Requirements and Design

Collected Notes for Series Slots with Expressions

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1. Introduction

In a series slot with expression, a RPL expression is used to calculate the values for the timesteps in the slot. The RPL expression can reference values in other slots to be used in the calculation. Reclamation in Albuquerque uses this type of slot to sum outflows for groups of accounts on reservoirs. They typically annotate a release from an account with a note on the outflow slot for the account. They would like for the release notes on the outflows of the accounts to show up in the series slot with expression that sums the account outflows. In this sense, the notes should be "collected" from the source slots referenced in the RPL expression and shown in the expression slot.

2. Requirements

The following requirements for collected notes on series slot with expression have been identified:

- Notes are attached to series slots at particular timesteps in the series. The series slot with expression should at each timestep display the notes from each corresponding timestep in all series slots referenced in the RPL expression for the slot. This means that multiple notes from source slots could be displayed at a single timestep in the expression slot.
- When the series slot with expression is recalculated, the collected notes should be updated to reflect current notes from source slots.
- Collected notes should be saved to the model file so that they are available in the expression slot when the model is opened (similar to the expression slot values).
- The collection and display of collected notes should be optional.
- It should be possible to easily see the source slot for a collected note shown in an expression slot, and to readily open the source slot.
- Collected notes should not interfere with the ability to add notes directly to the series slot with expression as can be done with any other series slot.
- Having to do manual configuration to identify the source slots for an expression slot is undesirable.
- Collecting notes for series slots with expressions should not unreasonably impact model run performance.

- It should be possible to show collected notes in expression slots as footnotes in a Tabular Series Slot Report generated through the Output Manager in RiverWare. These footnotes should make apparent what the source slot is for the collected note.
- If an expression slot references a note in a source slot, and then another expression slot references that expression slot, the source slot for the collected note should be maintained as the original source slot where the note was assigned.

3. Design Approach

An approach was chosen that will use a global setting in the RPL Parameters dialog to indicate if notes should be collected and displayed or not from source slots referenced in expression slots. In this way, note collection can be easily turned on or off for the model, and no configuration for this needs to be made on a per slot basis. This setting will be saved with the model.

The RPL mechanism for generating a list of all series slots accessed during the execution of a RPL expression will be utilized to automatically generate a source slot list for the expression slot so that no manual specification of these will be required by the user. The set of referenced slots will be created as inclusive across all timesteps by asking for the slots accessed each time the RPL expression is executed and combining these into a unique set. This allows notes from referenced slots to be collected once at the end of the run (or at the end of a manual initiation of expression slot solving) for all slots in the set instead of collecting referenced slot notes on a per timestep basis. This will minimize the performance impact of collecting notes while still ensuring that all slots referenced in the solving of the expression slot are represented in the notes.

The pros of this approach are:

- Collection of notes from source slots can be toggled on for all expression slots in the model at a single place.
- Source slot information is generated automatically and requires no configuration by the user.
- Source slot information is complete because it is collected across all timesteps.
- Notes are collected from source slots only once instead of at each timestep.

The tradeoffs that come with choosing this approach are:

- The referenced slots are collected via the RPL mechanism for each timestep, so there is some per timestep processing.
- Collected notes for all referenced slots across the timesteps will be shown at each timestep, so will not be customized for the specific slots that were accessed at each timestep's execution.
- Since note collection is only performed once at the end of a run, if the run is paused or aborts in the middle, the expression slots that are set to solve at each timestep or at the beginning of the run will not have collected notes displayed with the already calculated values in the interrupted state.

If notes have been collected, collected notes will be displayed in all places that directly assigned notes are currently displayed (Open Slot dialog, SCT dialog, and Note Group Manager dialog). However, they will be displayed with a different icon so that it is visually obvious which notes are collected notes. The context menu for cells with collected notes in the Open Slot dialog and the SCT dialog will have a menu item to allow opening of the source slot from which the collected note originated. When the text of a collected note is displayed in a tool-tip, in a notes column, or at the bottom panel of a dialog, the source slot name will be displayed in parentheses after the note text.

Notes can currently be optionally output with Tabular Series Slot Reports and via the old-style DMIs. If notes have been collected, collected notes will automatically be output with directly assigned notes if note output is specified. Here the text of the collected note will also display the source slot name in parentheses after the note text.

4. Simulation Library Implementation

The following details the changes required to classes in the simulation library to support the design approach for collection of notes on series slots with expressions:

Slot::ExprData
    Data Members To Add
        Rpl::SlotSet _sourceSlotSet
    Methods To Add
        clearSourceSlotSet()
        Rpl::SlotSet* getSourceSlotSet()

Slot
    Methods To Add
        clearExprSlotSet()
        Rpl::SlotSet* getExprSlotSet()
        clearCollectedNotes() – clear collected notes from the slot's _seriesNoteAssoc data
        structure then call AnnoMgr::cleanSlotsHavingNotes method if no notes are left
        virtual calcCollectedNotes()

SeriesSlot

    Methods To Add
        virtual calcCollectedNotes() – call getExprSlotSet() and for each source slot, requests its
        series note associations (seriesNoteAssociations()). For each association, copy the
        AnnoNoteAssociation, reset the slot member to the expression slot, set the source slot
        member to be the source slot, and add the new note association to the expression slot
        with addNote(const AnnoNoteAssoc&).

Methods To Modify

resetState() - add that if series is an expression slot, call clearExprSlotSet() and clearCollectedNotes()

evaluateExpr(bool) – change the two expr->evaluate(result, NULL) calls so that if the RplExprSlotMgr indicates notes should be collected, do expr->evaluate(result, getExprSlotSet()). This will pass in the slot set so any new source slots accessed during expression evaluation will be added to the set. If notes are not being collected, use NULL for the second argument in evaluate(result, NULL).

AnnoNoteAssoc

Data Members To Add

bool _isNoteCollected

Slot* _sourceSlot

Methods To Add

bool isNoteCollected()

setNoteCollected(bool)

setSourceSlot(Slot*)

Slot* getSourceSlot()

RplExpressionMenu

Methods To Modify

evaluateExpression() – add call to calcCollectedNotes() after call to slot->evaluateExpr()

RplExprSlotMgr

Data Members To Add

bool _collectReferencedSlotNotes

Methods To Modify

evaluateSlots(EvalTime) – if EvalTime is ONDEMAND or END_RUN, iterate _slots and call calcCollectedNotes for each series slot that doesn't have an evaluation time of NEVER.

dump – boolean for _collectReferencedSlotNotes needs to be added for output to model file

rplExprSlotMgrCmd – code to process boolean for the _collectReferencedSlotNotes needs to be added for load from model file

Methods To Add

bool doCollectReferencedSlotNotes()

AnnoMgr

Methods To Modify

dumpSlotNotes – a Boolean for if note is a collected note, and the name of the source slot needs to be added for output to model file

processTstepNoteCmd – add code to process the boolean and source slot for a collected note for loading from model file
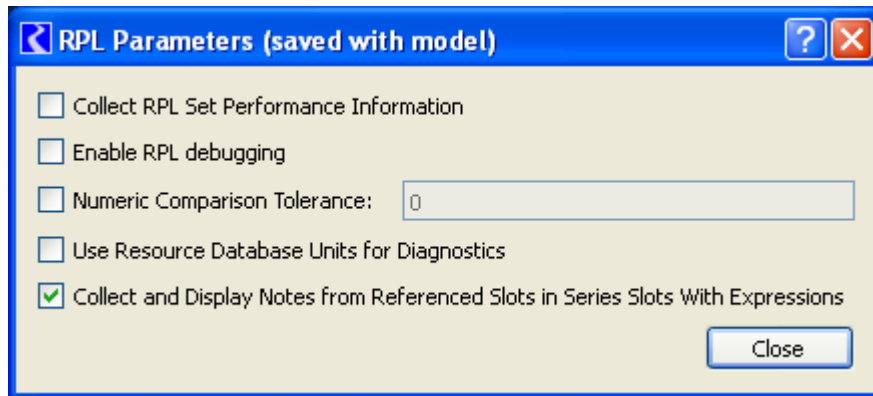
slotCallbackHandler() – to maintain the pointer to the source slot in the AnnoNoteAssoc class, the SLOT_DELETED callback code will need to be enhanced to check the _slotHavingNotes list, and for each expression slot in the list, check its AnnoNoteAssoc list to see if any associations refer to the deleted slot as its source slot. If so, the associations should be deleted to prevent a bad pointer after the slot deletion.

5. User Interface Changes

The User Interface for RiverWare will be affected by adding collected notes as described below.

RPL Parameters Dialog

The RPL Parameters dialog contains global settings related to RPL functionality in the current model. A checkbox titled "Collect and Display Notes from Referenced Slots for Series Slots with Expressions" will be added to this dialog to control the collection of notes and the display and reporting of collected notes for all series slots with expressions in the model. Notes will only be collected if this option is checked.
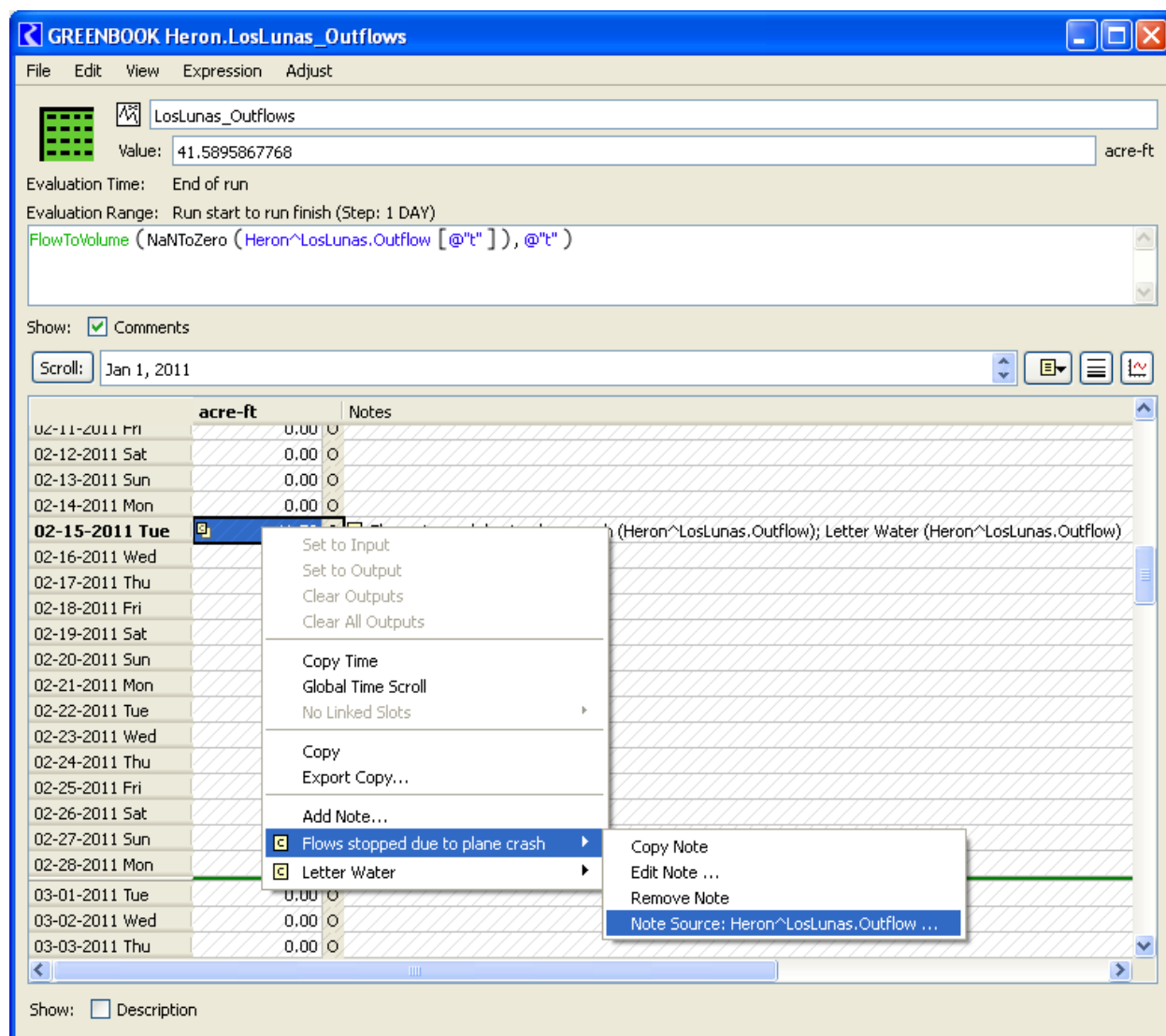

Open Slot Dialog

Currently in the Open Slot Dialog, notes are indicated with a tablet icon as seen below. A different icon will be used for a collected note to allow a visual way of distinguishing between collected notes and directly assigned notes (tentatively the tablet outline with a 'C' on the tablet). Multiple notes at a timestep are shown with two overlapping tablets, If any of the multiple notes are a collected note, there will be a multiple icon with a 'C' on the tablet. Code for the dialog will need to be modified to assign the different icons when collected notes are involved.
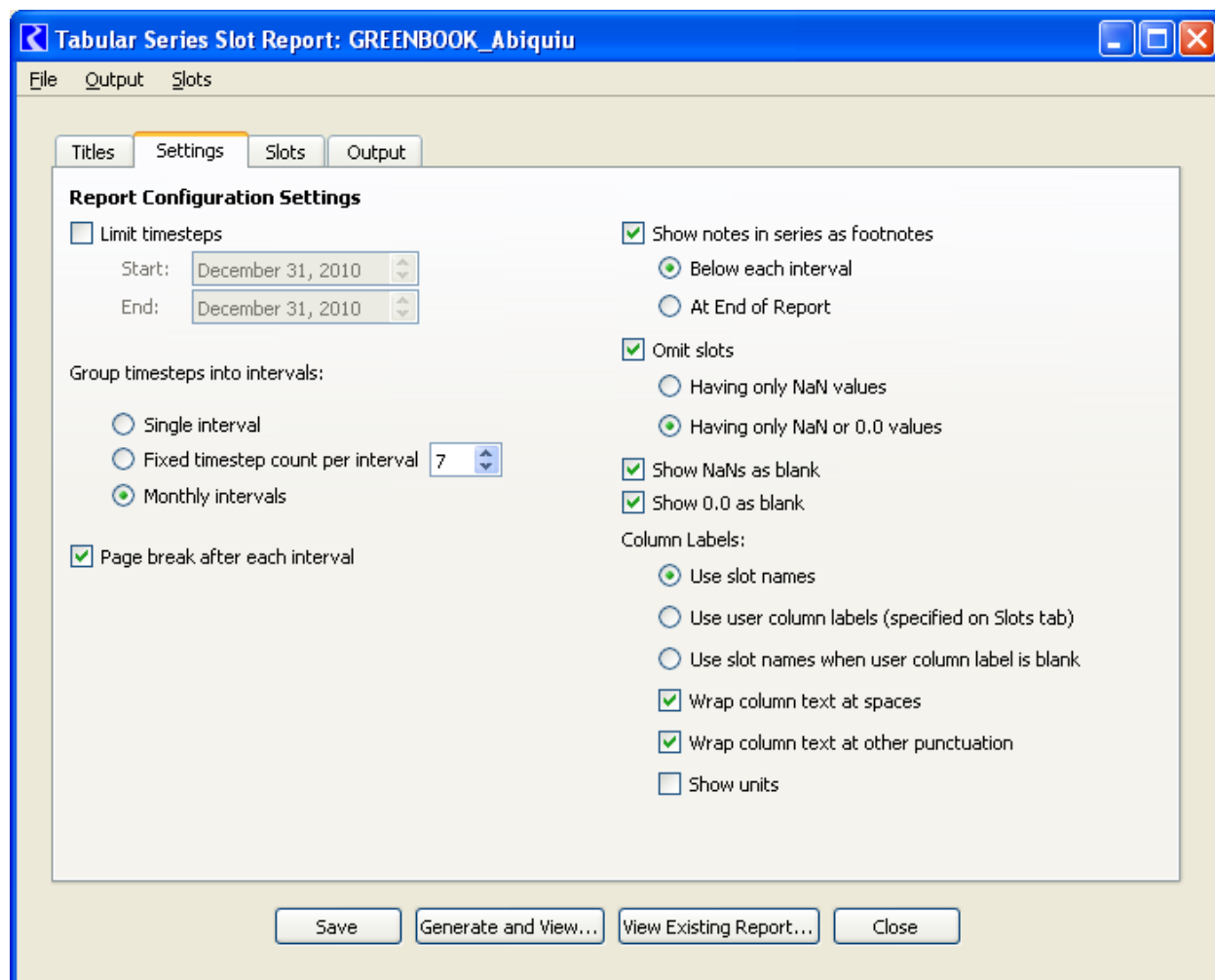
The context menu for a cell with a note currently allows options to Copy Note, Edit Note, and Remove Note as seen below. For a collected note, all of these options will be available. This allows a particular collected note to be removed if the user chooses not to want to see it for display or reporting reasons. Note that when the expression slot is regenerated, all collected notes will be regenerated. To make it easy to get to the source slot for a collected note, an additional menu option will be added to the context menu with the source slot name, which will generate an open slot dialog for the source slot scrolled to the timestep that has the source note. The dialog code will need to be modified to conditionally add this context menu option.

The Open Slot dialog has an option to show the note text in a separate column and also will give a tool tip showing the note text when mousing over a note icon. In both cases, the source slot name in parentheses will be added at the end of the note text for a collected note.

Tabular Series Slot Report Dialog

The settings tab of the Tabular Series Slot Report Dialog is where the user chooses to show notes as footnotes in the report. This dialog will not be changed, and collected notes, if calculated, will be shown with other notes.
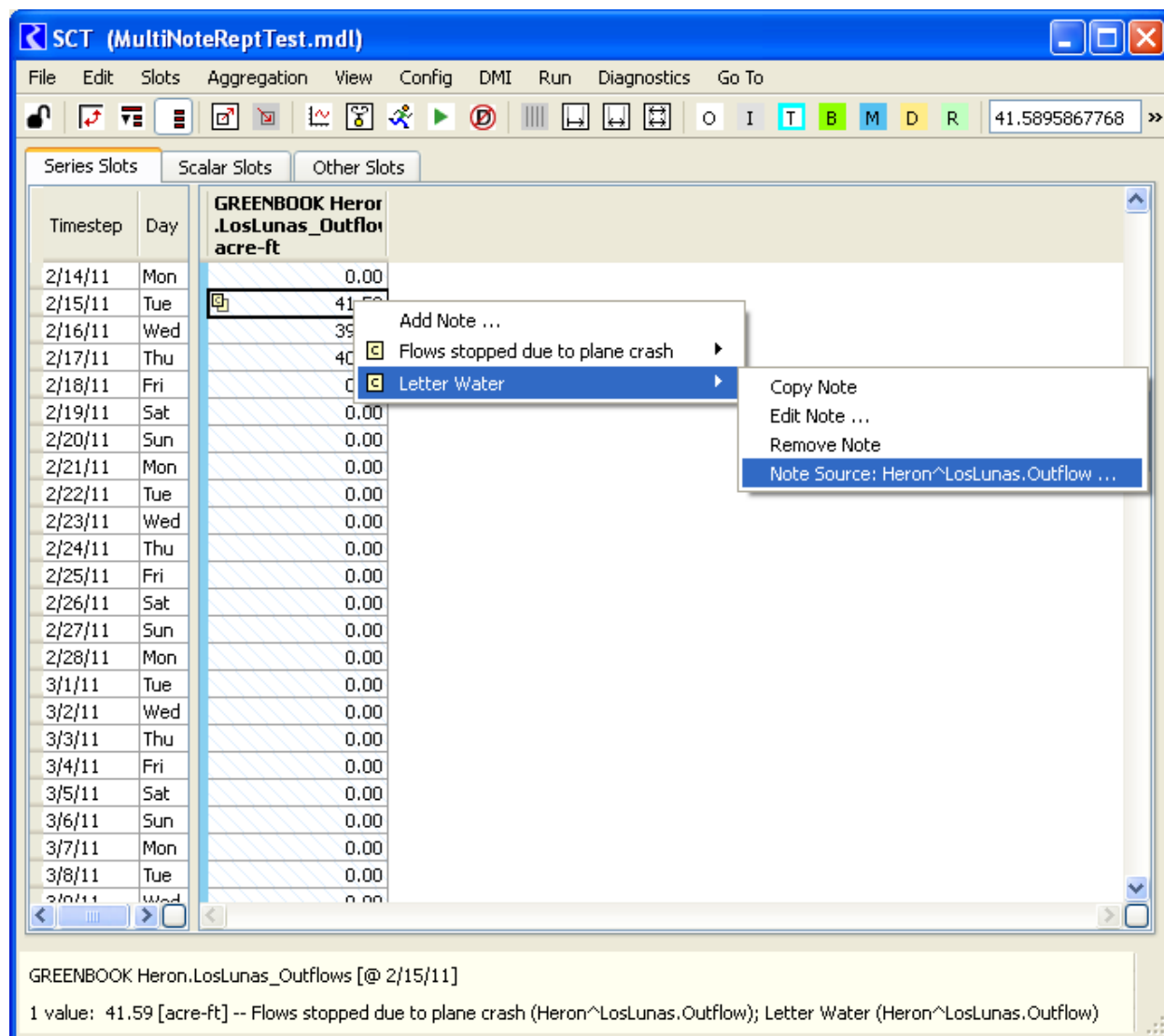
In the actual generated report, note text in the footnote will have the source slot in parentheses shown after the note.
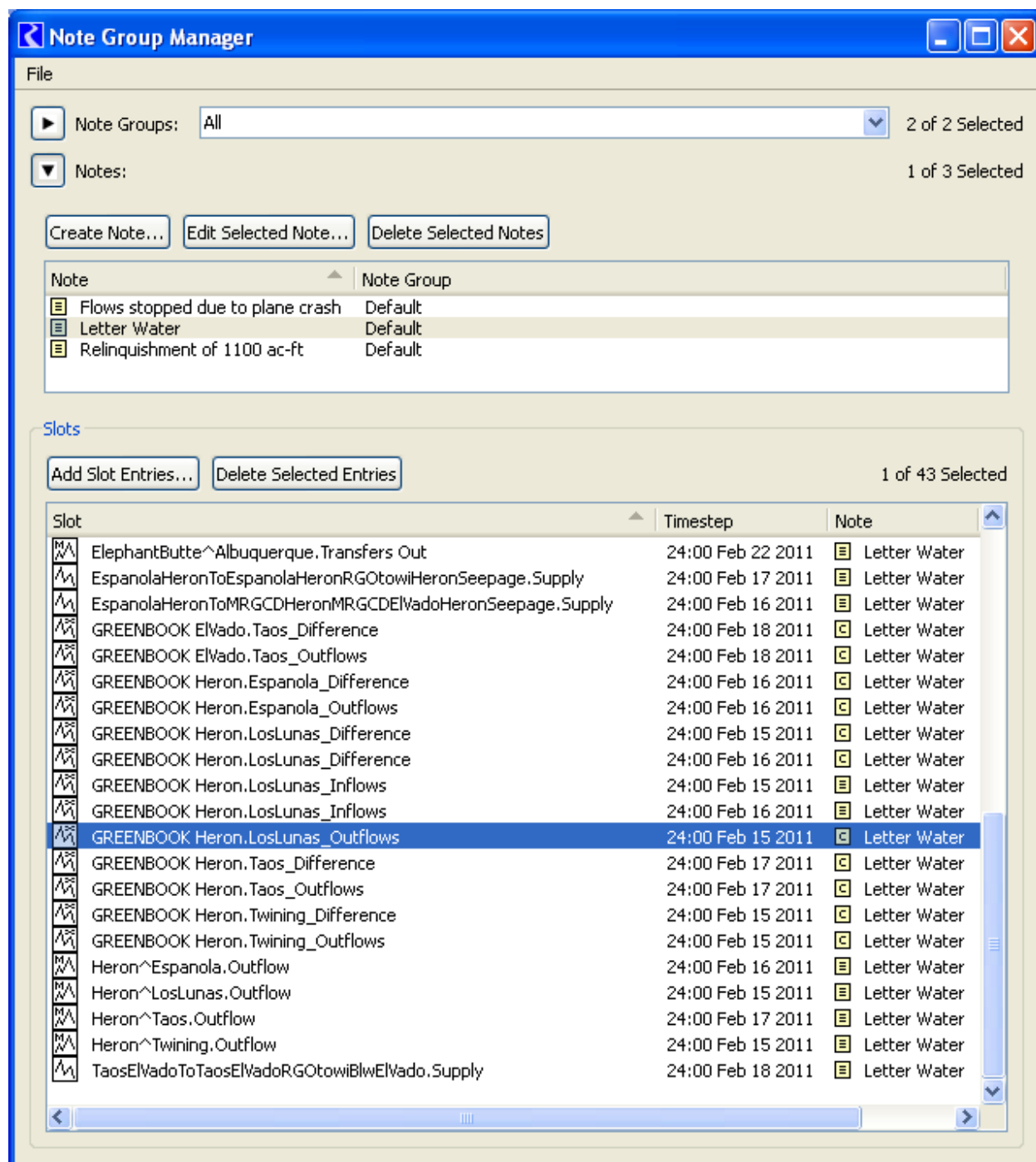
SCT Dialog

The SCT dialog also displays note icons, so code changes similar to the Open Slot Dialog will need to be implemented in the SCT. This includes code to assign the appropriate icons depending on if a note is collected or directly assigned, to show the source slot name in parentheses after the note text when displayed, and to add a menu item for the source slot to the context menu of collected notes.

Note Group Manager Dialog

The Note Group Manager dialog displays slots associated with notes. This is the central place where a user can see references to all slots where a particular note is assigned. The expression slots where notes are assigned as collected notes should also be displayed in this dialog. Code will need to be modified to show collected notes with the 'C' tablet icon to distinguish them from directly assigned notes. This is another place where a collected note could be removed from an expression slot as in the context menus for the SCT and the Open Slot Dialogs.

NoteQtUtils Namespace

Functions in the NoteQtUtils namespace are used from the GUI dialogs to access note functionality. Pixmaps for the collected note icons will need to be created in different colors, and functions will need to be added to get the appropriately colored pixmap depending on the color assigned to the annotation group to which the collected note belongs.