasive & nuisance species

Indicators of upland transition zone (UTZ)
- UTZ criteria in Tidal Marsh Recovery Plan (met vs. not met)

External Drivers
- Extreme weather events (rosy vs. not good)

Unless otherwise noted, categories are increasing vs. stable/decreasing

- Manage sediment
- Manage native & non-native animals
- Protect Acres
- Manage native & non-native animals
E-4 South Bay

Conservation objectives are shown to the right, intermediate drivers in the middle, external drivers on the left, and action categories around the edges.

E-4.1 Subtidal and intertidal mudflats, near-term

**External Drivers**
- Sediment supply
- Extreme events (rosy vs. not good)

**Intermediate Drivers**
- Mudflat acreage with high-quality bird food (inverts.)

**Indicators of subtidal & intertidal mudflats**
- Wintering shorebird abundance
- Diving duck abundance
- Eelgrass & subtidal shellfish acreage
- Harbor seal abundance

**Action Categories**
- Manage Sediment***
- Manage nuisance animals***
- Manage human disturbance

*Unless otherwise noted, categories are stable/increasing vs. decreasing*

*** = affects all indicators of subtidal & intertidal mudflats
E-4.2 Tidal marsh, near-term

- **Physical attributes**
  - Native marsh acreage, size, connectivity
  - CA Clapper Rail & SM Harvest Mouse
  - Dabblers

- **Requirements**
  - Flood protection#
  - Manage vegetation
  - Protect acreage
  - Manage nuisance animals

- **External Drivers**
  - Sediment Supply
  - Extreme Events

- **Intermediate Drivers**
  - Manage Sediment
  - Manage vegetation

- **Indicators of tidal marsh**

*Unless otherwise noted, categories are stable/increasing vs. decreasing.*
**E-4.3 Managed ponds, near-term**

*Appendix E Influence diagrams
Section E-4 South Bay*

*** = influences all indicators of managed ponds

**External Drivers**
- Temperature & precipitation
  - normal vs. abnormal
- Extreme Events

**Intermediate Drivers**
- Water quality***

**Indicators of Managed Ponds**
- Small/med shorebirds
- Snowy plover
- Breeding waterbirds
- Diving ducks
- Dabblers
- Salt-pond specialists

**Unless otherwise noted, categories are stable/increasing vs. decreasing**

- Manage nuisance animals***
- Restore acreage***
- Manage water***
- Protect acreage***

Unless otherwise noted, categories are stable/increasing vs. decreasing
**Appendix E Influence diagrams**

**Section E-4 South Bay**

**E-4.4 Upland transition zone, near-term**

* *** = influences all indicators of managed ponds

### External Drivers
- **Temperature & precipitation**
  - normal vs. abnormal
- **Extreme Events**

### Intermediate Drivers
- **Temperature & precipitation**
  - normal vs. abnormal
- **Water quality***

### Indicators of Managed Ponds
- **Small/med shorebirds**
- **Snowy plover**
- **Breeding waterbirds**
- **Diving ducks**
- **Dabblers**
- **Salt-pond specialists**

### Management Strategies
- **Manage nuisance animals***
- **Restore acreage***
- **Manage water***
- **Protect acreage***

Unless otherwise noted, categories are stable/increasing vs. decreasing
E-4.5 Subtidal and intertidal mudflats, long-term

Unless otherwise noted, categories are stable/increasing vs. decreasing

*** = affects all indicators of subtidal & intertidal mudflats
E-4.6 Tidal marsh, long-term

- Available land for protection 2015-2029
- Physical attributes 2015-2029
- External Drivers
  - Extreme Events 2015-2029
  - Sediment supply
  - Extreme events (rosy vs. not good)
  - Sea-level Rise
- Intermediate Drivers
  - Total acreage UTZ 2015-2029
  - Total acreage tidal marsh 2015-2029
- Indicators of subtidal & intertidal mudflats
  - Wintering shorebird abundance
  - Diving duck abundance
  - Eelgrass & subtidal shellfish acreage
  - Harbor seal abundance
- Manage sediment***
- Manage nuisance animals***
- Manage human disturbance

- Mudflat acreage with high-quality bird food (inverts.)
- Restore acreage

*** = affects all indicators of subtidal & intertidal mudflats

Unless otherwise noted, categories are stable/increasing vs. decreasing
E-4.7 Managed ponds, long-term

Available land for protection 2015-2029

External Drivers
- Extreme Events 2015-2029
- Sea-level Rise
- Sediment Supply
- Extreme Events

Intermediate Drivers
- Total acreage UTZ 2015-2029

Indicators of tidal marsh
- Native marsh acreage, size, connectivity
  - CA Clapper Rail & SM Harvest Mouse
  - Dabblers

Requirements
- Flood protection#
- Manage vegetation
- Protect acreage
- Manage nuisance animals

# = influenced by both external drivers

Unless otherwise noted, categories are stable/increasing vs. decreasing

Manage Sediment
- Manage Sediment
- Manage nuisance animals
- Manage vegetation
- Protect acreage

Available land for protection 2015-2029

Manage

Flood protection#
E-4.8 Upland transition zone, long-term

*** = influences all indicators of upland transition zone

Manage human disturbance***

Indicators of upland transition zone

UTZ acreage dominated by native plants

CA Clapper Rail

Manage sediment

Manage vegetation

Restore acreage

Protect acreage

Manage nuisance animals

External Drivers

Extreme Events

Sea-level rise

Intermediate Drivers

Available land for protection

Manage nuisance animals

Manage vegetation

Restore acreage

Protect acreage

Manage sediment

Unless otherwise noted, categories are stable/increasing vs. decreasing